



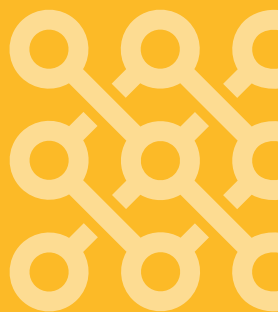
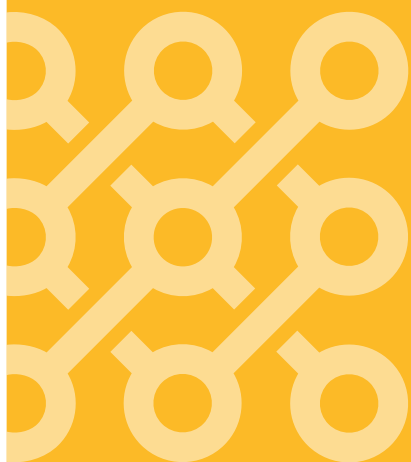
84. Latvijas Universitātes
starptautiskā zinātniskā
konference 2026



LATVIJAS
UNIVERSITĀTE

TĒŽU KRĀJUMS

BOOK OF ABSTRACTS



2026

Latvijas Universitātes 84. starptautiskā zinātniskā konference (2026. gada 14.–16. aprīlis). Tēžu krājums = 84th International Scientific Conference of the University of Latvia (April 14–16, 2026). Book of Abstracts. Aija Erta (sast.). Rīga: LU Akadēmiskais apgāds, 2026. 949 lpp.
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84. Latvijas Universitātes starptautiskā zinātniskā konference 2026

Konferences mērķis ir akcentēt universitātes nozīmīgo lomu zināšanu radīšanā, sabiedrības attīstībā un ilgtspējīgu risinājumu veidošanā. Deviņi konferences temati, kas vienlaikus ir Latvijas Universitātes prioritārie pētniecības virzieni, uzsver augstākās izglītības un zinātnes lielo ietekmi uz sabiedrību, ekonomiku un valsts attīstību.

Atklāšanas akadēmiskajā plenārsēdē 14. aprīlī ar referātu “No izcilības līdz ietekmei: kā plānot nozīmīgus pētījumus?” uzstāsies Eiropas Pētniecības padomes (*European Research Council – ERC*) granta saņēmēja Tartu Universitātes ģeoinformātikas profesore Evelīna Ūemā (*Evelyn Uuema*).



84th International Scientific Conference of the University of Latvia 2026

The 84th International Scientific Conference of the University of Latvia (UL) will take place from April 14 to 16, united by the theme “The University of the Future: Impact-Driven Leadership”.

The aim of the 84th International Scientific Conference of the University of Latvia is to highlight the important role of universities in creating knowledge, developing society and creating sustainable solutions. The programme emphasizes nine priority research areas of the University of Latvia, which reflect the significant impact of higher education and science on society, economy and national development.

The opening plenary session with prof. Uemaas’ paper “From excellence to impact: Designing research that matters?” will take place 14 April.

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NO IZCILĪBAS LĪDZ IETEKMEI: KĀ PLĀNOT NOZĪMĪGUS PĒTĪJUMUS?

Evelīna Ūemā (*Evelyn Uuemaa*)

Tartu Universitātes ģeoinformātikas profesore, Igaunija



Foto no: <https://2026.europe.foss4g.org/scientific-committee/evelyn-uuemaa/>

Evelīna Ūemā (*Evelyn Uuemaa*) ir ģeoinformātikas profesore Tartu Universitātē (Igaunija), Ainavu ģeoinformātikas laboratorijas vadītāja. Viņas pētījumi apvieno mašīnmācīšanos un ģeogrāfiskos datus, lai uzlabotu vides pārmaiņu monitoringu un pārvaldību. Evelīna Ūemā ir saņēmusi arī Eiropas Pētniecības padomes (*European Research Council – ERC*) grantu.

Profesore Ūemā savos pētījumos pievēršas tam, kā mūsdienu tehnoloģijas var palīdzēt labāk izprast un mazināt cilvēka darbība ietekmi uz vidi. Viņas darbs apvieno ģeogrāfiju, datu analīzi un informācijas tehnoloģijas, lai risinātu aktuālas vides problēmas, pieņemtu labākus lēmumus par teritoriju plānošanu, dabas aizsardzību un ilgtspējīgu attīstību.

Profesores pētījumu centrā ir zemes izmantošanas pārmaiņas, urbanizācija un lauksaimniecības ietekme uz dabas procesiem. Izmantojot ģeogrāfiskās informācijas sistēmu (ĢIS), satelītattēlus un datoru modelēšanu, viņa analizē, kā cilvēku darbība ietekmē ainavu, ūdens kvalitāti un ekosistēmas kopumā.

Īpaša uzmanība tiek pievērsta piesārņojuma plūsmām, piemēram, barības vielu nonāksanai ūdens tilpēs intensīvas lauksaimniecības dēļ. Pētījumi palīdz identificēt teritorijas, kurās ietekme uz vidi ir vislielākā, un piedāvāt risinājumus ilgtspējīgākai saimniekošanai.

Tāpat profesore izmanto attālinātās izpētes datus un mašīnmācīšanās metodes, lai analizētu lielus datu apjomus un prognozētu nākotnes scenārijus. Tas ļauj pieņemt datus balstītus lēmumus teritoriju plānošanā un vides aizsardzībā.

Evelīnas Ūemā pētījumi sniedz būtisku ieguldījumu ilgtspējīgas attīstības veicināšanā, palīdzot sabiedrībai rast līdzsvaru starp ekonomisko attīstību un dabas saglabāšanu.

Savā referātā profesore pievērsīsies jautājumam, kā apvienot zinātnisko izcilību ar ietekmi, pārvēršot tās no konkurējošiem mērķiem par savstarpēji stiprinošiem faktoriem, un rosinās plašāku diskusiju par pētniecības kvalitātes nozīmi ilgtermiņa attīstībā.

FROM EXCELLENCE TO IMPACT: DESIGNING RESEARCH THAT MATTERS

Evelyn Uuemaa

Professor in Geoinformatics, University of Tartu, Estonia

Evelyn Uuemaa is a professor of geoinformatics at the University of Tartu and leads the Landscape Geoinformatics Lab. Her research combines machine learning and geographic data to improve monitoring and management of environmental change. Prof. Uuemaa has received a European Research Council grant to apply geoinformatics to mitigate the environmental impact of intensive agriculture. Her work explores how modern technologies can be harnessed to better understand and mitigate the environmental impacts of human activity. Integrating geography, data analysis, and information technology, she tackles urgent environmental challenges, with a particular emphasis on land-use change, urbanization, and the influence of agriculture on natural processes. By using Geographic Information Systems (GIS), satellite imagery, and computational modelling, she analyses the impact of human activities on landscapes, water quality, and ecosystems as a whole.

A key aspect of her research is tracing pollution flows, such as the movement of nutrients into waterways resulting from intensive farming. Her findings highlight where environmental pressures are greatest and help guide more sustainable ways of managing land.

In addition, Professor Uuemaa applies remote sensing data and machine learning methods to analyse large datasets and predict future scenarios. This enables more informed, data-driven decision-making in spatial planning and environmental protection.

Evelyn Uuemaa's research makes an important contribution to sustainable development by helping society find a balance between economic growth and environmental conservation.

A short introduction of lecture by professor herself:

Impact is too often treated as something to assess once research is complete, rather than something built into its very foundations. Drawing on insights from my ERC-funded work and the Centre of Excellence I lead, I will argue that impact is not an afterthought but is shaped from the moment we define our research questions.

1.

**Cilvēkkapitāla attīstība,
veselas un zināšanās balstītas
sabiedrības veidošana /**

**Development of human
capital, creation of a healthy,
knowledge-based society**

1.1. sekcija. **VESELĪBA UN LABKLĀJĪBA DARBĀ –
PAMATS KONKURĒTSPĒJĪGAI BIZNESA
UN DARBA VIDEI /**

**HEALTH AND WELL-BEING AT
WORK – THE FOUNDATION FOR
A COMPETITIVE BUSINESS AND
WORKING ENVIRONMENT**

AI LITERACY AS A PSYCHOSOCIAL RISK CONTROL IN THE WORKPLACE: CROSS-REGIONAL DIFFERENCES BETWEEN EU AND NON-EU ORGANISATIONS

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University of Latvia

Background. Deployment of artificial intelligence (AI)-mediated automated systems can enhance safety and productivity (Aderamo et al., 2024) and support decision-making across sectors (Qi, 2024). However, safety depends not only on technical performance but also on workers' understanding of system capabilities and limitations, and on their confidence and control when operational problems arise (Endsley, 2017; Lee & See, 2004; Parasuraman & Riley, 1997). Insufficient knowledge can contribute to uncertainty, perceived loss of control, and reluctance to question outputs-recognised work-related psychosocial risks.

Aim. To investigate and compare European Union (EU) and non-EU organisations in reported workplace AI literacy practices for AI-related automated systems, and to consider how differences may affect psychosocial risks and worker well-being.

Methods. A cross-sectional online survey included 227 respondents across sectors and company sizes in 18 countries. Respondents indicated whether their organisation deployed higher-risk and non-risk systems and rated seven governance practices, including AI literacy, on a multi-point scale. Organisations were classified as EU (EU member states) or non-EU (any country outside the EU, including the United Kingdom). Descriptive statistics, chi-square tests, and Cramer's V compared regions and effect sizes for system use and AI literacy.

Results. Most respondents reported that their organisation used at least one non-risk system (79.3%) and at least one higher-risk system (81.8%). No statistically significant EU vs non-EU difference was found for non-risk systems (82.2% vs 78.9%, $p = 0.679$) or higher-risk systems (85.4% vs 79.7%, $p = 0.438$). Overall, 90.4% reported that AI literacy practices were implemented. However, AI literacy differed by region: 97.8% of EU versus 83.9% of non-EU respondents reported implementation, with a statistically significant gap ($p = 0.021$).

Conclusions. Although EU and non-EU organisations report similar deployment of high-risk and non-high-risk AI-mediated systems, non-EU employees more often work where structured AI literacy is limited or missing. This disparity may amplify psychosocial risks by reducing clarity about system behaviour, limiting informed options for responding to errors, and increasing uncertainty about responsibility when outputs appear unsafe or unfair. Strengthening AI literacy within occupational health and safety arrangements, particularly in non-EU settings, should be prioritised to support workers' safety and well-being.

Keywords: AI literacy, cross-regional comparison, occupational health and safety, psychosocial risk, control, organisational governance.

Acknowledgements. I thank the survey respondents, Professor Henrijs Kalķis, Associate Professor Romans Putāns. No conflicts of interest and funding.

BURNOUT SYNDROME AND WORK-RELATED PSYCHOSOCIAL FACTORS AMONG HEALTHCARE PROFESSIONALS IN PRIMARY HEALTH CARE

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Background. Burnout syndrome is recognized as an occupational phenomenon resulting from chronic workplace stress that has not been successfully managed (World Health Organization [WHO], 2019). It is characterized by emotional exhaustion, depersonalization, and reduced personal accomplishment (Maslach & Jackson, 1981). Healthcare professionals in primary health care settings are frequently exposed to high quantitative and emotional demands, organizational pressures, and limited job resources. According to the Job Demands–Resources (JD–R) model, an imbalance between job demands and available resources significantly increases the risk of burnout (Bakker & Demerouti, 2007).

Aim. To determine the prevalence and severity of burnout syndrome and examine its association with work-related psychosocial factors among healthcare professionals in primary health care.

Methods. A cross-sectional study was conducted from March to June 2024 among 160 healthcare professionals employed at Family Medicine Centers of the Royal Commission Health Services Program. Data were collected using the Maslach Burnout Inventory (MBI) and selected domains of the Copenhagen Psychosocial Questionnaire II (COPSOQ II). Descriptive statistics, correlation analysis, and multivariate regression were applied to assess associations between psychosocial factors and burnout dimensions.

Results. Moderate to high levels of emotional exhaustion and depersonalization were observed in a substantial proportion of participants. Mean scores were 28.65 ± 14.89 for emotional exhaustion, 29.58 ± 15.82 for depersonalization, and 38.64 ± 9.62 for personal accomplishment. Significant positive correlations were identified between quantitative demands, emotional demands, and emotional exhaustion ($p < .01$). Regression analysis indicated that higher job demands significantly predicted emotional exhaustion, whereas meaning of work and social support functioned as protective resources.

Conclusions. Burnout among healthcare professionals is strongly associated with adverse psychosocial working conditions, particularly excessive job demands. Organizational strategies aimed at balancing demands and strengthening job resources are essential to promote well-being and sustain healthcare quality.

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FIZISKĀS UN GARĪGĀS SLODZES IETEKME UZ INDUSTRIJAS 5.0 RAŽOŠANAS VIDĒ NODARBINĀTO KOGNITĪVAJĀM SPĒJĀM

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Ievads. Mūsdienu industriālo darba vidi raksturo strauja tehnoloģiju attīstība, informācijas sistēmu sarežģītība un pāreja uz Industriju 5.0, kuras centrā ir cilvēka un tehnoloģiju sinerģija, kur uzsvars tiek likts uz progresīvu tehnoloģiju salāgošanu ar cilvēka spējām. (Shabur, et al, 2025). Industrija 5.0 pārvieto operatoru no iekārtas perifērās zonas uz sadarbību kiberfiziskajās sistēmās. (Yanytska, 2025) Mūsdienās Eiropā aktuāla ir darbaspēka novecošanās: Eurostat dati liecina, ka vairāk nekā 65 % no Eiropā nodarbinātajiem ir vecuma grupā no 55 līdz 65 gadiem (Eurostat, 2024). Šī tendence skaidri iezīmē darbinieku kognitīvo spēju saglabāšanas un uzlabošanas aktualitāti, jo nodarbināto kognitīvās spējas tieši ietekmē ne tikai drošību, darba laikā pieņemto lēmumu kvalitāti, bet arī uzņēmuma kopējo efektivitāti.

Metodes. Pētījumā veikta zinātniskās literatūras analīze, meklētas sakarības starp fizisko slodzi, garīgo slodzi darba vietā un nodarbināto kognitīvajām spējām ražošanas uzņēmumos. Teorijas avotu atlasē aplūkotas šādas datu bāzes – Primo, Scopus, Researchgate, IETA (International Information and Engineering Technology Association), MDPI (Multidisciplinary Digital Publishing Institute). Tika atlasīti 30 zinātniskie raksti par pētījuma tēmu.

Rezultāti. Industrijas straujā attīstība pēdējo gadu laikā ir radījusi izaicinājumus nodarbinātajiem veselības, labklājības un darbaspēju jomā. Ieviešot jaunas uz tehnoloģijām balstītas sistēmas darba vidē, uzņēmumi ne tikai uzlabo produktivitāti un samazina izmaksas, bet arī veicina drošu un efektīvu darba izpildi. Arvien vairāk darba uzdevumu no aktīva un manuāla darba tiek pārvērsti pasīvos un kognitīvos uzdevumos. Ražošanas vides digitalizācijas laikā ir jāpievērš uzmanība tam, kā izmaiņas ietekmē cilvēku darba vidē – mentālo darba slodzi, nogurumu un uzmanības spējas (Argyle et al., 2021). Analizēto pētījumu rezultāti norāda uz izmērāmām sakarībām starp garīgo un fizisko darba slodzi un nodarbināto kognitīvo sniegumu. Literatūras analīze pierāda, ka paaugstināta fiziskā darba slodze ietekmē psihomotoro funkciju un neiromuskulāro koordināciju. Mērena fiziskā un garīgā darba slodze var uzrādīt adaptīvu efektu, potenciāli veicinot modrību un uzmanības noturību uzdevuma veikšanas laikā. Zinātniskie avoti norāda, ka ilgstošs vai pārmērīgs darba slodzes līmenis korelē ar kognitīva noguruma, paaugstināta izdegšanas riska un samazinātas veikspējas stabilitātes rādītājiem (Alojaiman, 2023).

Secinājumi. Fiziskā un garīgā darba slodze būtiski ietekmē nodarbināto kognitīvo sniegumu industriālā darba vidē un šī ietekme it tieši atkarīga no darba slodzes intensitātes. Šie atklājumi apstiprina uz cilvēku orientētas darba slodzes pārvaldības nozīmi Industrijas 5.0 ietvaros.

Atslēgvārdi: darba slodze, kognitīvās spējas, cilvēkfaktors, Industrija 5.0

IMPROVEMENT OF ERGONOMICS AT WORKPLACE USING AI MODELS

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Background. Musculoskeletal diseases are the most common occupational diseases in Estonia and in European Union as a whole. The opportunities to use artificial intelligence (AI)-based workplace arrangement models give the possibilities to prevent and treat the musculoskeletal disorders. The problem stands in industry and for computer workers. Occupational illnesses develop by stages. At the first early stage, the rehabilitation is effective and the worker can return to work after short time of treatment. At the next stage, treatment is possible, but it takes more time and sometimes the worker has to change the character of the work. In the 3rd stage, occupational disease, the musculoskeletal changes are usually irreversible, but it is possible to use some rehabilitation methods to alleviate the sufferings of patients.

Aim. The aim of the current study was to compare the possibilities of treatment of musculoskeletal disorders using Images created by ChatGPT for garment and computer workers. The input data connected with workplace are needed for ChatGPT.

Methods. Altogether 103 (54 office and 49 garment) workers were enrolled in the study. The methods for investigation were: 1) the microclimate measurements in office-rooms and in the garment industry based on ISO, EN and EVS standards; health status data of workers using the questionnaires (work ability index WAI; the Nordic questionnaire for MSD-s, psychological tests); the results of measurements of muscle strain (myotonometry).

Results. The model (garment and office workers) for considering the connections between the neck, shoulder, elbow, wrist, back and pain duration and the stages of disease, pain duration and age, pain duration and groups of occupation is given on the basis of interviews. Input data: repetitive movements with (mouse), static work position, myotonometry, VAS pain scale use etc. → the use of Computer software on (OW) → we get Precautionary actions from Prevention of diseases.

AI technology is advanced, you can enter relevant search words and an image will be created using the corresponding software. Using Microsoft Bing Image Creator to create the images the following: 1) operating factors: repetitive movements, static and uncomfortable positions and 2) the influence on organ systems, functional stages, loss of working capacity were entered.

Conclusion. The difference between the office and garment workers' painful regions lies in the neck area. The neck is more damaged in garment industry workers (71.3%) and less in computer workers (55.6%). The low back pain data have the same numbers.

Pain duration is the longest in the neck region, both in the office and the garment industry workers. The group of workers who have severe pain, which means 5 points in VAS scale and pains duration over 30 days, should have been treated actively, because chronic myalgia syndrome may lead to chronic musculoskeletal disease and cause permanent incapacity. It is necessary to check the job management.

DARBA VIDES RISKU IDENTIFIKĀCIJAS NOZĪME NODARBINĀTO VESELĪBAS VEICINĀŠANĀ ORGANIZĀCIJĀ “BUREAU VERITAS LATVIA”SIA

Kairiša Egita, Ženija Roja

Latvijas Universitāte, MDZF, Cilvēkfaktora un darba vides nodaļa

Ievads. Darba vides drošība un veselības aizsardzība ir viens no ilgtspējīgas un uz attīstību tendētas organizācijas darbības priekšnosacījumiem. Zināms, ka darba vides riski var negatīvi ietekmēt darbinieku ne tikai fizisko, bet arī psihoemocionālo veselību, zaudējot darba produktivitāti. Līdz ar to, darba vides risku identificēšanai ir būtiska nozīme nodarbināto veselības veicināšanā un biznesa efektivitātes uzlabošanā ikvienā organizācijā. Pētījumam tika izvēlēta organizācijā “BUREAU VERITAS LATVIA”, kur nodarbinātie izpilda ne tikai biroja darbus, bet piedalās arī izbraukumos, veicot augstas kvalitātes pakalpojumus, lai palīdzētu klientiem sasniegt un apliecināt pieaugošās prasības attiecībā uz produktu vai pakalpojumu kvalitāti, drošību, apkārtējās vides aizsardzību un sociālo atbildību.

Mērķis. Šī pētījuma mērķis bija identificēt darba vides riskus organizācijā “BUREAU VERITAS LATVIA”, lai uzlabotu nodarbināto veselību un drošību.

Metodes. Pētījumā piedalījās 12 minētās organizācijas darbinieki. Audits veikts darbinieku pamata darba vietā biroja telpās. Veikta nodarbināto aptauja, lai iegūtu darbinieku viedokli par esošiem darba vides riskiem un priekšlikumus darba apstākļu uzlabošanai. Veikts audits par esošo darba aizsardzība sistēmu organizācijā.

Rezultāti. Aptaujā no 30 organizācijā uzrunātajiem darbiniekiem, piedalījās 12 darbinieki, t. sk. 75% sievietes un 25% vīriešu. Darba stāžs profesijā 50% darbiniekiem ir līdz 5 gadiem, bet 25% ir 11 un vairāk gadu. Par apmierinošiem darba apstākļiem, darba organizēšanu, darba slodzi izteicās 85% nodarbināto, bet pārējie norādīja par dažām nepilnībām darba aprikojumā, virsstundu darbā, monitoru novietošanu, kāju paliktņu iztrūkumu. Vairums darbinieku atzīmēja, ka izjūt nogurumu atsevišķās ķermeņa daļās pēc ilgstoša darba pie datora, kā arī redzes pārslodzi. Darbs ir atbildīgs, kas nereti ir iemesls dažādām stresa situācijām un to izraisītiem veselības traucējumiem. Iegūtie aptaujas rezultāti saskan ar zinātniskā literatūras pētījumiem par darba vides riskiem biroja darbiniekiem.

Audita rezultāti uzrādīja, ka pētītajā organizācijā darbinieki tiek nodarbināti, ievērojot normatīvos aktus un darba tiesiskās attiecības atbilstoši LR likumdošanai. Darba aizsardzības sistēma ir izstrādāta un tiek uzturēta. Novērots, ka nepieciešams atsevišķus dokumentus aktualizēt, bet jāatzīmē, ka tie nerada riskus nodarbināto veselībai. Organizācijā darba vides riski tiek identificēti atbilstoši LR MK not. Nr. 660 “Darba vides iekšējās uzraudzības veikšanas kārtība”, Darba aizsardzības likumam un citiem nozarei saistošiem normatīviem aktiem.

Secinājumi. Darba vides risku identifikācija organizācijā ir pirmais solis, lai uzturētu veselīgu un drošu darba vidi. Iegūtie audita rezultāti apliecina, ka pētītajā organizācijā darba aizsardzības sistēma ir izveidota un uzturēta. Nodarbināto aptaujas rezultāti liecina par nepieciešamību organizācijas vadībai pievērsties darba vietu iekārtošanai atbilstoši nodarbināto ērtībām darbā.

Atslēgvārdi: darbs, riski, identifikācija, audits, nodarbinātie

Pateicība. Prakses vadītājai asoc. profesore, Dr.med. Ženija Roja, darba un prakses devējam. Finansējums. Pašfinansējums.

DUĀLO MONITORU IEVIEŠANAS IETEKME UZ KOGNITĪVO SLODZI, DARBINIEKU LABKLĀJĪBU UN DARBA EFEKTIVITĀTI BIROJA VIDĒ

Jekaterina Danenberga, Henrijs Kaļķis, Ženija Roja

Latvijas Universitāte, MDZF

Ievads. Mūsdienu darba vide raksturojas ar augstu informācijas intensitāti, biežu uzdevumu pārslēgšanu un vairāku IT sistēmu, programmatūru un digitālo rīku vienlaicīgu izmantošanu. Šādos apstākļos darbiniekiem palielinās kognitīvā slodze, kas ietekmē darba efektivitāti, labklājību, darbinieku pieredzi (employee experience) un motivāciju.

Kognitīvās ergonomikas kontekstā arvien lielāka uzmanība tiek pievērsta darba vides dizainam, kas ļauj mazināt kognitīvo slodzi un uzlabot darba sniegumu. Vairāku monitoru darba staciju izmantošana ir viens no iespējamajiem risinājumiem informācijas pārskatāmības uzlabošanai un uzdevumu pārslēgšanas mazināšanai.

Mērķis. Pētīt duālo monitoru ieviešanas ietekmi uz darbinieku uztverto kognitīvo slodzi un darba efektivitāti ražošanas uzņēmuma biroja vidē. Pētījums tika veikts uzņēmuma investīciju efektivitātes izvērtēšanas ietvaros.

Metodes. Pētījumā tika izmantota autores izstrādātā kvantitatīva aptauja, kas veikta pēc duālo monitoru ieviešanas nodaļās. Aptaujā iekļauti jautājumi par uztverto kognitīvo slodzi, uzdevumu pārslēgšanas biežumu, koncentrēšanās spēju, un subjektīvo darba efektivitāti. Tika izmantoti Likerta skalas jautājumi, kā arī atvērtie jautājumi par pieredzi un ergonomiskajiem izaicinājumiem. Papildus tika veiktas daļēji strukturētas intervijas ar nodaļu darbiniekiem un vadītājiem, analizējot sniegtās kvalitatīvās atsauksmes.

Rezultāti. Apzinoties nepieciešamību paaugstināt darba efektivitāti un darbinieku labklājību, 2025. gadā uzņēmumā tika īstenota darba vides uzlabošanas iniciatīva, aprīkojot vairāku nodaļu darba vietas ar duālajiem monitoriem. Pētījumā piedalījās 35 nodarbinātie – 25 sievietes un 10 vīrieši ar kopējo darba stāžu ilgāk nekā 5 gadi.

Pētījuma rezultāti liecina par uztvertās kognitīvās slodzes samazināšanos un uzdevumu izpildes uzlabošanos. 85% Darbinieku norādīja uz samazinātu nepieciešamību pārslēgt logus, mazāku informācijas “tūrešanu prātā” un labāku pārskatāmību, strādājot ar vairākiem dokumentiem un sistēmām vienlaikus. 70% Darbinieku atsauksmes liecina par labāko pašsajūtu, mazāku nogurumu, iespēju darbus paveikt ātrāk un efektīvāk.

Secinājumi. Duālo monitoru ieviešana var tikt uzskatīts kā kognitīvās slodzes mazināšanas instruments informācijas intensīvā darba vidē. Tomēr efektivitātes ieguvumi ir atkarīgi no darba uzdevumu rakstura un ergonomiska darba vietas dizaina.

DARBA VIETAS ERGONOMISKĀ PILNVEIDE MONTĀŽAS RAŽOŠANAS PROCESĀ

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Ievads. Mūsdienās ergonomika ražošanā nav tikai darbinieku komforta jautājums, bet būtisks faktors veselības un darba efektivitātes nodrošināšanā. Ergonomiski nepiemērota darba vide veicina ar darbu saistīto veselības traucējumu izpausmi, palielinot arodslimību un nelaimes gadījumu risku. Tādēļ mūsdienu darba vidē ergonomiskiem risinājumiem ikvienā darba procesā ir būtiska nozīme, lai sasniegtu augstus ražošanas rādītājus un produkta kvalitāti.

Pētījuma mērķis bija izvērtēt montāžas darba vietas atbilstību ergonomikas prasībām un izstrādāt projektu tās pilnveidošanai, uzlabojot darba apstākļus un montāžas procesa kontroli.

Metodes. Pētījumā tika pielietota RULA metode ergonomiskās darba vietas novērtēšanai, kā arī veikta ražošanas plūsmas analīze, lai identificētu procesa neefektivitātes un uzlabojumu iespējas.

Rezultāti. Analizējot esošo darba vietu, tika konstatēts, ka tā neatbilst ergonomikas principiem, kā arī apgaismojuma un elektrostātiskās izlādes (ESD) pieļaujamajiem rādītājiem konkrēta darba veikšanai. Nepietiekams apgaismojums rada papildu slodzi redzei, savukārt neergonomiska darba poza izraisīja diskomfortu un sāpes muguras un plecu daļā maiņas beigās. Tika identificēta iespēja uzlabot montāžas procesa kontroli, ieviešot sensoru sistēmu. Pētījuma rezultātā izstrādāts darba vietas pilnveidošanas projekts, kas ietver montāžas procesa integrēšanu ESD (elektrostātiskās izlādes) drošā darba vietā, nodrošinot zemējumu un antistatisku aprikojumu elektronisko komponentu aizsardzībai pret bojājumiem, darba vietas plauktu pārorganizēšanu atbilstoši ergonomikas un loģistikas principiem, izvietojot biežāk lietotos komponentus tiešā sasniedzamībā un samazinot liekas kustības, uzlīmju padošanas iekārtu uzstādīšanu un sensoru integrēšanu montāžas procesā.

Secinājumi. Esošās darba vietas montāžas procesā neatbilst ergonomikas un tehniskajām prasībām, kas būtiski ietekmē darbinieku veselību un drošību, kā arī darba efektivitāti. Darba vietas ergonomiskās pilnveides un tehnoloģisko risinājumu projekta ieviešana ļautu samazināt fizisko slodzi, uzlabot darba kvalitāti un palielināt montāžas procesa efektivitāti. Kompleksa pieeja, apvienojot ergonomiskos un tehnoloģiskos uzlabojumus, nodrošina ilgtermiņa ieguvumus ne tikai uzņēmumam, bet arī nodarbinātajiem.

Atslēgvārdi: ergonomika, tehnoloģijas, ražošanas efektivitāte, pilnveidošana

RELEVANCE OF FIREFIGHTERS'SUBJECTIVE RESPONSES IN A SIMULATED FIREFIGHTING HEAT EXPOSURE EXPERIMENT

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Background. Different firefighting situations demand high alertness level from every firefighter while fulfilling their tasks. Firefighters' well-being is negatively affected by physiological strain (e.g., sleep deprivation), environmental stressors (e.g., extreme thermal conditions), and equipment-related constraints, including inadequately designed or improperly fitted personal protective clothing.

The aim of the current study was to examine the association between firefighters' subjective responses and objectively measured physiological parameters during standardized exercise tasks performed in climate chamber.

Methods. Experiments with eight firefighters utilizing two types of dressing strategies were performed in 2024. In the first strategy (S1), the pre-work phase exercise on a bicycle (20 min) was performed in station wear. In the second strategy (S2) the firefighter conducted already the prework phase in full protective clothing before entering the heat (treadmill exercise 30 min). After exiting from heat, firefighter removed gloves, SCBA, helmet, balaclava, turnout gear jacket and started recovery phase (sitting on chair, 30 min). The physiological and environmental parameters were continuously recorded during the experiment. However, the subjective questions were asked at the end of each task but at least at 10 min intervals. The firefighters evaluated the perceived exertion, skin wetness, pain, thermal and comfort sensation. Borg RPE and ISO 10551 based scales were used in the study.

Results. All test persons finished intended exposure time in the experimental conditions. None of the firefighters felt pain. In both S1 and S2 a strong correlation between skin temperature and perceived skin wetness was detected. The results of the subjective responses confirmed that if the skin temperature rises the feeling of wetness increases. One of the predefined termination criteria of the experiment was an increase in the participants' core temperature to 39 °C in the hot environment. This threshold was not reached during the heat exposure; however, in S2 it was reached by two participants during the recovery phase.

Conclusion. Based on the correlation results, this study confirms that during experiments involving human participants, it is important to collect both objective data and the subjective responses. Subjective responses may act as early indicators of that participants are not feeling well and reach closer to premature quitting of the exposure. Objective measurements are recommended to prevent adverse outcomes, because individuals may not perceive their physiological limits accurately due to motivational factors.

Keywords: Heat stress, firefighters', physiological responses, objective measurements, BORG RPE scale.

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WORK RELATED MUSCULOSKELETAL DISORDERS IN SONOGRAPHERS. A LITERATURE REVIEW

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Introduction. Work related musculoskeletal disorders (WRMSDs) are the most common health problem among healthcare workers, including sonographers. An analysis of scientific literature shows that sonographers often perform repetitive scanning procedures that involve sustained awkward postures, repetitive motions, and prolonged muscle load and they suffer from musculoskeletal pain, injured shoulder, tenosynovitis of the hand and wrist, carpal tunnel syndrome and lower back (Murphey, 2017). The risk factors for the occurrence of WRMSDs among sonographers include not only physical ergonomic risk (Bonutto et al., 2020) factors but also psychosocial factors (Zangiabadi et al., 2024). The aim of this study was to analyze the literature over the past 10 years regarding WRMSDs in sonography specialists.

Materials and Methods. Review was carried out by databases (PubMed, Scopus, Web of Science, Science Direct) over the last 10 years. Selection criteria: scientific publications in English, published only in scientific journals. Exclusion criteria: conference abstracts.

Results. A total of 154 articles were selected. 15 articles were eligible according to the selection criteria. Evidence shows that the most common causes of WRMSDs among sonographers are linked to the two main factors of ultrasound work environment and equipment design (Mazzola et al., 2017). Studies have reported awkward postures, such as shoulder abduction and continuous rotation of the neck and trunk, as aggravating factors for WRMSDs (Feng et al., 2016). These postures can lead to musculoskeletal complaints from users in their neck, shoulders, hand (joint), or back area. The occurrence of musculoskeletal complaints usually is recorded using a modified Nordic Questionnaire (Weimer et al., 2025; Arvidsson, 2020). Sonographer is often required to extend and abduct the arm away from the body to hold the transducer in the required position and then use fine controlled movements to obtain an ideal image (Simonsen et al., 2017; Zhan et al., 2017). During this scanning action, they simultaneously operate the keyboard with their other hand and rotate their head back and forth between the patient and monitor. Scientists have proven that sonographers that worked for more than eight hours per day had more pain or WRMSDs than their counterpart with lower duration of session (Junejo et al., 2017). Full time or part time work is essential for sonographers (Fukumura, 2024). Significant is to assign rest/break periods to avoid workload in sitting position, forward bending, twisting or side bending the neck and back. Some authors in systematic reviews (Sweeney et al., 2020) investigate the effectiveness of ergonomics interventions on upper limb pain, dysfunction and productivity in sonographers (Bagley et al., 2017). All workstation equipment must be adjustable in order to address the physical dimensions and work style of each sonographer, arm support systems (Rai et al., 2022; Sweeney et al., 2021). Scientific studies have shown that WRMSDs are closely related to burnout syndrome, and this is why sonographers often leave their careers prematurely (Bagley et al., 2023).

Conclusions. Mainly sonographers are at a high risk of WRMSDs due to the nature of their work, which can affect productivity in the long run. The most important preventive measures to reduce WRMSDs are ergonomic intervention and employee education about ergonomic risks at work.

Keywords: sonographers, WRMSDs, risk factors, ergonomic workplace

INDUSTRY 5.0-COMPATIBLE ORGANIZATIONS IN KNOWLEDGE-INTENSIVE SECTORS: FATIGUE AS AN EARLY INDICATOR OF SYSTEMIC FLAWS

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Introduction. The concept of Industry 5.0, formalized by the European Commission in 2020, promotes a transition toward human-centric, sustainable, and resilient industrial systems. While the framework has been widely discussed in manufacturing contexts, its implications for serviceoriented knowledge-intensive sectors remain insufficiently examined. These sectors are characterized by high cognitive demands, fast pace of digital acceleration, and complex, often multicultural organizational structures, where worker well-being is increasingly challenged by chronic overload and fatigue.

Aim. This study seeks to create a conceptual framework to explore how Industry 5.0 principles can be operationalized at the organizational level in knowledge-intensive environments with the aim of identifying the potential leverage points for system improvement.

Methods. A conceptual systems approach was applied using a Causal Loop Diagram (CLD) to model dynamic interactions between system variables. The final CLD was created during multiple iterative brainstorming sessions consisting of identification and replenishment of variables, their respective connections, and associated reinforcing and balancing loops based on the expertise of the authors, Industry 5.0 principles, macroergonomics theory, and relevant literature findings.

Results. The resulting systems model included variables grouped in such categories as Technological Environment, Work System Design, Task-Level Work Design, Human Capacities, and Outcomes & System-Level Feedback. The identified reinforcing loops demonstrate the effect of performance pressure and digital intensity that increase cognitive load and fatigue, reducing adaptive capacity and further amplifying organizational strain. Balancing loops associated with recovery, autonomy, and supportive organizational design enhance resilience and sustainable performance. Fatigue emerges as an early indicator of systemic misalignment suggesting organizational redesign.

Conclusions. Translating Industry 5.0 into practice within knowledge-intensive sectors requires adopting systems-wide perspective to redesign organizational structures and protect human cognitive resources promoting individual, organizational, and societal resilience and sustainability. Fatigue assessment offers a practical diagnostic tool for identifying system-level vulnerabilities and guiding human-centric transformation.

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TOWARD SCALABLE GLAUCOMA SCREENING: FDP-BASED COMPUTERIZED PERIMETRY

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Glaucoma affects 3–4% of adults over the age of 40 and remains one of the leading causes of irreversible visual impairment worldwide. By 2040, the number of individuals living with glaucoma is projected to reach nearly 112 million. Although earlier diagnosis and improved access to treatment can help reduce the overall disease burden, demographic trends and unequal access to diagnostic technologies continue to pose significant challenges. Structural changes associated with glaucoma can often be detected early using optical coherence tomography (OCT), yet the limited availability of OCT restricts its use for large-scale screening. Functional deficits identified through perimetry typically appear 3–5 years later; however, combining OCT with perimetry has been shown to improve early detection sensitivity by 10–20%. Despite this benefit, both methods rely on specialized equipment, limiting their feasibility for widespread or frequent screening.

The aim of this study is to develop and evaluate a computerized perimetry system that uses standard display screens, FDP-type stimuli, and efficient threshold-estimation algorithms. The research examines whether such a system can reduce examination time, maintain diagnostic reliability, and improve accessibility in resource-limited settings.

A custom application was developed to perform visual field testing using widely available monitors. The system displays 5×5-degree FDP stimuli arranged according to the standard 30-2 grid. To accelerate threshold estimation, the ZEST (Zippy Parameter Estimation by Sequential Testing) algorithm is implemented, enabling faster convergence toward individual sensitivity thresholds. In addition, experiments were conducted to estimate threshold distributions and psychometric functions, as knowing these distributions is essential for further reducing test duration and improving measurement precision.

Preliminary findings indicate that the computerized perimetry system can reliably present FDP stimuli and estimate thresholds with substantially reduced testing time. Analysis of threshold and psychometric functions suggests further opportunities for optimization. Overall, the results demonstrate that FDP-based computerized perimetry using ZEST can significantly improve access to visual field assessment while requiring only modest hardware resources.

Keywords: Glaucoma, FDP-Based Computerized Perimetry

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IMPORTANCE OF EVALUATIONS BY MANAGEMENT, PATIENTS AND PATIENT RELATIVES FOR OPERATING STAFF WORKING IN OPERATION ROOMS

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Introduction. For every employee is important evaluation of contribution of work in all fields and for all specialities, but special importance that is for medical personnel working in operating rooms.

Aim of the research is to evaluate level of importance of operating staff working in operation rooms by management, by patients and by patient relatives.

Methods. Research methods applied in this research were scientific publications analysis, analysis of survey data on medical personnel self-evaluations in evaluation scale 1-10, where 1-not important; 10-very important.

Results. The evaluations by medical personnel was analysed by gender, by age group, by time working in respective profession, by time working in respective working place by use of indicators of descriptive statistics (indicators of central tendency or location, indicators of dispersion), testing of statistical hypotheses by t-test, by analysis of variance ANOVA, by chi-square test, it was applied also correlation analysis. Results indicated that there is no statistically significant differences in evaluations by gender, by age group, by staff positions.

Conclusions. Survey results as well as suggestions of medical personnel was analysed and prepared for practical recommendations for hospital management and research will continue with more objective analysis of staff working at the operating rooms.

Keywords: operating staff, operation rooms, self-evaluations, evaluation of work

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EVALUATIONS OF OFFICE EMPLOYEES ON HEALTH ISSUES BASED ON EU-SILC QUESTIONNAIRE DATA

Henrijs Kaļķis, Ženija Roja, Biruta Sloka

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Introduction. Every employee working in office is feeling better or worse to full-fill work duties in great extent depend from health conditions of every employee. This information is collected in all EU and EU candidate countries in annually conducted survey of income and living conditions (EUSILC) where data are collected by representative samples in every EU and EU candidate country. In Latvia it is realised by Central Statistical Bureau of Republic of Latvia and anonymised survey data are available for research – those data were used in this presentation.

Aim of the research is to evaluate level of health by inhabitants of Latvia and limitations of activities because of health problems.

Methods. Research methods applied in this research: scientific publications analysis, analysis of survey (EU-SILC) data on personnel self-evaluations in evaluation scale in scale 1–5, where 1 very good; 5 – very bad. The evaluations by employed inhabitants of Latvia was analysed by gender, by age group, by statistical regions of Latvia, by education level, by self-defined current economic status, by territories, by income quintile groups, by use of indicators of descriptive statistics (indicators of central tendency or location, indicators of dispersion), testing of statistical hypotheses by t-test, by analysis of variance ANOVA, by chi-square test, it was applied also correlation analysis. **Results.** Results indicated that there is no statistically significant differences in evaluations by gender, by age group, by statistical regions and by education level, but differ statistically significant by education level and by income quintile groups that can be associated with various fatigue expressions at the workplaces.

Conclusions. Analysis of EU-SILC data showed various self-evaluations for office workers regarding health issues, pointing out several evaluations on general health, chronic illness, limitations in activities due to health problems that can directly affect fatigue levels of employees. Research will be continued with self-developed questionnaire in order to perform deeper analysis of multidimensional fatigue in office workers in Latvia.

Keywords: Fatigue, health condition self-evaluations, EU-SILC

This research has been supported by the project “Impact of fatigue as a multidimensional variable on the performance of office workers in relation with psycho-emotional risks at work”

DARBA AIZSARDZĪBAS SISTĒMAS PILNVEIDOŠANAS IESPĒJAS RAŽOŠANAS UZŅĒMUMĀ LATVIJĀ

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Ievads. Darba aizsardzības sistēmai ir nozīmīga loma nelaimes gadījumu un arodslimību prevencijā, kā arī cilvēku darbspēju un labklājības saglabāšanā visa mūžā garumā, īpaši ražošanas vidē, kurā notiek nemitīgas tehnoloģiskās un organizatoriskās pārmaiņas (Idowu, 2015; Vranješ, Todić. 2019). Ražošanas uzņēmumos tiek ieviestas jaunas tehnoloģijas, pilnveidoti esošie tehnoloģiskie procesi, modernizētas iekārtas un optimizētas darba plūsmas. Šādas pārmaiņas nosaka nepieciešamību sistemātiski pilnveidot un adaptēt darba aizsardzības sistēmu atbilstoši mainīgajiem darba vides riskiem, tādējādi sekmējot arī kopējo uzņēmuma produktivitāti (Genesis et al., 2022; Mixafenti et al., 2025).

Mērķis. Pētījuma mērķis ir izpētīt darba aizsardzības sistēmas darbību vienā no lielākajiem ražošanas uzņēmumiem Latvijā un sniegt priekšlikumus tās pilnveidei, īpašu uzmanību pievēršot darbinieku uztverei, uzvedības modeļiem un sistemātiskajiem aspektiem.

Metodes. Pētījumā tika veikta darbinieku aptauja, izmantojot autoru veidotu un ražošanas uzņēmumam pielāgotu aptaujas anketu. Aptaujas anketa sastāvēja no 3 daļām demogrāfijas daļas, pamatdaļas ar 15 slēgtajiem jautājumiem, kuri papildināti ar iespēju sniegt viedokli sekmīgākai rezultātu interpretācijai un noslēguma daļas viena atvērtā jautājuma, kurā respondentiem tika lūgts sniegt ierosinājumus darba aizsardzības sistēmas uzlabošanai uzņēmumā. Aptaujas pamatdaļā tika iekļauti jautājumi, kuri saistīti ar darba aizsardzības politikas īstenošanu uzņēmumā, informētību par darba aizsardzības prasībām un darba vidē esošajiem riskiem, darba aizsardzības prasību ievērošanu – gan respondentu pašnovērtējums, gan vērtējums par tiešā vadītāja darba aizsardzības prasību ievērošanas kultūru, darbinieku iesaisti – rīcību pamanot nedrošas situācijas vai darba aizsardzības prasību neievērošanu, ziņojumu un ierosinājumu sniegšanu darba aizsardzības sistēmas uzlabošanā, darba un atpūtas laika organizāciju, kā arī informētību par veselības veicināšanas pasākumiem, kurus piedāvā uzņēmums un to izmantošanu. Pētījumā piedalījās 234 dalībnieki.

Secinājumi. Pētījuma rezultāti kopumā liecina par pozitīvu darbinieku vērtējumu attiecībā uz darba aizsardzības sistēmas darbību uzņēmumā. Darbinieki ir labi informēti un izglītoti par darba aizsardzības prasībām, darba vides riskiem un pieejamajiem veselības veicināšanas pasākumiem. Uzņēmuma darba aizsardzības sistēmas pilnveidošanai nepieciešams stiprināt darba aizsardzības kultūru, attīstot efektīvus komunikācijas kanālus, nodrošinot regulāru atgriezenisko saiti, veicinot darbinieku iesaisti un darba aizsardzības prasību ievērošanu, kā arī nodrošinot ergonomisko jautājumu efektīvu pārvaldību (darba un atpūtas režīma ievērošanu, atslodzes vingrinājumu veikšanu un veselības veicināšanas pasākumu izmantošanu). Autori secina, ka turpmākajā pētījuma posmā ir ieteicams sistemātiski vākt un analizēt objektīvus datus, lai kvantitatīvi novērtētu darba aizsardzības sistēmas efektivitāti un identificētu iespējas tās pilnveidošanai.

REFLECTION-MODE FOURIER PTYCHOGRAPHIC MICROSCOPY FOR QUANTITATIVE MULTIANGLE IMAGING OF BIOLOGICAL SPECIMENS

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We report a reflection-mode Fourier ptychographic microscopy (FPM) platform adapted for quantitative, label-free imaging of biological tissues with intrinsic scattering and refractive index heterogeneity, such as ocular and skin microstructures. The system integrates a custom-designed 32-element LED illumination ring (24 dark-field elements in the outer ring and 8 bright-field elements in the inner ring; central wavelength ≈ 525 nm) with a $37.5\times$ objective (NA = 0.50) and a CMOS imaging sensor. Sequential angular illumination is performed in epi-configuration, and the captured intensity datasets are processed via iterative phase-retrieval algorithms operating in Fourier space.

By coherently synthesizing spatial frequency components corresponding to multiple illumination angles, the approach extends the effective support of the optical transfer function beyond the intrinsic passband of the objective, yielding a synthetic numerical aperture approaching 1.0. This synthetic aperture expansion enables enhanced lateral resolution and quantitative phase reconstruction without mechanical scanning or high-NA immersion optics.

The system is applied to the investigation of semi-transparent and weakly scattering biological specimens relevant to vision science. Reconstructed amplitude maps reveal fine morphological features, including layered tissue organization and cellular boundaries, with approximately twofold improvement in lateral resolution compared to conventional incoherent epi-illumination microscopy.

These results demonstrate that reflection-mode FPM can transform a standard epi-microscope into a high-resolution, quantitative phase imaging platform suitable for label-free characterization of eye tissues. The technique offers a cost-effective alternative to specialized high-NA or interferometric systems and shows strong potential for applications in ophthalmic diagnostics, and translational biomedical imaging.

Keywords: Reflection-mode Fourier ptychographic microscopy, Quantitative phase imaging

Acknowledgment: This work was supported by a research grant from the Faculty of Science and Technology, University of Latvia, under the project titled: "Ultra-Resolution Ptychographic Microscopy using Structured illumination".

LASĪŠANAS ACU KUSTĪBAS DIGITĀLAJĀ LAIKMETĀ

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Ievads un pētījuma mērķis. Pēdējās desmitgadēs digitālo mediju lietošana ir būtiski pieaugusi, savukārt, drukātu tekstu lasīšana ir ievērojami samazinājusies. Lai gan digitālā vide nodrošina ātru piekļuvi informācijai, pētījumi rāda, ka jaunākām paaudzēm bieži ir grūtāk ilgstoši noturēt uzmanību un apstrādāt garākus tekstus (*Shorey et al., 2021; Munsch, 2021; Chicca & Shellenbarger, 2018*). Lai novērtētu lasīšanas acu kustības un lasītā teksta uztveri dažādas sarežģītības tekstu lasīšanā uz datora ekrāna, *MultiPLEYE COST* (CA21131) akcijas ietvaros paredzēts izveidot plaša mēroga lasīšanas acu kustību datu korpusu, kas ļaus pētniekiem iegūt datus, izmantojot kopīgu infrastruktūru un daloties ar zināšanām dažādās jomās, tostarp lingvistikā, psiholoģijā un datorzinātnē, kas pēta lasīšanu digitālajā laikmetā.

Metodes. Pētījumā dalībniekiem tika sniegts uzdevums lasīt desmit dažāda žanra un grūtības pakāpes tekstus uz datora ekrānā un pēc katra atbildēt uz sešiem daudzizvēļu jautājumiem par teksta izpratni. Acu kustību pieraksts tika veikts izmantojot *EyeLink 1000 Plus* iekārtu.

Rezultāti. Pilotpētījumā tika veikts acu kustību pieraksts sešiem dalībniekiem un pārbaudīta eksperimenta procedūra. Sākotnējā datu analīze parādīja, ka kalibrēšanas kvalitāte ne visos gadījumos bija pietiekama. Tika identificēti vairāki faktori, kas var ietekmēt datu precizitāti, piemēram, dalībnieka galvas un ķermeņa pozīcija, acu attēla kvalitāte, apgaismojums, kameras leņķis. Balstoties uz *MultiPLEYE data collection guidelines* validēšanas kļūdai jābūt ne lielākai par 0,3° (savukārt, maksimālai kļūdu vertībai < 0,5°). Vienlaikus tika atrasta un pārbaudīta pieeja Interesešu apgabaliem (Area of Interest) turpmākajai datu analīzei, kas iekļaus lasīšanas fiksācijas skaitu un ilgumu.

Secinājumi. Pirms turpmākās datu vākšanas nepieciešams pilnveidot kalibrēšanas un validēšanas procedūru, kā arī rūpīgi kontrolēt dalībnieka pozīciju, kameras novietojumu, acu attēla kvalitāti un apgaismojumu. Būtiski nodrošināt, lai validēšanas kļūda nepārsniegtu 0,3°, bet maksimālā kļūda būtu mazāka par 0,5°. Ja nepieciešams, ieteicams paredzēt biežākus pārtraukumus, lai samazinātu nogurumu un saglabātu koncentrēšanos.

Atslēgvārdi: Acu kustības, lasīšana

Pateicība: Pētījums tiek īstenots ar Latvijas Zinātņu Padomes Fundamentālā un lietišķo pētījumu programmas atbalstu, projekta Nr. lzp-2025/1-0195, un COST akcijas Nr. CA21131 ietvaros.

HUMAN-CENTRED LEADERSHIP AND SOCIETAL RESILIENCE IN INTERNAL SECURITY: A SYSTEMATIC ANALYSIS OF THE SYNERGY GAP

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Internal security organisations in the Baltics (police, border guards, rescue services) are essential resilience infrastructure confronting hybrid threats. Despite increased investments in crisis preparedness, these teams face burnout rates of 45–60%. Focusing on technical readiness often worsens individual stress, as personnel leave mainly due to leadership failures and toxic culture, not operational risks. There's a critical need to sustain human-centred leadership and resilience in these high-pressure roles.

The research aims to identify the systemic gaps in current scientific literature on human-centred leadership and resilience within the internal security context, with the goal of developing a multilevel human factors improvement model supported by VR/XR-based simulation methodologies. A systematic literature analysis was conducted in accordance with PRISMA-informed principles. The methodology involved the transparent identification and screening of over 150 interdisciplinary sources. A key component was the systematic filtering of materials using keyword clusters (leadership, ergonomics, resilience, internal security, etc.), followed by narrowing through step-by-step combinations. In addition, a comparative analysis of database results against prompt-based literature recommendations was employed.

The review confirms research fragmentation. Combining keywords (e.g., leadership with resilience and security) reduces the number of relevant results exponentially, indicating unexamined synergistic effects. Technical readiness is documented, but traditional training has only a 10-40% transfer rate. High burnout increases vulnerability to extremist narratives, framing burnout as a security risk. Research rarely considers resilience from a human-centred leadership perspective. Current organisational resilience strategies are procedural and overlook the human factors that support individuals during declining security conditions.

The analysis reveals a 'synergy gap' in internal security, showing that current resilience efforts overlook the human aspect, a key factor in burnout. To avoid capacity loss and trauma, resilience should focus on individual human factors and leadership quality, treating them as strategic security indicators vital for societal stability in worsening security conditions.

DOES EMPOWERMENT REDUCE BURNOUT? INSIGHTS FROM 741 NURSES AND ADVANCED PRACTICE NURSES IN ESTONIA

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Background. Nurses are a vital part of the healthcare system, acting as the foundation of patient care. As the largest group within the global health workforce, they are tasked with delivering essential care, promoting health, and managing patient outcomes. As nurses are the main health care providers who experience higher levels of burnout due to insecurity and role conflict over nursing roles and responsibilities and poor leadership, empowering nurses has been found to be an effective tool to reduce nurse burnout, increase job satisfaction and improve patient care quality.

Aim. This study investigates the relationship between empowerment and burnout among nurses and advanced practice nurses (APNs) in public hospitals in Estonia. The aim is to explore how empowerment, structural and psychological, can mitigate burnout among nurses.

Methods. A cross-sectional survey was conducted with 741 nurses and APNs. Data collection used three established questionnaires: the Conditions for Work Effectiveness Questionnaire-II (CWEQII) for structural empowerment, the Psychological Empowerment Scale (PES), and the Copenhagen Burnout Inventory (CBI). Statistical analysis, including correlation and regression techniques, examined the relationships between empowerment types and burnout.

Results. Results indicate that both nurses and APNs in these hospitals report moderate-to-high levels of empowerment, particularly in terms of access to opportunities and the meaningfulness of their work. However, despite this empowerment, burnout remains high, with 24% of APNs and 27% of nurses experiencing significant exhaustion. Structural empowerment showed a moderate negative correlation with burnout, while psychological empowerment had a weaker but still negative correlation. Advanced practice nurses, although feeling more competent and autonomous, did not benefit from additional structural measures compared to regular nurses. The findings suggest that empowering nurses, particularly through structural changes like access to resources and support, is critical in reducing burnout. However, current empowerment strategies may not be fully addressing the psychological aspects that contribute to burnout.

Conclusion. This study emphasizes the importance of ongoing efforts to empower nurses, as doing so not only improves their well-being, but also improves patient care quality and organizational outcomes in healthcare. Future studies should reassess these dynamics as APNs become more integrated into healthcare systems.

AR VECUMU SAISTĪTO REDZES FUNKCIJU IZMAIŅU IETEKMES NOVĒRTĒŠANA STARPDISCIPLINĀRĀ PERSPEKTĪVĀ: PROJEKTA KONCEPTS UN PLĀNOTIE PĒTNIECĪBAS POSMI

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Ievads. Redzes aprūpē visizplatītākais redzes funkciju traucējums pasaulē ir presbiopija, kas saskaņā ar 2021. gadā publicēto Globālo slimību sloga pētījumu, skar aptuveni 510 miljonu cilvēku (Bourne et al., 2021). Redzes aprūpē presbiopija tradicionāli tiek pētīta un skaidrota no bioloģiskā aspekta – to ierosina ar vecumu saistītas acs lēcas fokusēšanās mehānisma (akomodācijas) pakāpenisks un neatgriezenisks funkciju zudums. Šis starpdisciplinārais pētījums paredz cilvēka redzes novecošanās procesu pētīt kā biopsihosociālu fenomenu, kur izmaiņas, kas notiek vienā līmenī, piemēram, bioloģiskajā, var ietekmēt vai tikt ierosinātas ar izmaiņām citā līmenī, piemēram, psiholoģiskajā vai sociāli-ekonomiskajā līmenī (Molton & Jensen, 2010). Pētījuma mērķis ir izveidot starpdisciplināru Bio-psiho-socio-demogrāfiskā ietvara novērtēšanas modeli, kas visaptveroši kvantificē ar vecumu saistīto redzes funkciju izmaiņu aspektus.

Metode. Šī pētījuma konceptuāli un metodoloģiski integrētā starpdisciplinārā pieeja apvieno optometrijas, klīniskā medicīnas, sociālās un ekonomiskās ģeogrāfijas, plašsaziņas līdzekļu un komunikācijas un antropoloģijas konceptus, metodes un zināšanu bāzi. Tematiski projekta metodoloģiju paredzēts realizēt 4 posmos, kas notiks paralēli viens otram un nav uzskaitīti hronoloģiski: I posms – plašsaziņas līdzekļu un sociālo mediju diskursa analīze, tai skaitā ekstensīva sociālo mediju analīze, pielietojot netnogrāfijas un sociālās klausīšanās pieeju. II posms – etnogrāfisks pētījums ar līdzdalīgas rīcības izpēti ciklu, kas ietver kvalitatīvu interviju veikšanu. III posms – sociāldemogrāfiskā kartēšana Latvijas reģionos, izmantojot ģeotelpiskās datu analīzes metodes, kā arī sociāli ekonomiskās nevienlīdzības un sociāli demogrāfisko atšķirību analīze reģionālā līmenī. IV posms – glaukomas distresa anketas validēšana latviešu valodā un pielietošana ar glaukomu saistīto emocionālo slogu novērtēšanai dažādu glaukomas terapijas veida pacientiem.

Rezultāti. Pētījuma īstenošanas periods ir no 2026. gada marta līdz 2029. gada februārim, kura laikā paredzēts izstrādāt un validēt starpdisciplināru Bio-psiho-socio-demogrāfisko modeli, kas integrēs redzes zinātnes klīnisko pieeju ar sociāldemogrāfiskajiem un antropoloģiskajiem faktoriem, sniedzot ieguldījumu sabiedrības veselības uzlabošanai un reģionālo sociālekonomisko atšķirību mazināšanai Latvijā.

Atslēgvārdi: presbiopija, novecošanās, biopsihosociāls modelis, sociāldemogrāfiskā kartēšana, glaukoma

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ERGONOMISKO UN PSIHOSOCIĀLO FAKTORU MIJEDARBĪBA MŪSDIENU DIGITĀLAJĀ BIROJA DARBA VIDĒ

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Ievads. Mūsdienu biroja darbs ir cieši saistīts ar digitālo tehnoloģiju izmantošanu, kas ietver ilgstošu darbu pie ekrāna, biežu uzdevumu maiņu, nepārtrauktu informācijas plūsmu un darbu laika ierobežojuma apstākļos. Šāda darba organizācija būtiski palielina kognitīvo slodzi un veicina noguruma uzkrāšanos darba dienas gaitā. Problēma ir īpaši nozīmīga, jo kognitīvais nogurums ietekmē uzmanības noturību, informācijas apstrādes ātrumu un lēmumu pieņemšanas kvalitāti, tādējādi samazinot darba precizitāti, efektivitāti un drošību. Tas var izpausties kā koncentrēšanās grūtības, reakcijas laika palēnināšanās un kļūdu biežuma pieaugums.

Mērķis. Pašreizējā pētījuma mērķis bija sistemātiski apkopot un analizēt zinātniskos pierādījumus par digitālā biroja darba raksturlielumiem un ar tiem saistītajiem kognitīvā noguruma indikatoriem, īpašu uzmanību pievēršot ergonomisko un psihosociālo faktoru mijiedarbībai. Pētījums ir vērsts uz teorētiski pamatotas izpratnes padziļināšanu par mehānismiem, kas saista digitālās darba vides prasības ar kognitīvās slodzes pieaugumu un darba snieguma izmaiņām.

Metodes. Ir veikts sistemātisks literatūras apskats Scopus, Web of Science un PubMed datubāzēs, iekļaujot publikācijas no 2010. līdz 2026. gadam, ievērojot PRISMA 2020 vadlīnijas. Analīzē ir iekļauti empīriski pētījumi par biroja darbiniekiem, kuros novērtēti objektīvi un uzvedības kognitīvā noguruma rādītāji, piemēram, reakcijas laiks, kļūdu biežums, uzmanības noturība un darba snieguma indikatori. Dati ir analizēti tematiski, nosakot būtiskākos riska faktoros un to darbības mehānismus.

Rezultāti. Ilgstošs un nepārtraukts darbs pie ekrāna, bieža veicamo uzdevumu maiņa un darbs ierobežota laika apstākļos ir konsekventi saistīti ar reakcijas laika palēnināšanos, kļūdu skaita pieaugumu un darba snieguma pasliktināšanos. Vienlaikus palielinās subjektīvi uztvertais nogurums un organisma nepieciešamība pēc atjaunošanās. Noguruma apstākļos darbinieki nereti izmanto kompensējošas stratēģijas, piemēram, paātrina darba tempu vai atsakās no pārtraukumiem, kas īstermiņā var uzturēt darba produktivitāti, bet ilgtermiņā tas tomēr pastiprina noguruma uzkrāšanos.

Secinājumi. Digitālajā biroja darba vidē ergonomiskie un psihosociālie faktori nav vērtējami atsevišķi to savstarpējā mijiedarbība veido kumulatīvu noguruma mehānismu, kas pakāpeniski ietekmē kognitīvo kapacitāti un darba snieguma precizitāti un efektivitāti. Iegūtie rezultāti norāda, ka darba vides novērtēšanā ir nepieciešams vienlaikus analizēt digitālās slodzes rādītājus, kognitīvās veikspējas izmaiņas un darbinieku subjektīvo nogurumu. Šāda integrēta pieeja ļauj savlaicīgi identificēt paaugstināta noguruma risku un plānot preventīvos pasākumus darba organizācijas uzlabošanai.

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SEJU UZTVERES PROCESI BĒRNIEM AR LASĪŠANAS GRŪTĪBĀM: ACU KUSTĪBU ANALĪZE

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Lai gan lasīšanas grūtību cēloņi zinātniskajā literatūrā galvenokārt tiek saistīti ar fonoloģiskās apstrādes traucējumiem, pēdējo gadu pētījumi norāda arī uz izmainītiem vizuālās informācijas apstrādes procesiem (Li & Zhao, 2025). Cilvēkiem ar disleksiju var būt novērojamas izmaiņas dažāda līmeņa redzes uztveres procesos, t.sk. augstākā līmeņa uztverē, kas atbild par objektu kategorizāciju un seju uztveri (Kristjaansson & Sigurdardottir, 2024), kā arī izmaiņas lokālās informācijas apstrādē, kas ietekmē ne tikai vārdu, bet arī seju atpazīšanu. Vienlaikus globālā informācijas apstrāde bieži saglabājas neskarta vai pat pastiprināta (Sigurdardottir et al., 2015).

Šī pētījuma mērķis ir ar acu kustību analīzes palīdzību objektīvi novērtēt seju uztveres procesus bērniem ar lasīšanas grūtībām. Pētījumā piedalījās 180 bērni no 2., 4. un 6. klases ar un bez lasīšanas grūtībām. Lasītprasme tika novērtēta, izmantojot Acadience™ lasītprasmes novērtēšanas rīku (Good et al., 2011; Rascevska et al. 2018), iedalot dalībniekus divās grupās: (1) bērni ar lasīšanas grūtībām (zem 20. procentiles) un (2) bez lasīšanas grūtībām (virs 40. procentiles). Acu kustību pieraksts veikts ar Tobii Pro Fusion (Tobii, Zviedrija) iekārtu, demonstrējot seju, objektu un pareidolijas stimulus ar uzdevumu identificēt sejas.

Sākotnējie pētījuma rezultāti norāda, ka bērni ar lasīšanas grūtībām seju un objektu kategorizācijas uzdevumos apskata plašāku sejas apgabalu. Turpretī kontroles grupas bērni veic mērķtiecīgākas fiksācijas acu apgabalā, dominējot tendencei fokusēties uz sejas kreiso pusi. Iegūtie rezultāti liecina, ka bērniem ar lasīšanas grūtībām novērojama holistiska seju analīze. Savukārt, bērniem bez lasīšanas grūtībām novērotā tendence vērst uzmanību tieši uz attēla kreiso pusi var tikt saistīta ar kreisā redzes lauka dominances attīstību un atšķirīgiem procesiem centrālās sistēmas darbībā salīdzinājumā ar bērniem bez lasīšanas grūtībām.

Atslēgvārdi: seju atpazīšana, lasīšanas grūtības, acu kustības

Pateicība: pētījums izstrādāts LZA pēcdoktorantūras projekta Nr. 1.1.1.9/LZP/1/24/144 ietvaros.

DIGITĀLAIS NOGURUMS KĀ PASTIPRINOŠS RISKA FAKTORS BIROJA VIDĒ

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Ievads. Biroja darbs arvien biežāk apvieno ilgstošu mazkustīgu (sēdošu) pozu ar intensīvām digitālām darba prasībām, kas var veicināt muskuloskeletālos simptomus un subjektīvi uztvertu nogurumu. Šajā pētījumā, balstoties uz aptaujas datiem, analizētas saistības starp digitālo nogurumu, mazkustīga darba paradumiem un muskuloskeletālajām sūdzībām biroja darbinieku vidū.

Metodes. Tika veikta šķērsgriezuma tiešsaistes aptauja 98 biroja darbiniekiem, izmantojot QuestionPro. Aptaujā tika vērtēts ar darbu saistīts fiziskais diskomforts, uztvertā darba slodze un laika spiediens, digitālais nogurums, kā arī darba organizācijas raksturlielumi, tostarp sēžot pavadītais laiks. Dati analizēti, izmantojot aprakstošo statistiku un korelācijas analīzi. Pētījumu apstiprināja Latvijas Universitātes Ētikas komiteja (protokols Nr. 13-28/60, 2025. gada 15. aprīlis); dalība bija brīvprātīga un anonīma.

Rezultāti. Visbiežāk minētie ar darbu saistītie simptomi bija kakla–plecu diskomforts (26,2%) un redzes pārslodze (25,4%). Liela daļa respondentu (71,5%) norādīja, ka lielāko darba laika daļu pavadītais sēžot. Vairāk nekā puse dalībnieku uzrādīja augstu darba intensitāti, laika spiedienu un subjektīvu digitālo nogurumu. Kopumā rezultāti liecina, ka augstāks uztvertais digitālais nogurums un pārsvarā mazkustīgs darbs ir saistīti ar lielāku pašu ziņoto muskuloskeletālo sūdzību slogu biroja darbā.

Secinājumi. Aptaujas dati norāda, ka digitālais nogurums un mazkustīga darba paradumi biroja darbā ir būtiski un savstarpēji saistīti riska signāli, kas atspoguļojas ievērojamā kakla–plecu diskomforta un redzes pārslodzes simptomu izplatībā. Iegūtie rezultāti pamato nepieciešamību pēc integrētām, cilvēkcentrētām preventīvām stratēģijām, kas vienlaikus risina digitālās darba slodzes pārvaldību, darba organizāciju un mazkustīgas uzvedības mazināšanu biroja vidē.

Atslēgvārdi: digitālais nogurums; mazkustīgs darbs; biroja darbinieki; muskuloskeletālie simptomi; aptaujas pētījums; darba organizācija

Pateicība: Šo pētījumu ir atbalstījis projekts “Internal and external consolidation of the University of Latvia”, Agreement Nr. 5.2.1.1.i.0/2/24/I/CFLA/007[US1.1], UL registration Nr. ESS2024/465

OPERĒJOŠĀ BLOKA PERSONĀLA TRAPECVEIDA MUSKUĻA MIOTONOMETRISKO PARAMETRU IZMAIŅAS DARBA MAIŅAS LAIKĀ UN PREVENTĪVIE PASĀKUMI

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Ievads. Ar darbu saistīti muskuļu un skeleta sistēmas traucējumi ir bieži sastopama arodveselības problēma veselības aprūpes darbiniekiem. Īpaši augsts risks novērojams operējošā bloka personālam, kur darbs saistīts ar ilgstošu statisku slodzi, piespiedu darba pozām un ierobežotām kustību iespējām operāciju laikā. Ilgstoša fiksēta kakla pozīcija veicina muskuļu pārslodzi, īpaši trapecveida muskulim, kas nodrošina kakla-plecu joslas stabilizāciju un galvas pozīcijas uzturēšanu. Šāda statiska muskuļu aktivitāte plecu joslā ir saistīta ar paaugstinātu muskuļu tonusu, sāpēm kakla un plecu rajonā (Ackah & Kwashie, 2023; Koshy, et al., 2020; Schlussel & Maykel, 2019; Abdelall, et al., 2018).

Pētījuma mērķis: novērtēt operējošā bloka personāla trapecveida muskuļa miotonometriskos parametrus un pamatot preventīvo pasākumu nepieciešamību kakla-plecu joslas muskuļu sasprindzinājuma mazināšanai.

Metodes. Labā un kreisā trapecveida muskuļa frekvence, cietība un dekrementa tika mērīti darba maiņas sākumā un beigās, izmantojot MyotonPRO ierīci. Mērījumi tika veikti divas reizes dienā 20 darba dienas.

Rezultāti. Pētījumā piedalījās 63 operējošā bloka darbinieki (79,4% sievietes un 20,6% vīrieši) no trīs Latvijas slimnīcu operāciju blokiem. Dalībnieki tika iedalīti piecās amatu grupās: operāciju māsas (vid. vecums $41,80 \pm 9,81$ gadi), anestēzijas māsas (vid. vecums $34,88 \pm 8,33$ gadi), anesteziologi (vid. vecums $42,33 \pm 9,88$ gadi), endoskopijas dienesta darbinieki (vid. vecums $52,50 \pm 13,13$ gadi) un ķirurgi (vid. vecums $41,83 \pm 15,22$ gadi). Pētījumā tika konstatēta asimetrija kreisās puses m. trapezius frekvences un cietības vērtības bija statistiski nozīmīgi augstākas nekā labajā pusē gan darba maiņas sākumā ($p < 0,001$), gan beigās ($p = 0,012$; $p = 0,015$). Starp amatu grupām statistiski nozīmīga atšķirība tika konstatēta tikai kreisās puses trapecveida muskuļa cietībai darba maiņas sākumā ($p = 0,004$), augstākas vērtības novērojot anesteziologiem un endoskopijas dienesta darbiniekiem. Kopumā tika novērota operējošā bloka darbinieku paaugstināta trapecveida muskuļu cietības (>380 N/m) un frekvenču (>18 Hz) vērtību izplatība virs normas, norādot uz paaugstinātu sasprindzinājumu kakla un plecu daļā.

Secinājumi. Operējošā bloka darbs ir saistīts ar plecu un kakla daļas muskulatūras funkcionālu pārslodzi, kas izpaužas kā asimetrisks slodzes sadalījums, ko apliecina miotonometriskie rādītāji, pārsniedzot normas robežas. Izteiktā slodzes akumulācija novērojama anesteziologiem un endoskopijas dienesta darbiniekiem, kā arī gados vecākiem darbiniekiem. Tas norāda uz darba organizācijas un piespiedu darba pozu ilgtermiņa ietekmi un uzsver nepieciešamību pēc mērķētiem ergonomiskiem risinājumiem un darba režīma optimizācijas.

Atslēgvārdi: operāciju bloks, personāls, trapeceveida, biomehāniskie rādītāji, miotons

Pateicības: Autori izsaka pateicību iesaistīto slimnīcu vadībai un darbiniekiem par sadarbību un dalību pētījumā.

Finansējums: Pētījumu atbalstīja projekts "Ar darbu saistītie muskuļu un skeleta sistēmas traucējumi un psihosociālie riski veselības aprūpes personālam, kas nodarbināti operāciju zālēs", līguma Nr. LU-BA-PA-2024/1-0044, UL reģistrācijas Nr. ESS2024/465.

ACU KUSTĪBU ANALĪZE VĀRDU UN NEVĀRDU LASĪŠANAS LAIKĀ BĒRNIEM AR ATŠĶIRĪGU LASĪTPRASMES SNIEGUMU

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Par nevārdiem tiek uzskatīti vārdi, kuriem nav noteiktas nozīmes un tie netiek glabāti vārdu krājumā. Ir noskaidrots, ka prasmīgāki lasītāji spēj ātrāk atpazīt nevārdus un lasa tos ātrāk, salīdzinot ar mazāk prasmīgiem lasītājiem. Lai gan acu kustības lasīšanas laikā ir plaši analizētas, līdz šim nevārdu lasīšanas process no acu kustību analīzes perspektīvas ir pētīts maz.

Šī pētījuma mērķis ir novērtēt atšķirības veikto fiksāciju ilgumā un skaitā dažāda garuma vārdu un nevārdu lasīšanas laikā skolas vecuma bērniem ar un bez lasīšanas grūtībām. Pētījumā iesaistītie bērni ir 2., 4. un 6. klases skolēni, kuru lasītprasmes snieguma novērtēšana tika veikta ar Acadience Reading testu. Izmantojot tiešaistē pieejamo rīku UniPseudo, tika ģenerēti 24 vārdu – nevārdu pāri, kuru garums ir no četriem līdz septiņiem burtiem. Vārdi un nevārdi jauktā secībā tika izvietoti astoņās rindās, un dalībnieku uzdevums bija lasīt tos skaļi, imitējot nepārtrauktu teksta lasīšanu. Lasīšanas laikā acu kustību reģistrēšana tika veikta, izmantojot Tobii Pro Fusion video-okulogrāfu (darbības frekvence 250 Hz). Vārdi un nevārdi tika demonstrēti uz datora monitora 65 cm attālumā no pētījuma dalībnieka.

Sākotnējie rezultāti liecina, ka vecāko klašu skolēni, lasot vārdus un nevārdus, veic īsākas fiksācijas un to skaits ir mazāks nekā jaunāko klašu bērniem. Tiek novērotas arī atšķirības fiksāciju ilgumā un skaitā starp bērniem ar un bez lasīšanas grūtībām.

Atslēgvārdi: nevārdi, lasītprasme, fiksācijas, acu kustības

Pateicības: Pētījums tiek izstrādāts ar Latvijas Zinātnes padomes atbalstu (1.1.1.9. pasākuma "Pēcdoktorantūras pētījumi" pētniecības pieteikums Nr. 1.1.1.9/LZP/2/25/199 "Uz acu kustību analīzi balstīta skrīninga rīka izstrāde lasīšanas prasību novērtēšanai").

EKSPERTU VALIDĀCIJA REDZES SLODZES INTENSITĀTES NOVĒRTĒŠANAI PROFESIJU GRUPU SADALĪJUMĀ LATVIJĀ

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Ievads. Tuvuma darba īpatsvars darba vidē pēdējo desmitgažu laikā ir būtiski pieaudzis un to galvenokārt veicina digitalizācija, procesu automatizācija, kā arī attālinātā darba režīma nostiprināšanās (Salvatori et al., 2018; Ganne et al., 2021). Tuvuma darba slodzes izpratne un sistemātiska novērtēšana kļūst aizvien būtiskāka gan darba kvalitātes un aizsardzības, gan ilgtspējīgas nodarbinātības kontekstā, tomēr pašreizējais regulējums nepiedāvā universālu metodiku vai kritērijus tuvuma redzes slodzes intensitātes novērtēšanai dažādās profesijās. Latvijā spēkā esošie normatīvie akti nosaka obligātās veselības pārbaudes veikšanu darbiniekiem, kuriem ir redzes sasprindzinājums vai darbs ar displejiem katru darba dienu vismaz 2 h dienā, tomēr pašreizējais normatīvais ietvars neparedz konkrētus kritērijus redzes slodzes specifikas izvērtēšanai. Pētījuma mērķis ir izstrādāt redzes slodzes intensitātes novērtēšanas klasifikāciju profesiju grupu sadalījumā Latvijā un veikt šīs klasifikācijas validāciju.

Metodes. Pētījumā izmantots Staptautiskais standartizētais profesiju klasifikators (ISCO-08) un 2021. gada tautas skaitīšanas dati Latvijā. Pētnieku izvirzītās redzes slodzes intensitātes novērtēšanas kategorijas pēc profesiju grupas pamatzdevumu aprakstiem tika validētas ar strukturētu ekspertu vērtējumu.

Rezultāti. Pētījuma ietvaros tika atlasītas 426 atsevišķās profesiju grupas no profesiju klasifikatora un tās tika iedalītas trīs kategorijās pēc kumulatīvā laika, kas tiek pavadīts, skatoties un veicot darbus attālumā, kas vienāds vai tuvāks par 75 cm. Minētajam kategoriju iedalījumam tika veikta validācija ar 7 ekspertu iesaisti (3 optometriisti, 3 darba aizsardzības un ergonomikas speciālisti, 1 arodārsts). Starp 7 ekspertu sniegtajiem vērtējumiem tika konstatēta statistiski nozīmīga un cieša savstarpējā saskaņa (Kendala W ar korekciju = 0,92; χ^2 (425) = 3129; $p < 0.001$), norādot uz augstu ekspertu vienprātību profesiju grupu kategorizēšanā pēc tuvuma slodzes.

Secinājumi. Piedāvātā klasifikācija ļaus veikt redzes slodzes intensitātes novērtējumu atbilstoši profesiju klasifikatoram un tā būs pamats turpmākiem pētījumiem, lai analizētu Latvijas reģionos dažādu profesiju redzes slodzes intensitāti un to saistību ar iedzīvotāju sociāli demogrāfisko profilu un redzes aprūpes speciālistu pieejamību.

Atslēgvārdi: tuvuma redzes slodze, novērtēšana, klasifikators, profesijas, darba vide, cilvēkfaktori

Pateicības: Pētījums tapis Latvijas Universitātes Attīstības programma ar lielu ietekmi finansētā projekta Nr. ZDA-LIP2025/10 "Bio-psiho-socio-demogrāfiskā ietvara izveide: Ar vecumu saistīto redzes funkciju izmaiņu ietekmes novērtēšana un kartēšana" ietvaros.

AUTOMATED SUBJECTIVE REFRACTION TOOLS: REDEFINING THE ROLE OF THE OPTOMETRIST IN THE AI ERA

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In the world, there is a huge population with refractive errors, with myopia as a leading problem. However, access to eye care is a major challenge in many countries around the world, mainly due to a shortage of eye specialists (WHO,2019). For example, in India, there is one eye specialist per 65,000 patients. Furthermore, eye examination methods differ from one country to another, and this raises questions about the quality of eye examination. Subjective refraction is essential for optimal visual quality, as it determines refractive status using spherical and cylindrical lenses to achieve best-corrected visual acuity under relaxed accommodation; its structured algorithm allows automation to expand access to care in underserved regions. Semi-automated devices such as SiView Exam@, NIDEK, and Eye Refract use supervised machine learning, often based on decision tree algorithms. Although they are designed to replicate the work of an optometrist, a clinician is still required to make the final prescription decision. However, evidence on their algorithm transparency, accuracy, and repeatability is still limited. For instance, studies on SiView report an average difference of 0.7 diopters compared with an optometrist's refraction (Pichereau et al., 2023). While this difference may seem small, even 0.7 D can lead to visual discomfort and asthenopia – particularly in patients with astigmatism (Wajuihian, 2015; Zhang et al., 2023) – and may also affect binocular vision and accommodation (Atchison et al., 2001). Because there are not enough eye care professionals, automated refraction devices will continue to be used – especially for simple refractive error corrections. This will allow optometrists to focus more on complex cases. However, to ensure these devices are used safely and effectively, larger studies are needed to evaluate their accuracy and repeatability across a wide range of refractive errors.

Keywords: Optometrists, semi-automated devices, artificial intelligence, subjective refraction.

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DIGITALIZATION ACCELERATION IN HEALTH CARE: ORGANIZATIONAL ADAPTATION SPEED AND HUMAN-CENTERED STRATEGY

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Background. The speed of digitalization and artificial intelligence (AI) development in health care has significantly increased in recent years. Generative AI, data analytics, and remote care platforms are rapidly transforming clinical and administrative processes. However, health care institutions often adapt more slowly due to regulatory constraints, fragmented IT systems, financial limitations, and limited human resource capacity. This gap creates risks for employee well-being and work process stability.

Aim. To analyse the gap between the accelerating pace of digital and AI development and the slower institutional adaptation in health care organizations, and to identify principles for a human-centered digitalization strategy that supports well-being at work.

Methods. The study is based on strategic analysis and practical experience in developing a digitalization strategy for a health care institution. Document analysis, process mapping, and organizational readiness assessment were applied. Particular attention was given to electronic documentation systems, centralized data management, business intelligence tools, telemedicine solutions, and AI-supported administrative automation. Change management principles and staff digital competence development were evaluated.

Results. Findings indicate that rapid technology implementation without a structured strategic framework increases cognitive workload, role ambiguity, and resistance to change. In contrast, a phased and human-centered approach, including training, internal communication, and clearly defined performance indicators, reduces administrative burden and improves decision-making quality. Organizational readiness and leadership engagement were identified as critical success factors.

Conclusions. Digitalization speed alone does not ensure efficiency or competitiveness. Health care institutions must balance innovation dynamics with institutional stability and employee wellbeing. A structured, strategy-based and human-centered digital transformation enhances sustainable productivity and strengthens the foundation for a competitive and healthy work environment.

1.2. sekcija. **LABBŪTĪBU VEICINOŠS DIZAINS UN
TEHNOLOĢIJAS /**
**WELL-BEING-PROMOTING
DESIGN AND TECHNOLOGIES**

TECHNOSTRESS AND TEACHER WELL-BEING: IMPLICATIONS FOR EDUCATIONAL ORGANIZATIONS IN THE DIGITAL AGE

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The rapid integration of digital technologies into educational environments has introduced technostress as a significant occupational hazard for teaching staff. Grounded in Ragu-Nathan et al.'s (2008) conceptual framework, our research examines five core technostress dimensions: techn overload, techno-invasion, techno-complexity, techno-insecurity, and techno-uncertainty, and their cumulative effects on teacher well-being, job satisfaction, and professional performance. Technostress is prevalent among educators and intensifies during periods of heightened academic workload. Its consequences span both psychological and physical domains, manifesting in reduced job satisfaction, emotional exhaustion, and impaired work performance, while simultaneously eroding work-life boundaries. Our research further identifies key organisational enablers capable of attenuating these adverse outcomes, including supportive internal communication, workplace learning opportunities, digital leadership, and corporate digital responsibility. Crucially, the perception of technology as either a challenge or a threat is shown to mediate employees' behavioural and emotional responses. The findings underscore the necessity of proactive, organisation-level strategies that address not only technical training and skill development, but also the broader psycho-social conditions that enable educators to engage productively with digital tools. These insights offer a foundation for evidence-based recommendations aimed at promoting sustainable digital wellbeing within educational institutions.

Keywords: digital technologies; education; teachers; technostress; well-being

ARTISTIC RESEARCH AS PERFORMATIVE KNOWLEDGE PRODUCTION

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Artistic research has become an established part of higher education, yet its methodological status remains unclear. It is often evaluated using criteria derived from scientific or qualitative research – such as replication, objectivity, or measurable outcomes. When judged by these standards, artistic research can appear subjective, unstable, or insufficiently rigorous. This paper proposes a different way of understanding its methodological logic. Drawing on theories of performativity (Austin, Butler, Bolt), I propose that artistic research operates as performative knowledge production. I argue that artistic research operates performatively: it produces knowledge by doing and affecting change. In this sense, knowledge does not pre-exist the work and then become documented; it emerges through the artistic process itself. In scientific research, repetition is used to verify results. In artistic research, repetition functions differently: through iterative practice, variation, deviation, and even failure, new insights and transformations occur. The value of the work lies not in replicating the same outcome but in generating shifts in perception, material understanding, conceptual framing, or social relations. From this perspective, experimentation and academic rigour are not opposites. Rigour in artistic research lies in making these transformations visible and accountable: articulating what changed, how conventions were challenged, and what new understandings became possible. By reframing artistic research as performative knowledge production, this paper offers a model that allows it to be evaluated on its own terms, without reducing it to scientific validation or subjective expression. Artistic research emerges as a distinct but legitimate mode of inquiry, expanding the notion of how knowledge itself can be understood.

Keywords: Artistic research, performativity, knowledge production, epistemology, methodological rigour, iteration and transformation

CHALLENGES OF IMAGES: CONTRIBUTE TO VISUAL LITERACY IN STAGES OF THE GRAPHIC DESIGN STUDY'S

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The objective of this study is to develop and evaluate a learning task for enhancing visual literacy on the course History of Graphic Design for bachelor level. In this presentation we are looking only for one part of this action research, but the sustainable task plan was designed. Contemporary art suggests a shift in the generation of original ideas, emphasizing cognitive processes and planning rather than technical execution. Visual literacy is the ability to find, select, interpret, use, evaluate, and create images, using media, in a way that facilitates thinking, decision-making, communication, and learning. The enhancement of visual literacy necessitates the establishment of clear methodological guidelines and the definition of precise evaluation criteria. The data were obtained from a cross-disciplinary assignment in which students acted as competent visual readers – users of Internet resources and creators of manually executed visual work with self-created hand drawn typeface. A total of 125 student works produced between 2022 and 2024 were evaluated. The most challenging aspects were the accurate use of Internet resources and the selection and arrangement of artefacts, followed by the selection or creation of a typeface and its manual execution. The establishment of three levels of mastery (A, B, and C) was based on methodological criteria and coding schemes. The results indicate that 79% of students attained level A or B, thereby substantiating the efficacy of the task plan.

Keywords: higher education, manual freehand drawing, image, typeface

WHEN AI ENTERS THE WORKPLACE: A HUMAN-CENTERED DESIGN PERSPECTIVE ON EMOTIONAL WELL-BEING AND TECHNOLOGY ADOPTION

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Artificial Intelligence (AI) increasingly performs cognitive tasks such as analysis, decision making, and content generation in knowledge intensive workplaces, challenging professional roles traditionally grounded in expertise and judgment. Unlike the Industrial Revolution, which automated physical labor, AI now automates intellectual work and reshapes the paradigm of professional activity. This shift affects how employees perceive their expertise, authority, and value, with significant implications for identity and well-being. Despite its growing presence, AI adoption often encounters resistance that cannot be explained by technical limitations alone. Understanding this resistance requires attention to the psychological and experiential dimensions of how employees relate to AI at work. Although research on technology adoption is extensive, the relationship between employees' psychological needs and AI adoption has not been systematically examined through a human-centered design lens. This study addresses that gap by exploring how human-centered design perspectives, particularly those concerned with emotional well-being, user experience, and need fulfillment, can explain patterns of acceptance and resistance in knowledge work contexts. A systematic literature review was conducted across workplace AI adoption, user experience theory, and emotional design research. Qualitative thematic synthesis was applied to identify connections between human-centered design principles and AI adoption outcomes. The findings indicate that trust, perceived control, transparency, and value alignment are central to employees' willingness to engage with AI and to their emotional well-being. Resistance emerges when implementation threatens professional identity, reduces autonomy, or diminishes meaningful contribution. Employees evaluate AI not only in terms of efficiency but also in terms of whether it supports their sense of competence and professional purpose. Adoption is most sustainable when AI is positioned as augmenting rather than replacing human expertise. This study contributes a human-centered design perspective to AI adoption research by linking employee psychological needs to practical organizational implementation considerations.

Keywords: Human-Centered Design, AI adoption, Emotional well-being, Knowledge work, Professional identity

STUDENT DEVELOPED DESIGN PRODUCTS IN TEXTILE TECHNOLOGIES WITHIN SCIENTIFIC RESEARCH PROJECTS

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Ventspils Valsts 1.ģimnāzija

Today, in many schools, including our own, students develop scientific research projects and deepen their knowledge through the investigation of topics closely related to their academic subjects. Each year at Ventspils State Gymnasium No. 1, students choose research topics connected to the subject of Design and Technologies. They select themes that are of personal interest and that they wish to explore in greater depth. An important consideration for students is whether their chosen research topic is relevant in the contemporary context. While developing the theoretical framework of their scientific research project, students also create unique design products in various textile technologies as part of the practical component. In order to develop these design products, students follow several stages. First, they conduct research on a specific textile technology and its related products. Next, they produce multiple sketches and select one concept for further development. For the implementation of their idea, appropriate materials, tools, and equipment are prepared. During the production process, students document each stage of development. Finally, the completed design product is tested and the results are evaluated. The author will share her professional experience on how students develop their design products in various textile technologies within the framework of scientific research projects.

Keywords: research, idea, scientific research projects, design and technologies, design product, manufacturing process, textile technologies.

TRADITIONAL AND INNOVATIVE TECHNICAL APPROACHES IN THE GRAPHIC DESIGN PROCESS

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University of Latvia

The study reviews and analyses the possibilities of using and combining traditional and technologically innovative methods in the creative process, particularly at the stage of idea visualisation or sketching. It explores how emerging technological solutions can support, enhance, and expand creative practices in art and design education. Concept visualisation during the ideation phase remains a fundamental component of the creative process, and mastering this skill continues to be an important objective in higher education. The study includes a practical sketching task carried out with students from the University of Latvia, Professional Bachelor Study Program “Art,” in which graphic and interior design students produced multiple sketches within a limited time frame using different techniques, including digital applications and artificial intelligence (AI) tools. The study summarises data on the advantages and disadvantages of different types of sketching in the field of design, as pointed out by the authors of several previous studies. The results are then compared with the students’ findings after completing a practical task. The findings indicate that technological support can accelerate the sketching process through diverse functional features, enable the creation of visually compelling early-stage design presentations for clients, and increase the confidence of less experienced designers in their creative abilities.

Keywords: Design ideation, digital sketches, freehand sketching, sketch-based AI images

DECENTRING THE HUMAN IN SOCIAL WELLBEING: TOWARD ECOLOGICAL RELATIONALITY

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Wellbeing is commonly defined as the state of feeling good and functioning effectively across multiple domains of life. While contemporary scholarship recognises wellbeing as multidimensional encompassing physical, psychological, social, and material dimensions it remains largely grounded in anthropocentric and individualistic paradigms. Social wellbeing, in particular, is typically confined to human-to-human interaction. In contrast, this paper adopts a human-decentred perspective that understands wellbeing as co-constituted within networks of ecological and social reciprocity, where flourishing emerges through relations rather than residing solely within individuals. The theoretical framework draws on relational ontology, environmental humanities, and more-than-human theory, including the work of David Abram, as well as relational approaches in social theory that view beings as constituted through interdependence rather than autonomy. From this perspective, wellbeing is conceptualised as relational wellbeing as an emergent property of dynamic interactions among humans, plants, animals, and shared habitats. This framing resonates with post-anthropocentric thought, which challenges the ontological divide between nature and culture and situates human life within multispecies assemblages. A central yet often overlooked dimension of this relational field is the role of plants as foundational participants in human habitat and social life. Perspectives in critical plant studies reposition plants from passive background objects to dynamic agents within shared ecosystems, expanding “the social” to include vegetal interdependence and habitat-based wellbeing. Rather than viewing plants merely as resources or environmental context, this approach recognises their role in shaping atmospheres, sustaining bodily processes, structuring spaces of dwelling, and mediating affective experience. By reframing social wellbeing as relational wellbeing, this study advances a conceptual and methodological shift that situates human flourishing within multispecies interdependence. Such an approach is particularly urgent in the context of climate crisis and biodiversity decline, where wellbeing cannot be disentangled from planetary vitality and ecological continuity.

Keywords: Relational wellbeing, more than human, nature culture, critical plant studies, interdependence

AN INTERDISCIPLINARY APPROACH IN SUSTAINABLE DESIGN EDUCATION: FROM THEORY TO PROTOTYPE

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It is now widely understood that design can and must play a crucial role in the societal transformations towards sustainability. Design can in fact act as a catalyst to trigger and support innovation and can help to shape the world at different levels: from materials to products, product-service systems, social organisations and socio- technical systems. Researchers such as F. Ceschin, I. Gaziulusoy, and E. Manzini indicate that sustainable design has evolved from a narrow focus on ecological footprints toward addressing long-term, large-scale transformations. This study analyses projects by first-year students of the “Design Technologies” bachelor program at Riga Technical University (RTU) Rezekne Academy (RA). These projects promoted an interdisciplinary, research-based approach, fostering an understanding of sustainability and physical environment solutions. Collaboration between students, faculty, and industry partners ensured effective knowledge exchange and the development of engineering-enhanced prototypes. Students utilized research laboratories for 3D printing and laser technologies to produce highprecision prototypes. In collaboration with engineers, they determined optimal material processing and connectivity, ensuring functional and technological quality through a full design cycle. This approach enhanced interdisciplinary research and developed students’ artistic and scientific competencies. Research base: 20 first-year students of the RTU RA “Design Technologies” bachelor program, academic staff, and industry partners. Period: 2024/2025 academic year. **Aim.** to analyse results obtained during prototype development by integrating sustainability and interdisciplinary methods. Scope: experimental and scientific research was conducted to test materials and technologies. Using traditional and innovative methods, functional-decorative wall panels were developed. **Methods.** theoretical (literature and analogue analysis); Empirical (observation, surveys, focus group discussions, data analysis).

Keywords: sustainable product design, interdisciplinarity, experiments, innovative technologies, prototype, wall panel.

LATVIAN MEDAL ART AT THE FIDEM XXXVIII CONGRESS IN MUNICH: MYTH, CULTURAL ROOTS, AND WELL-BEING-PROMOTING DESIGN

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This paper examines the participation of Latvian medal artists in the international exhibition “Our Myths –Our Roots”(Munich, 2026), presented within the framework of the FIDEM XXXVIII Congress and hosted by the Munich State Coin Collection at the State Collections of Antiquities. The exhibition brought together 500 contemporary art medals from more than 30 countries, including works by sixteen Latvian medal artists. The study analyzes Latvian medal art through the conceptual lens of well-being-promoting design and technologies. While rooted in the centuries-old tradition of medal-making, the exhibited works demonstrate a dynamic dialogue between classical casting techniques and contemporary fabricated approaches, incorporating materials such as anodized aluminum, stainless steel, ceramics, glass, terracotta, and mixed media. This diversity of technologies expands the expressive potential of medal art and positions it within broader discussions of sustainable design, material awareness, and human-centered values. The thematic spectrum of the Latvian medals reveals a multidimensional understanding of wellbeing. Several works address emotional and psychological dimensions, reflecting on grief, memory, resilience, and empathy. Others engage with social and political realities, including war, human rights violations, public safety, and civic responsibility. Environmental awareness and respect for nature emerge as significant concerns, alongside reflections on cultural heritage, craftsmanship, and regional identity. Mythological imagery and historical references are reinterpreted to connect past and present, while certain works explore the tension between biological strength and technological progress in the context of future societal development. Through allegory, symbolism, and material experimentation, Latvian medal art demonstrates how small-scale sculptural objects can embody complex narratives related to physical, emotional, intellectual, spiritual, and societal well-being. The paper argues that contemporary medal art functions not only as a bearer of cultural memory but also as a form of reflective design practice that encourages awareness, responsibility, and meaningful engagement with the world.

Keywords: Latvian medal art; contemporary medal sculpture; well-being-promoting design; cultural heritage; mythology; social responsibility; environmental awareness; design and technologies.

FIRE SCULPTURE AS AN EMOTIONAL EXPERIENCE

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As an ephemeral and intense artistic event, fire sculpture creates a distinctive emotional experience that weaves together aesthetic perception, ritual elements and a felt sense of being with others. This article explores how people emotionally experience fire sculpture in different roles, including as spectators, co creators and artists. The theoretical framework draws on work on emotional and aesthetic experience in performance art, on ritual processes, and on the symbolic and phenomenological meanings of fire. A qualitative research design is used, combining in depth interviews, written accounts of experience and self ratings of emotional intensity before and after the event. The material is examined through thematic and phenomenological analysis in order to trace recurring emotional motifs and follow the dramatic “journey” participants describe during the unfolding of the fire sculpture. The findings point to a shifting sequence of emotional phases, moving from anticipation and tension through a sense of culmination to release and a lingering afterglow. They portray fire sculpture as a particular kind of emotional space located between art, ritual and entertainment, marked by heightened bodily awareness, a changed sense of time and space, and intensified feelings of connection. The study suggests that returning to fire sculpture over time can nourish individual well being and shared experience by fostering collective emotional engagement, reflection and a sense of belonging.

Keywords: fire sculpture, emotional experience, performance art, ritual, phenomenology, well-being

EVALUATING THE IMPACT OF PERCEPTUALLY 3D ROAD MARKINGS ON DRIVER PERFORMANCE AT CROSSWALKS AND INTERSECTIONS

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Ensuring consistent driver compliance with traffic-control devices remains a persistent challenge at pedestrian crossings and STOP-regulated intersections, particularly in environments where inattention elevates crash risk. This field study investigated whether illusion-based three-dimensional pavement markings influence driver behavior under real traffic conditions. Five sites were included in the analysis, comprising four pedestrian crossings and one STOP-controlled intersection. A one-week baseline observation period was conducted prior to installation, followed by a two-week post-installation phase after 3D markings were applied 1.5 to 10 meters upstream of each location. Trained observers systematically recorded pedestrian yielding, turn-signal activation, stopping behavior, and relevant contextual variables. Following installation, pedestrian yielding increased by 17.3 percent, indicating that enhanced perceptual salience at the roadway surface can improve driver awareness at crossings. Proper turn-signal use at the STOP-controlled intersection increased by 15.3 percent, suggesting more deliberate pre-maneuver preparation. However, rates of complete stopping did not increase. Instead, drivers more frequently engaged in slow rolling behavior, reflecting heightened caution without full statutory compliance. Overall, the findings indicate that perceptually salient pavement treatments can improve selected safety-related behaviors, particularly those associated with attention and communication, and may serve as a complementary intervention alongside conventional traffic-control measures.

Keywords: pedestrians; crossings; intersections; compliance; markings

AI, WELLBEING AND THE FUTURE OF WORK: CHANGING LABOUR MARKET AND EDUCATION.

Guna Jākobsone-Šņepste

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Artificial intelligence is reshaping both the labour market and education, altering productivity, institutional practices, skill demands, and the quality of human experience in professional and learning environments. Although public discourse often emphasises automation, efficiency, and labour displacement, AI is more accurately understood as a socio-technical transformation in which tasks, responsibilities, and expertise are reconfigured. Within this context, wellbeing becomes a critical concern. As workers, educators, and learners are expected to adapt to digital systems, develop competencies, and collaborate with intelligent technologies, emotional resilience and a sense of agency become essential. The emergence of generative artificial intelligence across educational, institutional, and business contexts has created questions, risks, challenges, and opportunities. A central concern is job quality: to what extent does technological integration enhance the quality of work? This question must be examined in relation to safety, working conditions, autonomy, workload, recognition of labour, and structural factors that shape job quality and psychological wellbeing. It is important to consider whether job quality may be undermined by stress associated with emerging technologies, psychological pressure in AI-driven environments, and the use of algorithmic management tools. In this context, digital wellbeing highlights the importance of technology-use practices that help preserve boundaries between professional and private life. Professional sustainability is central. Lifelong learning, skills obsolescence, reskilling, and the burden of continuous adaptation are integral to current discussions on the future labour market. Within this transformation, the role of the education system, particularly teachers, is critical, as teachers prepare future professionals for an increasingly technology-mediated labour market. Therefore, the education, professional development, and wellbeing of teachers should be treated as a strategic priority. Equitable access to technology, balanced workloads, critical thinking, and trust in technological systems are essential preconditions for a safe, ethical, and human-centred approach to wellbeing in the era of generative artificial intelligence.

Keywords: Generative AI, Education, Labour Market, Wellbeing, Effectiveness

DESIGNING FOR INCLUSION AND WELL-BEING: MAPPING SCHOOL CONSTRUCTION AND RENOVATION IN LATVIAN K-12 EDUCATION

Anna Ansone, Linda Daniela, Zinta Zālīte-Supe

University of Latvia

The design and renovation of school buildings play a critical role in shaping students' academic development, social interaction, and psychological well-being. In Latvia, substantial investments have been directed toward both the construction of new schools and the renovation of existing educational facilities. These processes represent significant opportunities to embed inclusive and well-being-oriented principles into educational environments. However, the extent to which policy goals are effectively translated into spatial and technological solutions remains unclear. This study maps the current Latvian context by analysing policy frameworks and planning processes related to newly constructed and renovated K-12 schools. Drawing on stakeholder interviews, surveys, and document analysis, it examines how physical design, technological infrastructure, and psychosocial considerations are addressed in practice, particularly in relation to diverse student needs. The study is conducted within the Erasmus+ project Collaborative Learning Communities for Redesigning Primary Education Towards Innovative & Sustainable Learning Environments (ISLE). This research contributes to the project's broader aim of strengthening collaborative capacity for the sustainable and inclusive redesign of primary education environments across Europe. Although national education policies emphasise inclusion, competence-based learning, and digital transformation, their implementation in architectural and spatial planning is uneven. Renovation projects frequently prioritise technical upgrades and energy efficiency, while opportunities to enhance flexibility, accessibility, and collaborative spaces are not fully realised. Furthermore, pedagogical knowledge related to learning environment design remains limited. Strengthening educators' competencies through professional development is essential to ensure that solutions are meaningfully integrated into teaching practices. Limited cross-sector collaboration among policymakers, municipalities, architects, educators, and technology providers further constrains the development of student-centred environments. The study argues that both construction and renovation processes constitute strategic moments for systemic change. Aligning policy, design, pedagogy, and technology through strengthened collaboration mechanisms is essential to creating inclusive learning environments that promote the well-being of all students in Latvian education.

Keywords: Inclusive education; well-being-promoting design; school construction and renovation; collaborative learning communities; educational infrastructure.

FROM TRADITIONAL CLASSROOMS TO FLEXIBLE SPACES: FINDINGS FROM A NATIONAL NEEDS ASSESSMENT IN LATVIA

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University of Latvia

Innovative learning environments are increasingly recognised as central to promoting quality, equity and inclusion in primary education. However, the extent to which existing school infrastructures align with contemporary pedagogical aspirations remains uneven across European contexts. This paper presents findings from a national needs assessment survey conducted in Latvia as part of the Erasmus+ KA220-SCH project Co-ILE (Supporting Teachers to Co-design & Use Innovative Learning Environments for Promoting Quality, Equity & Inclusion in Primary Education). The survey was distributed to all primary schools across Latvia from August to November 2025, and a total of 303 responses were received. The study examined the current situation regarding (a) the types and characteristics of learning spaces available in schools in Latvia, and (b) the pedagogical, psychosocial, physical, and inclusion-related challenges associated with the use of these spaces. Although many specialised spaces (e.g., libraries, gyms, art and music rooms) are widely available, their pedagogical use is selective. Notably, strong underlying demand emerges for more flexible environments, such as collaborative classrooms, learning-equipped corridors, science laboratories, maker spaces and vegetable gardens. This suggests a misalignment between existing infrastructure and teachers' aspirations for more experiential and inclusive pedagogies. The findings provide a comprehensive overview of the current learning environment landscape in Latvia and establish a strong evidence base for informing future policy and educational practice. The results highlight the continued dominance of traditional spatial-pedagogical configurations, alongside a growing teacher interest in more flexible, collaborative, and inclusive environments. This points to a need for systemic alignment between infrastructure, pedagogy, and equity objectives. The study underscores the importance of participatory, teacher-led co-design processes as a strategic pathway for sustainable transformation. Implications for policy development, school leadership, and targeted professional learning are outlined.

Keywords: Innovative Learning Environments, National Needs Assessment In Latvia, Primary Education, Educational Infrastructure, Learning Space Design

EVALUATING SPATIAL THINKING THROUGH AUGMENTED REALITY IN SECONDARY EDUCATION: A SYSTEMATIC LITERATURE REVIEW

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University of Latvia

Spatial thinking is widely recognized as a foundational cognitive competence essential for success across academic disciplines and in everyday problem-solving. Despite its acknowledged importance, definitions and conceptual frameworks of spatial thinking vary across educational research, posing challenges for the development of coherent instructional and assessment practices. This study presents a systematic literature review examining how spatial thinking is conceptualized, taught, assessed, and supported through augmented reality (AR) in compulsory and secondary education. The review followed a structured multi-stage screening process using the Web of Science and Scopus databases and applied predefined inclusion and exclusion criteria. After removing duplicates and ineligible studies, 56 articles were included in the final qualitative synthesis. Findings indicate that spatial thinking is predominantly conceptualized as a multidimensional construct encompassing five main skills. However, existing research shows that AR has primarily been used to enhance three of these skills, mental rotation, spatial visualization, and spatial orientation, through interactive three-dimensional environments that enable embodied interaction, real-time manipulation of 3D representations, and the integration of abstract and concrete spatial concepts. Nevertheless, without strong pedagogical design, technology may increase student engagement without necessarily promoting spatial learning. Moreover, there remains a lack of research examining how designing projects in three-dimensional environments and presenting final outcomes through AR technologies can systematically foster spatial thinking. Although AR has significant potential to strengthen and develop spatial thinking, its implementation requires teachers to develop their spatial competencies, strengthen their pedagogical competence, and enhance their digital literacy. The learning environment also plays a crucial role in supporting educators, particularly in terms of access to appropriate technologies and the availability of suitable physical spaces. Future research should explore how these interrelated factors, AR technologies, pedagogical competence, digital literacy, and the learning environment, can be coherently integrated to support the sustainable development of spatial thinking.

Keywords: Spatial thinking; Augmented reality technologies; Systematic literature review; Secondary education; Pedagogical competence

HOW DO STUDENTS USE TRADITIONAL MITTENS AND GLOVES AS A SOURCE OF INSPIRATION FOR MAKING CRAFT PRODUCTS?

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Patterned mittens and gloves are particularly important in Latvian traditional culture. Traditional gloves and mittens have been a source of inspiration for many mitten and glove knitters, artisans, artists, teachers and other interested people. The aim of this study is to explore the use of mittens and gloves as a source of inspiration in products created by pupils in grades 5–9 at the 16th Open Design and Technology Olympiad. Qualitative content analysis was used to analyse the pupils' design and craft products and written reflections (N = 121). The patterns, colours, materials, techniques and their combinations used in the creative works were analysed and compared with the sources of inspiration (mittens and gloves). The results show that personal significance influences the choice of inspiration source. Mittens and gloves are used in a variety of ways as sources of inspiration for the creation of new products: fragments of gloves and mittens are used without change, rearranged, supplemented with other elements, simplified, or derived. In some works, the geometric patterns of the mittens and gloves are transformed into organic patterns. The most frequently used techniques are embroidery, knitting, bead weaving, and sewing. These results open up the possibility of creating conditions and designing learning tasks that use artefacts as sources of inspiration in craft education.

Keywords: craft products, design and technology, source of inspiration, textile techniques, traditional mittens and gloves

GENERATIVE AI AS A “NEW COLLEAGUE”: IMPLICATIONS FOR HIGHER EDUCATION IN LATVIA

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Higher education is among the domains that will be most strongly affected by Artificial Intelligence (AI). In academic practice, generative AI can be compared to the arrival of a new member in a research group – one who has read almost everything written in the world, thinks vastly faster, never gets tired, is endlessly helpful, and, when prompted well, can even suggest new ideas. Early evidence already indicates that AI will act as a powerful amplifier of productivity and communication across university work. This paper reports research-in-progress from Vidzeme University of Applied Sciences (Latvia) within the National Education Research Programme project AI4EDULAB (“AI-based, ethical, and labour-market aligned personalised study content”). The project positions Vidzeme University among the national leaders studying AI opportunities for university education. Research is organised in three complementary streams: (1) AI-supported development of study content aligned with labour-market needs, (2) AI support for personalised learning materials, and (3) academic integrity and the implications of generative AI-produced study content. We develop methods to evaluate how well programmes and courses meet labour-market needs while preserving the university’s long-term mission to prepare graduates for the next 10–20 years. In addition, we address governance and policy dilemmas, where regulatory approaches often oscillate between restrictions and innovation, and propose recommendations that preserve transparency and high standards while enabling responsible AI adoption.

Keywords: Generative AI; higher education; personalisation; labour-market alignment; academic integrity; governance; AI4EDULAB; Latvia

FROM COMPETENCE TO CARE: INTEGRATING QUALIFICATION FRAMEWORKS AND WELL-BEING IN DESIGN STUDIES

Aija Freimane

This paper examines the integration of European Qualification Assessment Reference Frameworks for the Design discipline with an empirical case study on emotional well-being in a globally distributed learning environment (DLE). Grounded in the CALOHEE subject-specific framework and aligned with the European Qualifications Framework, design education is conceptualised as the development of cognitive, practical, interpersonal, and ethical competencies, including knowledge, skills, autonomy, and responsibility. The study analyses undergraduate design graduates' learning experiences across eight dimensions, encompassing creative practice, critical thinking, collaboration, sustainability, professional awareness, communication, and independent development. Findings indicate that students readily recognise gains in communication, teamwork, and design methodology, yet demonstrate limited awareness of autonomy, responsibility, reflective practice, financial literacy, and well-being as intended learning outcomes. Moreover, uncertainty in design processes, ambiguous role expectations, and insufficient technological and pedagogical support negatively influence emotional well-being. The paper advocates for transparent curricular articulation and emotionally responsive pedagogies to cultivate resilient, responsible designers.

Keywords: design education, qualification framework, emotional well-being, distributed learning environment

1.3. sekcija. **VIENLĪDZĪGAS IZGLĪTĪBAS IESPĒJAS
VISIEM /**

**EQUAL EDUCATIONAL
OPPORTUNITIES FOR ALL**

THE PHENOMENON OF BULLYING IN PRESCHOOL AGE (Poster)

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Identification of the problem and relevance of the paper. There is a growing body of scientific evidence to support the fact that bullying begins in the preschool years (Swit, Blakely-McClure, & Kamper-DeMarco, 2023). According to the data of the World Health Organization (2020), Lithuanian schoolchildren experience the most bullying compared to other European countries. Bullying for a long time is one of the most important topics studied by researchers when we talk about school-age children, however, bullying occurs much earlier, so there is a growing need to talk about this problem at a younger preschool age (Bistrong, Bradshaw, Morin, & Saracho, 2016). Therefore, the problem question emerges – how do manifestations of bullying occur in preschool-age children and what are the possibilities for reducing bullying? The aim of the work. To identify the problem of bullying and the possibilities of reducing it in preschool age.

Objectives of the work (the objectives defined in the introduction are rewritten): to theoretically substantiate the problem of bullying in preschool age. Carry out an empirical study to determine pedagogues' attitudes towards the problem of bullying and the possibilities of reducing it. Methods of the work project. Analysis of scientific literature, interview (oral), data processing methods – generalization and analysis of content.

The research revealed that the pedagogues notice the manifestations of bullying at a preschool age. In the opinion of all informants, preschool age is suitable for work on the topic of bullying and only continuous work, combining different methods of reducing the problem of bullying can provide effective results. The results of the study revealed: bullying behavior begins to manifest itself in preschool age and later – in preschool age, it becomes even stronger. Informants notice manifestations of bullying in the groups in which they work.

Keywords: Bullying, bullying prevention, educators, education, preschool age

ENHANCING PROBLEM-SOLVING SKILLS OF STUDENTS WITH DYSCALCULIA THROUGH A COGNITIVE LOAD THEORY – INFORMED INSTRUCTIONAL INTERVENTION

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Students with dyscalculia struggle with problem-solving skills due to limitations with their working memory and restricted cognitive processing. Cognitive Load Theory provides a framework to design an instruction according to the cognitive architecture of the learners. This study was conducted to develop and evaluate the effectiveness of a Cognitive Load Theory-informed instructional program i.e. Cognitive Load-Managed Math Instruction (CLM-Maths). CLM-Maths is especially designed to improve mathematical problem-solving skills among students with dyscalculia. It integrates the principles of CLT and Concrete-Pictorial-Abstract (CPA) to target the unique cognitive needs of students with dyscalculia. A quasi-experimental pre-test-post-test control-group design was used, where 34 purposively-selected participants were assigned to two equal groups. The experimental group ($n = 17$) received CLM-Maths intervention for the next 8 weeks and the control group ($n = 17$) continued with traditional classroom practices during this time. A 20-point math test ($KR-20 = 0.79$) was used as a data collection instrument. The data analysis revealed that there was no significant difference in the performance of both groups at the time of pre-test ($p = 1.00$). A significant improvement was observed in the performance of the experimental group ($t(16) = 4.27, p < 0.01$) with a large effect size ($d = 1.03$) as opposed to the control group, which demonstrated no significant improvement ($p = 0.68$). The post-test between-group analysis further revealed that the experimental group performed significantly better than the control group ($t(32) = 2.24, p = 0.03, d = 0.76$). The ANCOVA results showed that the intervention is still effective after controlling pre-test performance ($F(1,31) = 9.23, p < 0.01, \text{partial } \eta^2 = 0.23$). These findings demonstrate that CLT-based math instructions can effectively improve the problem-solving skills among students with dyscalculia. These findings support the use of cognitively-optimized instructional programs in special and inclusive classrooms.

Keywords: Cognitive Load Theory, dyscalculia, instructional intervention, mathematics instruction, special education

REFLECTION OF PRIMARY SCHOOL STUDENTS IN STEAM EDUCATION PROJECTS: EXPERIENCES OF LITHUANIAN TEACHERS (Poster)

Rasa Kulevičienė, Aleksandra Batuchina, Gražina Šmitienė

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Reflection is a crucial component of STEAM education projects, as it helps primary school students make sense of the learning process, connect different project stages, and perceive learning as meaningful and relevant. Although the importance of reflection in STEAM education is widely acknowledged in international research, this aspect remains under-researched in the Lithuanian primary education context. The aim of this study is to reveal how reflection is integrated into primary school STEAM education projects in Lithuania and to identify the ways in which primary school students verbally reflect during different project stages and after project completion, as perceived by teachers. The study is based on a qualitative research approach. Data were collected through in-depth, non-directive interviews with ten primary school teachers who have experience in implementing STEAM education projects. The collected data were analyzed using thematic analysis. The findings show that teachers systematically organize verbal reflection at the end of STEAM education projects, while reflection during individual project stages is more fragmented and often constrained by limited lesson time, curriculum requirements, and practical circumstances. Teachers primarily encourage students to reflect on their experiences, successes and failures, collaboration, and the applicability of acquired knowledge to real-life contexts. According to teachers, purposefully structured reflection supports students' responsibility for learning, deeper understanding of the project process, improved memory of learning experiences, and the development of collaboration and self-awareness skills. The study highlights the central role of the teacher as a facilitator of reflection and emphasizes the need to integrate consistent reflection throughout all stages of STEAM education projects in primary education.

Keywords: Reflection, primary school students, STEAM education projects

EDUCATIONAL EQUITY IN PRACTICE: POST-9TH GRADE TRANSITION OF UKRAINIAN REFUGEE STUDENTS IN LATVIA

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The full-scale invasion of Ukraine has resulted in a significant influx of Ukrainian refugee students into the Latvian education system. While formal access to compulsory education has been ensured, less scholarly attention has been paid to the critical transition period following the completion of basic education (Grade 9), when students must choose between general secondary education or vocational pathways. This decision-making stage plays a crucial role in shaping long-term educational trajectories, social integration, and equal educational opportunities.

The study examines how institutional conditions influence the educational choices of Ukrainian refugee families during the transition from basic to upper secondary education. Drawing on institutional approaches to educational inequality and Bourdieu's theory of cultural and social capital, the research explores how structural factors, language policy, institutional communication, and access to information shape students' agency and their ability to pursue preferred educational pathways on equal terms with local peers.

The research employs a qualitative design based on semi-structured interviews with Ukrainian refugee adolescents and their parents or caregivers. These data are complemented by a secondary analysis of Latvian education policies and statistical information on school transitions. This analytical perspective enables the identification of barriers related to language proficiency, institutional guidance practices, and social integration processes that may affect equitable access to education. Preliminary findings suggest that although legal access to education is formally guaranteed, informational asymmetries and institutional practices may contribute to disproportionate transitions into vocational education, irrespective of students' prior academic performance or aspirations. The study contributes to debates on inclusive and equitable education by demonstrating how formal equality does not always translate into equity in practice within heterogeneous educational environments.

Keywords: Ukrainian refugee students, Latvian education system, transition to secondary education, vocational and general education pathways, educational inequality, language policy in education, Bourdieu's theory of cultural and social capital

COLLABORATION OF PRESCHOOL CHILDREN WITH DEVELOPMENTAL DELAYS IN STEAM ACTIVITIES: TEACHERS' EXPERIENCES (Poster)

Rasa Kulevičienė, Irma Spiriajeviene, Kamilė Kesylė, Giedrė Tumosienė

Klaipėdos valstybinė kolegija/ Higher education institution

In order to promote the inclusion of preschool children with developmental delays in STEAM activities, their peer collaboration is of crucial importance. The aim of this study was to reveal the opportunities and challenges related to the engagement of preschool children with developmental delays in STEAM activities that require collaboration. The study is based on a qualitative research methodology. A focus group interview was conducted with 11 preschool teachers, 2 non-formal education teachers responsible for STEAM activities in kindergarten, and 3 special education teachers.

The findings revealed that collaboration among preschool children with developmental delays in STEAM activities is most effectively fostered through creative, practical, and sensory-based tasks that naturally engage children in working together toward a shared STEAM goal. Clear, simple, and concrete tasks, as well as the distribution of roles and responsibilities aligned with children's strengths, are particularly important. Adult mediation, when needed, also plays a significant role. Children's curiosity and their desire to be close to peers encourage engagement in collaborative STEAM activities, while the opportunity to work with a chosen or trusted friend enhances collaboration outcomes.

Challenges to collaboration in STEAM activities arise when tasks involve a fast pace, competition, or time constraints. In such situations, preschool children with developmental delays may become distracted, experience stressor frustration, or display emotional outbursts. Difficulties in following rules, maintaining attention, sharing materials, and waiting for their turn often lead to conflicts and require teacher intervention and support. Language and communication difficulties also represent a significant barrier, limiting children's ability to initiate and maintain interaction, understand instructions, and express their ideas.

The findings are relevant for the development of inclusive, collaboration-based STEAM practices in early childhood education settings and may contribute to improving pedagogical strategies aimed at strengthening the engagement and social interaction of preschool children with developmental delays.

Keywords: Preschool Children with Developmental Delays, STEAM Activities, Teachers' Experiences

CHARACTER EDUCATION FOR THE GIFTED: PRIORITIES ACROSS EDUCATIONAL STAGES AND CULTURAL CONTEXTS

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Gifted education has traditionally prioritised cognitive development, while character education has addressed socioemotional and moral formation. Yet, the intersection of these areas is increasingly recognised as essential for nurturing gifted learners capable of both intellectual excellence and ethical responsibility. Building on this growing recognition, this review examines how existing research conceptualises priorities in character education for the gifted across varying educational stages and cultural contexts. Following the PRISMA framework, this study systematically reviewed journal articles published between 2004 and 2025 across three databases (Web of Science, Scopus, and Sage Journals). Sixty articles met the inclusion criteria, comprising 36 empirical and 24 theoretical/conceptual studies. They were analysed according to study type and research design, educational stage, and cultural context, using a combined coding system. The synthesis was organised around three key categories: group characteristics (character strengths), encountered challenges, and proposed solutions and priorities. The synthesis revealed that empirical studies, whether qualitative, mixed-methods or quantitative, consistently foregrounded performance and intellectual virtues, whereas theoretical/conceptual studies distributed attention more evenly and gave comparatively greater weight to moral and integrative virtues. Gifted learners were found to face recurring challenges, including social and emotional difficulties, perfectionism, curriculum mismatch, and inadequate support systems. Proposed solutions clustered around differentiated instruction, social-emotional learning, mindfulness and well-being practices, external and internal support and the training of supporters. Priorities varied across educational stages and cultural contexts, yet a consistent need emerged for holistic frameworks that integrate cognitive, affective, and behavioural aspects. The review underscores the need for integrative, developmentally sensitive, and culturally responsive models of character education for the gifted.

Keywords: character education, character strengths; cultural context, educational stage, gifted and talented education, systematic review

BEYOND ACCESS: STRUCTURAL INEQUALITY AND THE LIMITS OF INCLUSIVE EDUCATION IN SOUTHERN AFRICAN SECONDARY SCHOOLS (Poster)

Fortunate Mugwaze

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Inclusive education is widely promoted as a universal solution to education inequality, however its implementation remains confined to policy rhetoric rather than structural transformation. While national frameworks in Southern endorise equal education opportunity, disparities in resource allocation, infrastructure, teacher distribution, and institutional capacity continue to reproduce exclusion, predominantly in rural and marginalised communities. This paper examined the limits of inclusive education in South African, Zimbabwean and Mozambiquean secondary schools, arguing that access alone cannot dismantle entrenched systems of inequality shaped by historical, socio-economic, and institutional forces.

Drawing on social justice and structural inequality perspectives, the study adopted a qualitative comparative case study approach grounded in critical policy analysis and a systemic literature review. research. The analysis revealed that while these countries differ in terms of investment in education, inclusive education policies operate within uneven settings marked by overcrowded classrooms, inadequate learning support services, limited teacher preparation for inclusive pedagogies, and insufficient psychological and health support systems. Under such conditions, inclusion risks becoming symbolic compliance rather than substantive transformation.

The study underscores that inclusive education requires legislative reform and systemic transformation that addresses historical inequalities, strengthens teacher preparation in inclusive pedagogies, and ensures integrated institutional support systems. Bridging the gap between policy and practice necessitates sustained political commitment, equitable financing, and context specific interventions. By foregrounding the structural dimensions of inequality, the study contributes to interdisciplinary debates on building fair, inclusive, and sustainable secondary education systems in the Global South.

Keywords: Inclusive education; Structural inequality; Social justice; Secondary education; Education access, Southern Africa

PRESCHOOL TEACHERS' PERCEPTION OF ENHANCING CHILDREN'S EMPATHY THROUGH ARTISTIC SELF-EXPRESSION

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Rooted in aesthetic philosophy, empathy can be enhanced through artistic self-expression so that children in preschool understand the boundaries between themselves and others, notice their needs, respect, support and help if necessary. The aim of the study is to explore the opinions of Latvian preschool teachers on enhancing children's empathy and the use of artistic self-expression in doing so. The study addresses three research questions:

- RQ1: What is the perception of preschool teachers regarding empathy and its expression in children's behavior?
- RQ2: What forms of artistic self-expression enhance children's empathy more?
- RQ3: How often do preschool teachers use forms of artistic self-expression to enhance children's empathy?

To answer the research questions, a questionnaire was created and distributed online via QuestionPro platform to 115 (n = 115) preschool teachers from different regions of Latvia. Findings show that preschool teachers perceive empathy as a significant skill that can be taught to and learned by a child. At the same time, preschool teachers point out that children quite often unnecessarily disrupt and even physically hurt each other. Moreover, most preschool teachers consider themselves empathic people who enhance children's empathy at a high level. While respondents state that children's empathy is enhanced through all forms of artistic self-expression, theatrical art practices, such as role-play and puppetry, score highest of the five art forms studied. Finally, preschool teachers use artistic self-expression forms several times a week to enhance children's empathy. These findings suggest that preschool teachers in Latvia understand and use artistic forms of self-expression to enhance empathy of preschool children.

Keywords: Arts, artistic self-expression, empathy, preschool children, preschool teachers

CLASSROOM MANAGEMENT PRACTICES OF NOVICE TEACHERS AND STUDENT BEHAVIOR: A SYSTEMATIC LITERATURE REVIEW (Poster)

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The initial years of teaching represent a critical stage in professional development, where classroom management skills directly influence both student behaviour and teacher retention. This study aims to investigate the relationship between the classroom management practices of novice teachers and student behaviour while identifying the factors influencing this interaction. The theoretical framework is based on U. Bronfenbrenner's bioecological model, analysing factors across the microsystem (direct classroom interaction), mesosystem (the link between theory and practice), and chronosystem (the transition from novice to expert).

The research design follows a systematic literature review methodology conducted in the Scopus database, adhering to PRISMA 2020 guidelines. The search focused on scientific publications in English from 2015 to 2025. By combining keywords such as novice teachers, classroom management, and student behaviour, 43 publications were initially identified, with 21 articles eventually included in the final synthesis after eligibility screening and full-text analysis.

Preliminary results highlight a significant gap between university-taught theory and practical application, which serves as a primary cause of stress and anxiety among new teachers. Novices predominantly rely on reactive, teacher-centered strategies (directives, commands) providing only short-term effects, while proactive, student-centered approaches (routines, support) are utilized less frequently. Significant cognitive differences in visual monitoring were also identified: while novice teachers exhibit fragmented attention focused on discipline, experts integrate management into the instructional process and maintain a consistent distribution of attention. Innovative mechanisms such as virtual reality simulations and behaviour-specific praise (BSP) were found to correlate with increased on-task behaviour. It should be noted that this systematic analysis is currently still in progress, as further keyword combinations and data synthesis are being finalized. These findings underscore the need for improved mentoring systems and practical interventions during teacher preparation.

Keywords: novice teachers, classroom management, student behavior, systematic literature review, professional development

EQUAL OPPORTUNITIES FOR ADULTS TO LEARN ENGLISH IN LITHUANIA (Poster)

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Investigation of the situation and reasons of English language use among adult Lithuanians is important because this knowledge would help researchers to be more aware of learning needs of adult learners. Moreover, respect of the diversity of adult learners might help educators to understand adult learners better and prepare more suitable teaching methods (Mačianskienė & Bijeikienė, 2018; Naumčiuk, 2023; Sanchez, 2023; etc.). Therefore, an investigation of document analysis was taken into account in order to share reasons of Lithuania's adults choosing English as a foreign language to learn. This analysis showed that English was the most popular choice for adults because of numerous reasons, like better job and study opportunities in Lithuania and abroad, for traveling and communicating purposes, prestige, wish to learn something new and popular, etc. On the other hand, this study revealed that there is not a lot of information and research on the situation about specifically English language learning among adults in Lithuania. Indeed, this knowledge would let educators to use more suitable methods in adult foreign language learning which is important, having in mind, that adults are becoming the majority not only in Lithuania and in other Baltic countries but, as well, in Europe (Eurostat, 2025). Hence, increased importance and attention from researchers to adults in learning foreign languages (e.g., English) and reasons they learn would not only develop learning methods and increase results in foreign language knowledge, but also promote equal opportunities for adults to learn English even later in life.

Keywords: adult foreign language learners, equality, Lithuania, English language, English language usage

MECHANISMS FOR REDUCING ACHIEVEMENT GAPS AMONG STUDENTS WITH DIFFERENT HOME AND SCHOOL LANGUAGE USE: TIMSS 2023

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Data collection for the IEA's Trends in International Mathematics and Science Study (IEA TIMSS 2023) took place at a time when the transition to instruction exclusively in the state language had already begun in Latvian schools. The results showed that, compared to previous cycles, student achievement levels declined significantly specifically in minority schools. International experience indicates that the transition to a single language of instruction within education systems substantially increases the proportion of students whose home language does not coincide with the language of instruction, thereby creating a risk of deepening educational inequality.

The aim of this study is to identify the key factors that influence achievement in mathematics and science among students with different patterns of home language use, and to examine how these factors operate across different national contexts. The analysis uses TIMSS 2023 data and the Oaxaca–Blinder decomposition method with the IEA-recommended Jackknife Repeated Replication (JK2) approach.

The results show that in countries where student achievement does not differ substantially by home language use, achievement gaps are mainly driven by structural factors – socioeconomic status, parental education, and digital skills – while differences in the “returns” to pedagogical factors are not statistically significant. In contrast, in countries where achievement gaps are pronounced, the returns component plays a significant role: school belonging, STEM self-efficacy, digital skills, and the integration of environmental topics into the teaching process have a substantially stronger positive impact on achievement for students who do not speak the language of instruction at home. The conclusions emphasize that reducing structural inequalities alone is not sufficient. To narrow achievement gaps, especially in countries with pronounced language barriers, targeted pedagogical interventions are required that strengthen students' sense of belonging, motivation, and self-efficacy, while simultaneously ensuring equal access to learning resources in a multilingual educational environment.

Keywords: language of instruction, home language use, student achievement, mathematics and science, educational inequality, language-minority students, TIMSS 2023

TRANSFORMATIVE EQUALITY IN INCLUSIVE EDUCATION: A DEAF EMIC PERSPECTIVE ON MAINSTREAM SCHOOLING IN LITHUANIA

Kęstutis Vaišnora

Vytautas Magnus University, Education Academy, Institute of Educational Research

In Lithuania, inclusive education is legally embedded in the Law on Education and its 2020 amendments, which guarantee children with disabilities the right to attend mainstream schools on an equal basis and ensure access to necessary support and non-discrimination. The law also provides Deaf pupils with a formal opportunity to learn Lithuanian Sign Language.

At the international level, inclusive education is closely linked to human rights, equality, and social justice. The United Nations Convention on the Rights of Persons with Disabilities (CRPD) and the World Federation of the Deaf (WFD) emphasise the right of Deaf people, as a linguistic and cultural minority, to full and meaningful participation in education.

This paper presents the results of qualitative research exploring how adult Deaf individuals retrospectively interpret and make sense of their experiences in mainstream schooling in Lithuania. The study seeks to illuminate the complex reality of deaf education, where linguistic and cultural dimensions intersect within the framework of inclusive education.

The literature review draws on transformative equality theory, arguing that inclusive education requires not only formal access but structural transformation of linguistic norms, cultural recognition, and participatory frameworks within mainstream schooling. Particular attention is given to the linguistic and cultural dimensions of Deaf identity within this equality paradigm.

The research is based on semi-structured interviews with adult Deaf participants and employs interpretative phenomenological analysis (IPA). The findings reveal that mainstream schooling was frequently experienced as isolating and implicitly segregating, while Lithuanian Sign Language emerged as a crucial condition for recognition, belonging, and participation.

The study suggests that inclusive education for Deaf learners requires transformative structural change grounded in principles of equality to ensure linguistic rights and cultural recognition.

Keywords: inclusive education for the Deaf, Transformative Equality, Equity, Rights of the Deaf, Oralism, Audism.

EMOTIONAL WELL-BEING OF PRIMARY SCHOOL PUPILS WITH SPECIAL EDUCATIONAL NEEDS: THE CONTEXT OF TEACHERS (Poster)

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KVK lecturer

There are approximately 50,000 school-age children with special educational needs (SEN) in Lithuania, of whom approximately 90% study alongside their peers in mainstream classes. Since SEN pupils experience learning and social interaction difficulties more often than their peers, everyday school experiences can have a negative impact on their emotional well-being. Therefore, teaching emotion recognition and management skills should be an integral part of primary school teachers' work with SEN pupils. The aim of this research is to investigate how teachers assess the emotional well-being of SEN pupils in primary school and what factors they believe determine it at school. To achieve this goal, a written survey of primary school teachers was conducted. The results of the research show that respondents assess the emotional well-being of primary school SEN pupils as satisfactory. When assessing the most common emotional difficulties experienced by primary school pupils with SEN at school, they highlighted feelings of loneliness and unhappiness, tearfulness, anxiety, shyness, fearfulness, and outbursts of anger. When assessing behavioral difficulties, they mentioned loss of self-control, fighting, and hurting others in various ways. Respondents also indicated that some primary school pupils with SEN feel unpopular at school. It was found that the emotional well-being of pupils at school is negatively affected by overly complex or uninteresting tasks, insufficient individualisation of education and difficulties in social interaction. Meanwhile, frequent encouragement from teachers, support from classmates, and timely assistance are considered essential factors in promoting the motivation and engagement of SEN pupils in primary school in the learning process. The results emphasize the importance of an inclusive educational environment that ensures emotional security in order to strengthen the emotional well-being of SEN pupils.

Keywords: primary school SEN pupils, emotional well-being at school, teacher assessment.

PART-TIME STUDIES AS A SOLUTION FOR EQUAL EDUCATIONAL ACCESS IN LATVIA (1991–2004): A HISTORICAL PERSPECTIVE IN THE CONTEXT OF DISTANCE EDUCATION POLICY

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This study analyses the role of part-time studies in ensuring educational accessibility in Latvia after the restoration of independence, interpreting this form of education as an early approach to expanding equal educational opportunities during a period of profound social and institutional transformation. The study forms part of a broader doctoral research examining quality criteria for the blended learning approach in distance basic education in Latvia, focusing on the balance between educational accessibility and educational quality within contemporary education policy.

The theoretical framework draws on concepts of educational accessibility, inclusive education and lifelong learning, viewing non-traditional study forms organised outside full-time face-to-face schooling as mechanisms for engaging diverse learner groups in education. The aim of the study is to examine how part-time studies functioned as an instrument of educational accessibility in Latvia between 1991 and 2004 and how this form of education was interpreted within public and regulatory discourse.

The research is designed as a qualitative historical source analysis based on a systematically compiled corpus of press publications from the digital archive periodika.lv, complemented by an analysis of education-related legislative and policy documents. Sources were structured into thematic categories to examine institutional practices, public attitudes, and policy initiatives related to parttime education.

The findings indicate that part-time studies expanded access to education for working learners, individuals living in remote regions, students with special educational needs, and other social groups for whom full-time education was less accessible. Historical sources reveal a persistent tension between expanding educational access and concerns related to quality and academic prestige. The analysis demonstrates that contemporary debates on restricting distance education reflect a historically recurring educational policy dilemma between equality and quality rather than a fundamentally new educational challenge. The study contributes to a deeper understanding of how access-oriented educational reforms interact with quality discourses in post-socialist contexts.

Keywords: part-time studies, educational accessibility, inclusive education, distance education policy, historical analysis of education, post-socialist education systems

THE ROLE OF ADMINISTRATIVE STAFF IN SUPPORTING THE INCLUSION OF REFUGEE AND ASYLUM-SEEKING STUDENTS IN HIGHER EDUCATION

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This study examines the role of administrative staff in higher education institutions in supporting the inclusion of asylum seekers and refugees. A review of theoretical literature identifies administrative personnel as the primary point of contact for this student group. They are responsible for document preparation, procedural guidance, and the provision of practical support. In addition, they frequently act as intermediaries between students and academic staff and help adapt institutional regulations to students' specific circumstances. However, their capacity to provide effective support is often constrained by limited resources, insufficient institutional policies, and a lack of targeted training. The literature underscores that staff competence - particularly knowledge of refugee rights and the specific educational and psychosocial needs of asylum seekers - is critical, yet frequently underdeveloped.

The empirical component of the study draws on the "justice" framework developed by political philosopher Nancy Fraser (2003, 2005, 2007), which conceptualizes justice across three interrelated dimensions: redistribution (economic), recognition (cultural), and representation (political). Guided by this framework, a focus group discussion was conducted in November 2025 with ten administrative staff members from higher education institutions in Latvia.

The findings indicate the absence of comprehensive diversity, equity, and inclusion (DEI) policies and coherent institutional frameworks specifically addressing the needs of asylum seekers and refugees. In practice, administrative staff assume a central and multifaceted role in institutional responses, combining policy implementation, emotional support, intercultural mediation, and organizational coordination. They address a wide range of academic, legal, and social challenges faced by refugee and migrant students. Participants also emphasized the need for systematic professional development. The paper is developed within the ERASMUS Plus 2024-1-BE01-KA220HED-000256136 project "Building Higher Education Quality InclUsion PaThwaYs – HEQUITY".

Keywords: Refugeestudents, asylum-seekingstudents, inclusion, administrativestaff, highereducation, strategies.

The paper is developed within the ERASMUS Plus 2024-1-BE01-KA220HED-000256136 project "Building Higher Education Quality InclUsion PaThwaYs – HEQUITY".

PREVENTING EARLY SCHOOL LEAVING: LESSONS FROM “PUMPURS” (Poster)

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Rīga Agenskalns State Gymnasium

This paper examines the scientific literature on early school leaving, with particular attention to its underlying causes and principal risk factors. The literature review highlights that early school leaving is shaped by a complex interplay of individual, familial, socio-economic, and institutional factors. Special attention is placed on low learning motivation, poor academic achievement, insufficient family support, social exclusion, and the limited capacity of schools to provide timely and adequate support. The analysis underscores that the reduction of early school leaving requires a comprehensive and preventive approach based on the early identification of risk factors and the provision of targeted, coordinated interventions.

Using document analysis as the principal research method, the study further explores the European Social Fund project No. 8.3.4.0/16/I/001, “Support for Reducing Early School Leaving” (“PuMPuRS”), implemented since March 2017. The project provided support to children and young people at risk of prematurely discontinuing their education and leaving school, with a focus on individualized assistance, preventive measures, and interinstitutional cooperation. The paper analyses the project’s objectives, support mechanisms, and a broader contribution to educational inclusion and accessibility.

In addition, the article considers the implications of the “PuMPuRS” project for the project “School–Community,” assessing how the experience, insights, and support principles developed within the former initiative may be transferred, adapted, and further developed in a new context. Emphasis is placed on the role of community involvement in building a sustainable support system aimed at reducing the risk of early school leaving.

Keywords: Early school leaving; risk factors; educational support; PuMPuRS; School–Community

IS GIFTEDNESS A PRIVILEGE OR A SPECIAL NEED? RETHINKING EQUAL EDUCATIONAL OPPORTUNITIES (Poster)

Marika Melne

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The question of whether giftedness should be understood as a privilege or as a special educational need reflects a broader conceptual and policy tension within contemporary education systems. This study explores how the evolving understanding of giftedness reshapes the discourse on equal educational opportunities from preschool to secondary education.

The theoretical framework builds on the historical and conceptual evolution of giftedness research, tracing the shift from a predominantly psychometric and ability-based construct toward a multidimensional, contextually embedded, and development-oriented conception of potential. Contemporary perspectives emphasize the interaction between individual abilities and environmental factors, the integration of socio-emotional dimensions, and the growing importance of structured intervention and promotion programs.

The research design is based on a qualitative integrative review and conceptual analysis. The study synthesizes findings from bibliometric trend analyses, policy documents, and recent empirical and theoretical publications in the field of gifted education. Particular attention is devoted to definitional models (ability-based, achievement-based, and hybrid approaches), identification procedures (including multi-criteria assessment and universal screening), and service delivery models such as differentiation, acceleration, and enrichment programs.

Analysis indicates a paradigmatic shift: giftedness is increasingly framed not only as exceptional performance but as a developable potential requiring systematic educational support. Simultaneously, issues of equity and underrepresentation challenge the assumption that gifted education inherently reinforces privilege. The findings suggest that equal educational opportunities require recognizing giftedness as a domain of specific educational needs, demanding inclusive identification practices, context-sensitive support structures, and policy coherence.

The paper contributes to ongoing discussions on how education systems can reconcile excellence and equity within an inclusive and sustainable framework.

Keywords: Giftedness; Gifted Education; Educational Equity; Special educational needs; Excellence and equity; Conceptual evolution of giftedness.

THE DEVELOPMENT OF FINANCIAL LITERACY IN LIFELONG LEARNING CONTEXTS (Poster)

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As the financial environment becomes increasingly complex and digitalized, financial knowledge has become essential for all citizens. The wide range of financial services and their easy accessibility increase the risk of making ill – considered decisions. Individuals may take on excessive credit obligations or become victims of financial fraud. According to the OECD/ INFE 2023 International Survey of Adult Financial Literacy, Latvia's overall score is 59 out of 100. This is lower than the OECD average of 63 points. The results indicate a need for targeted measures to strengthen financial competence in the population.

Financial education is viewed as financial lifelong learning. It is understood as a continuous process that supports the maintenance and development of financial competence across different life stages and changing socio – economic conditions. The study examines how financial competence develops over time and how it can be integrated into education throughout the life course.

A hierarchical approach is proposed. It begins with financial literacy as a foundation of knowledge. The next level is financial capability, defined as the application of this knowledge in everyday financial decisions. The highest level is financial competence, understood as a stable capacity for responsible action based on critical evaluation, self – efficacy, motivation, and long-term planning.

The structure of these levels is linked to Bloom's taxonomy. This framework helps explain the gradual development of competencies in financial decision-making. The study contributes to discussions on financial education policy and lifelong learning strategies aimed at improving financial resilience and well-being and promoting the long-term development of financial competence in the population.

Keywords: Financial literacy, financial proficiency, financial competence, lifelong financial education, financial education.

1.4. sekcija. **IZGLĪTĪBAS KVALITĀTE UN
SKOLOTĀJU PROFESIJAS NĀKOTNES
PERSPEKTĪVAS /**

**THE QUALITY OF EDUCATION
AND FUTURE PERSPECTIVES
FOR THE TEACHING**

TRANSFORMATION OF SOCIETY AND ITS EVALUATION

Juris Dzelme

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Technologies are changing the structure and goals of society, including the real content of the 12 virtues that the education system is expected to cultivate. The implementation of the four main quality criteria (fitness for purpose, customer satisfaction, excellence, standards) must be reconsidered. The cultivation of virtues and of attitudes – the most important part of education – must become the component of the educational process that is most essential for the survival of society. Using surveys, interviews and research on artificial intelligence (AI), information has been obtained on the use of AI in pedagogy and on future scenarios. These scenarios can be divided into two directions: friendly coexistence of communities of AI, robots and humans; the merging of AI and humans, based on broadband information exchange between the brain and AI (cyborgs). In order to prevent the destruction of humankind, ways must be found to move towards desirable scenarios.

The teaching/learning process must be transformed by focusing on cooperation between AI and humans and using the similarity between the thinking processes taking place in AI and in the psyche. Prohibitions should be abandoned, integrating the acquisition of skills for collaborating with AI into the implementation of education.

A comparison of the criteria used for problem solving in pedagogy and robotics reveals parallels between human thinking and the Chain of Thought methods used by AI. The four main criteria underlying the functioning of the human emotional system (change, power, sign, use) are analogous to the four evaluation categories used by AI (suggestion, opinion, tension, agreement) and are linked to the 12 virtues.

The future of the teaching profession is determined by the development of cooperation with AI. We must prepare for life in a world without work, in cooperation with AI and robots, with society regaining the lost nature.

Keywords: artificial intelligence, attitudes, cyborgs, education, quality, robots, virtues

INTEGRATING THE PERMA MODEL TO ENHANCE TEACHER AND STUDENT WELL-BEING IN 21ST-CENTURY CLASSROOMS

Liene Vītola

LU Mācītspēks studente

The demands of 21st-century education place significant emotional, cognitive, and social challenges on both teachers and students. Educators are expected not only to deliver academic content but also to foster engagement, creativity, and resilience in increasingly diverse and technologydriven classrooms. This paper examines the integration of the PERMA model – Positive Emotion, Engagement, Relationships, Meaning, and Accomplishment – as a framework to enhance wellbeing for both teachers and pupils. Through coaching interventions, educators are guided to cultivate personal flourishing while creating supportive and resilient learning environments. The study explores strategies for implementing PERMA-based practices, including personalized coaching, reflective exercises, and classroom interventions that reinforce positive emotions, meaningful engagement, and constructive relationships. Findings suggest that teachers applying PERMAinformed coaching experience reduced stress, greater professional satisfaction, and enhanced capacity to support student well-being. Students in these classrooms demonstrate higher engagement, improved social-emotional skills, and a stronger sense of accomplishment. By presenting practical approaches for integrating positive psychology into educational practice, this paper provides a roadmap for promoting holistic well-being in schools. Integrating the PERMA model offers a promising path to transform classrooms into thriving environments where teachers and learners flourish, effectively addressing the complex challenges of modern education with resilience and purpose.

Keywords: PERMAmodel; Teacherwell-being; Studentwell-being; Positivepsychology; Coaching; 21st-century education; Classroom resilience

MULTICULTURAL EDUCATION AS A TOOL TO PROMOTE FOREIGN STUDENTS' INTEGRATION IN THE CONTEXT OF MONTESSORI PEDAGOGY

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Riga Technical university

Multiculturalism is one of the most characteristic features of the present education. Latvia could also be mentioned among the countries realizing multicultural education. International students are an everyday phenomenon also at Riga Technical University (RTU). Therefore, integration of the foreign students in the study environment of RTU, providing an opportunity to acquire the basics of the Latvian language and helping them to get acquainted with the culture and traditions of Latvia are of utmost importance. The research mainly focuses on RTU multicultural education system analysing its advantages and drawbacks. The research also introduces with some theories of M. Montessori who focused her pedagogy on the diversity in education, including the young adult age. The main aim of this research is to identify whether multicultural education could be used as a tool to promote foreign students' integration. 137 students of RTU participated in this research. They were students from 20 different countries. Content analysis was chosen as a research method to reveal students' ideas and collect their opinions on the topic. The results of the research suggest that the principles of Montessori education are applicable at the tertiary level education and should be still explored for their potential not only in multicultural education but also in inspiring innovation in higher education.

Keywords: Culture, integration, Montessori pedagogy, multicultural education, multiculturalism

METHODOLOGICAL MATERIAL FOR PRACTICAL FINANCIAL LITERACY LEARNING FOR 8TH GRADE SOCIAL STUDIES TEACHERS

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The aim of the research is to explore opportunities for improving the financial literacy learning process by developing a practical support material for social studies teachers who teach Grade 8. The study involved a content analysis of national educational policy documents and regulations, an examination of available methodological support tools, the development of a methodological solution, and an expert interview. As a result, existing support materials aimed at enhancing financial literacy were compiled, and a methodological resource for the practical development of financial literacy in Grade 8 was created. This material was presented to Reinis Jansons, Head of the Swedbank Financial Institute, from whom feedback on the methodological content was obtained.

Keywords: financial literacy, social studies, competency-based education, lower secondary education, teacher support, methodological materials.

THE INTEGRATION OF TEACHER WELL-BEING INTO THE PROFESSIONAL DEVELOPMENT SYSTEM

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The relevance of the research is grounded in the circumstances in which, although teachers' professional development is regulated normatively, such regulation does not guarantee the transfer of professional learning into practice for the assurance of educational quality, nor does it reduce the shortage of teachers in the profession. Moreover, research indicates that the element of well-being is absent from teachers' professional development systems.

The research aims to develop an evidence-based framework for integrating teacher well-being into the professional development system. Research question: How should the implementation of teachers' professional development be managed to integrate teacher well-being as a determining factor?

The review study involved an analysis of theoretical literature, a survey of teachers in Latvian general secondary education institutions, and a content analysis of focus group interviews with education experts. Recommendations for the integration of teacher well-being into the professional development system were synthesised into a framework that was subsequently subjected to expert evaluation. Data analysis methods included content analysis and descriptive as well as inferential statistical techniques using the software programme Jamovi.

The findings indicate that high-quality management of professional development must integrate teacher well-being. Professional development management comprises the planned design of its forms and content, the support of individual professional growth, and the assurance of quality. The research contributes to discussions on teacher professionalism and innovation by proposing a professional development management framework that integrates well-being as a strategic resource. This approach supports the sustainable development of the teaching profession and enhances the quality of education.

Keywords: teacher well-being; professional learning; management of professional development quality; professional development system

This study is conducted within the framework of a research project "Elaboration of evidence-based solutions for effective professional competence development of adults and assessment of the transfer of its results into practice in Latvia" (project No. VPP-IZM-Izglītība-2023/4-0001 funded by the Ministry of Education and Science of the Republic of Latvia).

ASSOCIATIONS BETWEEN LOWER SECONDARY STUDENTS' MATHEMATICS PERFORMANCE AND REMOTE LEARNING EXPERIENCES DURING THE COVID-19 PANDEMIC

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During the COVID-19 pandemic, schools in Latvia and worldwide were closed for extended periods, necessitating the rapid introduction of remote learning, which schools implemented according to their capacities and available expertise. This period posed substantial challenges for all stakeholders – schools, teachers, authors and publishers of educational materials, and, above all, students. The aim of this paper is to identify which forms of support and which resources promoted students' learning outcomes, as well as which problems were particularly significant. The data source is information on Latvian students from the OECD PISA 2022 database. The study sample consists of 5,373 students from 225 schools. The extensive questionnaire included several groups of items concerning students' experiences with remote learning.

Data analysis was conducted using two approaches. First, principal component analysis was used to construct five scales: Teachers' psychological support, Provision of learning materials by teachers, Availability of learning resources, Students' psychological problems, and Students' physical problems. Their association with students' mathematics performance was examined using a linear regression model. Second, schools with the highest and the lowest average achievement were compared. Each questionnaire item was analyzed separately to determine whether the responses of students in high and low achieving schools differed statistically significantly.

Regarding teacher practices, the greatest positive contribution was associated with providing students with learning materials and tasks, as well as opportunities to submit completed work. Teachers' psychological support and encouragement did not affect achievement. In addition to printed and digital materials, synchronous online lessons and recorded lessons were also important. The most influential problems affecting achievement were related to access to a digital device and the internet, lack of a quiet place suitable for learning, and competing responsibilities, whereas problems with motivation or lack of external help did not affect students' achievement.

Keywords: OECD PISA 2022, remote learning, students' mathematics performance, forms of support

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ARTIFICIAL INTELLIGENCE IN MUSIC EDUCATION IN PRIMARY AND SECONDARY SCHOOL: A SYSTEMATIC LITERATURE REVIEW

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Recent advancements in artificial intelligence (AI) have had a profound impact on various fields, including music education. This systematic literature review aims to explore the experiences of primary and secondary school students, as well as music teachers in utilising AI in music education, with a focus on identifying the benefits and challenges. Two research questions were defined to achieve the study aim: RQ1: What are the potential benefits of using AI in music education for students and music teachers? RQ2: What challenges do students and music teachers face when using AI in music education? The present study encompassed scientific articles, conference proceedings, and doctoral theses included in the Web of Science, Scopus, and ProQuest databases between 2020 and 2026. The systematic literature review was conducted following the PRISMA protocol and included 19 publications. The findings of the systemic analysis showed that AI enhances the efficiency of music teachers' work and functions as a virtual assistant that helps reduce the amount of daily routine work. For students, the primary benefits of using AI in music learning are to increase engagement, maintain interest, promote creativity, and improve musical skills. The key challenges for music teachers are related to insufficient preparation to integrate AI into music education, but students face inequitable access to AI tools and a lack of critical evaluation. The study concluded that music teachers and students mostly have a positive attitude towards the use of AI in music education. However, it is imperative to improve music teachers' competencies and students' ability to evaluate the results generated by AI.

Keywords: Artificial intelligence (AI), music education, music teachers, primary and secondary school students, systematic literature review

SENSE OF BELONGING IN THE PROFESSIONAL IDENTITY OF MALE TEACHERS

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The teaching profession in many European contexts, including Latvia, remains highly feminized, positioning male teachers as a numerical minority within school communities. This study explores how a sense of belonging shapes the professional identity construction of male teachers and influences their professional commitment and retention.

Drawing on qualitative data from in-depth semi-structured interviews with male teachers representing different subjects and career stages, the study applies a thematic analysis approach informed by professional identity theory (Beijaard et al., 2004), self-understanding and vulnerability (Kelchtermans, 2009), and communities of practice (Wenger, 1998). The findings indicate that belonging operates on multiple interconnected levels: (1) relational belonging with students, (2) collegial belonging within the school staff, and (3) systemic belonging within the broader educational environment.

The results reveal that male teachers often construct their professional identity through relational recognition and role negotiation. While belonging to a supportive collegial community strengthens professional self-efficacy and stability, experiences of isolation or role stereotyping can intensify professional vulnerability. For participants in mid-career stages, belonging emerged as a critical protective factor against burnout and as a mediator between systemic pressures and professional commitment. Conversely, fragmented work structures or weak institutional identification were associated with a more fluid and uncertain professional identity.

The study contributes to the discourse on gender and teacher identity by foregrounding belonging as a central yet underexplored dimension in the professional trajectories of male teachers. It argues that professional retention is not solely a structural or economic issue but is deeply embedded in relational and identity-based processes. The findings have implications for school leadership, teacher education, and policy development, suggesting that fostering inclusive professional communities may be a key strategy for supporting male teachers' long-term engagement in the profession.

Keywords: professional identity, male teachers, sense of belonging, teacher retention, qualitative study

CONCEPTUAL FRAMEWORK OF EDUCATION 4.0: A LITERATURE REVIEW

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Over recent decades, digital technologies have become integral to education, introducing a new digital dimension to teaching and learning. This process can be examined within the broader cultural paradigm shift associated with the Fourth Industrial Revolution, known as Industry 4.0. Correspondingly, the educational framework aligned with this background is referred to as Education 4.0. This literature review conducts a qualitative content analysis of 71 peer-reviewed articles from the Web of Science database, published between 2010 and 2025, focusing explicitly on Education 4.0. It summarizes definitions of Education 4.0, highlights its core principles and instructional approaches, and provides an overview of the integration of Industry 4.0 technologies into education. The findings indicate that Education 4.0 is continuously evolving; therefore, regular reviews and updates are necessary to reflect recent developments of the concept. Furthermore, although Education 4.0 was initially associated with higher education, recent studies suggest that its principles should also be applied to basic education.

Keywords: Education 4.0, Industry 4.0, educational innovation, technology-enhanced learning, conceptual framework, literature review

AN INTEGRATED DEA–FUZZY LOGIC FRAMEWORK FOR CURRICULUM PERFORMANCE EVALUATION

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This study proposes an integrated DEA–Fuzzy Logic framework for the systematic and quantitative evaluation of curriculum performance within a multi-criteria decision-making context. The framework is designed to address two fundamental challenges in curriculum assessment: the inherent subjectivity and ambiguity of expert judgments, and the need to determine the relative importance and efficiency of courses under multiple competency criteria.

The proposed model operates in two sequential stages. In the first stage, professional competency domains are identified through expert consultation. The contributions of individual courses to these domains are then evaluated using a seven-level linguistic scale. To manage uncertainty and vagueness in these qualitative assessments, triangular fuzzy numbers are employed, enabling the transformation of linguistic judgments into quantifiable performance scores. This fuzzy-based aggregation process produces a structured and comparable multi-criteria dataset.

In the second stage, the quantified outputs are incorporated into a Data Envelopment Analysis (DEA) model. Considering courses as decision-making units, DEA determines their relative efficiency and importance levels without requiring predefined weights. Through this non-parametric optimization approach, courses are ranked according to their performance scores, and the representation intensity of competency domains within the curriculum is objectively analyzed. The integrated structure of the model ensures both criterion-level sensitivity and system-level performance measurement.

The framework is applied, as a case study, to an associate degree vocational education curriculum to demonstrate its operational validity. The findings confirm that the integrated DEA–Fuzzy Logic approach provides a robust, adaptable, and decision-supportive tool for evidence-based curriculum evaluation and improvement

Keywords: Data Envelopment Analysis (DEA), Fuzzy Logic, Curriculum Performance Evaluation, Multi-Criteria Decision Making (MCDM), Vocational Education

HUMAN NEEDS IN THE AGE OF ALGORITHMS: STUDENT MOTIVATION AND AI USE IN UPPER SECONDARY EDUCATION

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The integration of artificial intelligence (AI) into education has made AI tools an increasingly common component of students' learning practices. This pilot study examines how upper secondary school students in Latvia use AI in their learning and how this use is associated with their motivational experiences in teacher-supported learning environments. A mixed-method design was implemented. First, a quantitative survey of 24 students in Grades 11–12 established baseline data on the frequency and contexts of AI tool use. Subsequently, semi-structured interviews were conducted with seven volunteer participants to attain deeper insight into their experiences. Findings show that ChatGPT is the only AI tool used by all respondents. Overall, 83.4% of students reported using AI daily or several times per week. AI is most frequently used in the exact sciences (66.7%) and mathematics (50%). Reflexive thematic analysis of the interview data identified six overarching themes: (1) AI as a functional and personalized learning tool, (2) Limitations and critical use of AI, (3) AI as a promoter of autonomy and self-regulation, (4) The unique role of the teacher in motivation and deeper understanding, (5) Ethical awareness and the limits of fair use of AI, (6) School context: control and normative uncertainty. The findings, interpreted through the lens of Self-Determination Theory, show that AI functions most effectively as a tool for autonomy and, to some extent, for competence. Still, it does not replace the need for relatedness. They also point out the importance of developing clear school-level guidelines for the ethical use of AI while preserving the human dimension of education. The results of this pilot study will inform the next phase of a larger research project, particularly the development of a new instrument to measure upper secondary students' interactions with AI in the learning process.

Keywords: artificial intelligence, upper secondary students, reflexive thematic analysis, learning motivation, Self-Determination Theory

THE PROFESSIONAL EXPERIENCE OF MATHEMATICS TEACHERS IN PROMOTING STUDENTS' TRANSVERSAL SKILLS IN BASIC AND SECONDARY SCHOOLS

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Continuous technological development, globalization, and the constantly changing economic environment promote the inclusion of transversal skills in the learning process as an essential prerequisite for a successful life and professional growth. In the Latvian context, the development of transversal skills within the content of various school subjects has been one of the main educational priorities for several years. Therefore, the aim of the study was to explore the professional experience of basic and secondary school mathematics teachers in developing transversal skills. A total of 126 mathematics teachers and 512 students participated in the study. Students' transversal skills assessed by teachers were compared with the opportunities provided for the development of these skills in both basic and secondary schools. Descriptive statistics and Spearman's rank correlations were used. Secondary school students' self-assessments of transversal skills were also compared with teacher assessments. The Mann–Whitney U test was used.

In basic school, the assessment of students' transversal skills in many areas does not correlate with the assessment of the opportunities provided for their development. In secondary school, a correlation exists between the assessment of most transversal skills and the evaluation of the opportunities for their development. Additionally, secondary school students rate their skills higher than teachers do in almost all transversal skills; however, this difference is not always statistically significant.

The results indicate that although Latvian education policy documents emphasize the development of transversal skills at all levels of education, in practice their integration often occurs in a fragmented manner, as teachers lack a shared understanding and methodological support for effectively fostering these skills. Teachers believe they provide students with opportunities to develop transversal skills; however, these opportunities do not always translate into actual skill development.

Keywords: transversal skills, secondary school, basic school, teacher assessment, school mathematics

PROFILES OF LOW- AND HIGH-PERFORMING STUDENTS IN AN INTERNATIONAL COMPARISON: TIMSS 2023 AND PISA 2022

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Results from international assessments at different stages of compulsory education indicate that Latvia has a substantial proportion of students who are unable to perform even lowest-difficulty tasks, alongside a comparatively small share of students who achieve high levels of performance. For example, in the OECD's Programme for International Student Assessment (PISA) 2022, more than one fifth of Latvian students did not reach Level 2 in mathematics, which is considered the minimum level required for successful continuation of further education. This continues to point to the education system's inability to ensure equally high-quality education for all students. The aim of this study is to examine the profiles of low- and high-performing students using results from two international large-scale comparative education studies – the IEA's Trends in International Mathematics and Science Study (IEA TIMSS 2023) and OECD PISA 2022. In the first part, based on TIMSS 2023 data, student profiles at the lower and upper ends of the achievement distribution are analysed in depth, including motivation, home environment, parental and teacher characteristics, school context, and peer influence. In the second part, using PISA 2022 data, the focus is on students with low performance across all three core domains; these students are identified as those in the lowest quartile of achievement in mathematics, reading, and science. Methodologically, the study applies achievement distributions by percentiles to compare contextual factors between the lowest- and highest-performing groups and to identify the most significant factors associated with group membership. The analysis includes socioeconomic indicators, school context, teacher profiles, as well as teachers' classroom practices (e.g., supportive classroom climate, quality of explanations, task differentiation, feedback, and instructional pace), drawing on student questionnaire data and school leadership surveys. By combining the results of both studies, the analysis identifies directions for targeted support measures aimed at improving education policy and practice.

Keywords: TIMSS 2023; PISA 2022; low achievement; student profiles; teaching practices

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IMMERSIVE TECHNOLOGIES AS PEDAGOGICAL INNOVATION IN CULINARY EDUCATION: A SYSTEMATIC LITERATURE REVIEW

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The rapid development of immersive technologies – Virtual Reality (VR), Augmented Reality (AR), and Mixed Reality (MR), collectively known as Extended Reality (XR) – is enabling their increasing use across fields such as culinary education. While XR integration in chef training is still largely experimental, it holds significant potential to transform teaching and learning practices.

This study presents a systematic literature review conducted according to PRISMA 2020 guidelines. Using SCOPUS and its AI analytical tools, 136 articles were screened, with 18 selected for in-depth analysis. The studies examined the effectiveness of immersive technologies in culinary education, learners' perceptions, XR content design aligned with industry trends, and opportunities for enhancing functionality and pedagogy.

Findings highlight key advantages of XR over traditional teaching methods, including reinforcing technical cooking skills, capturing and sustaining student attention, boosting motivation, supporting inclusive education, enhancing communication and collaboration, clarifying complex tasks, and facilitating mastery of international standards. These benefits align with established educational theories, such as Kolb's Experiential Learning and Sweller's Cognitive Load Theory.

The review also emphasizes that XR's impact depends not only on technology but on educators' competence in integrating it. Professional development is critical, covering XR software and infrastructure use, lesson adaptation, and fostering collaborative classroom environments, all while maintaining a clear focus on learning objectives.

Overall, XR shows transformative potential in culinary education, offering innovative learning experiences when combined with theory-informed design and skilled pedagogical implementation.

Keywords: Immersive Technologies, Virtual Reality (VR), Augmented Reality (AR), Mixed Reality (MR), Extended Reality (XR), Pedagogical Digital Competence, Culinary Education, Culinary Training

THE IMPACT OF DIGITAL FEEDBACK INNOVATIONS ON STUDENT ACADEMIC PERFORMANCE: A PILOT STUDY IN A LATVIAN SCHOOL

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Ensuring the quality of education in a changing world requires leveraging technology to provide effective feedback. In Latvia school management systems like Eklase now provide a new dimension of feedback for students: alongside traditional summative grades they can get an immediate relative performance ranking. While the grade indicates absolute progress, the rank shows the students' relative position. The goal for this study is to evaluate the effect of this immediate rank on students' academic achievement, using big-data analysis and a quasi-experimental design. The theoretical framework ties together four theories: Leon Festinger's Social comparison theory (1954), the warnings of the Feedback intervention theory (Kluger & DeNisi, 1996) regarding ego level feedback, the performance aspect within Goal orientation theory (Elliot, McGregor, 2001) and recent findings of the Ordinal rank effect (Murphy, Weinhardt, 2020). The study asks whether access to immediate ranking leads to an increase in grades for the experimental group. A pilot study was conducted in one Latvian school, gathering data for 160 students in grades 4–12 over a five-month period in 2025/26. Results demonstrate a statistically significant positive correlation between access to ranking and higher grades. Students with access displayed an average summative grade of 8.01 compared to 7.64 for the control group, a difference of 0.37 points. The Mann-Whitney U test confirmed this difference was statistically significant for both summative ($p = 0.012$) and formative ($p = 0.003$) assessments. The overall average achievement difference was 0.45 points ($p = 0.008$).

These preliminary findings suggest that immediate relative performance feedback may serve as a powerful motivator in this specific educational context. For the teaching profession this highlights how data driven management can refine pedagogical strategies. This research contributes to the discussion on how technological innovations can impact student outcomes.

Keywords: Relative Performance, Ranking, Academic Performance, Feedback Intervention, EdTech

TEACHERS' MEDIA LITERACY IN THE AGE OF AI: A SYSTEMATIC LITERATURE REVIEW

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Media literacy has become a widely-discussed topic in the past few decades, with additional challenges regularly arising due to continuously evolving media consumption patterns, the rapid development of new technologies such as artificial intelligence, and an increasingly unstable geopolitical background. As media literacy has regularly been identified as a key component in ensuring the survival of western-style democracy, the importance of its inclusion in formal education has been emphasized by policymakers, with teachers being essential to its implementation. This systematic literature review looks at articles about teacher media literacy that have been published on the “Scopus” and “Web of Science” databases since 2023, the first full year that artificial intelligence (AI) applications such as OpenAI’s “ChatGPT” became widely available to consumers. Articles were selected using the key words “teacher” and “media literacy,” with results that did not directly relate to teacher media literacy or that did not have full text available being removed from consideration. Key aspects that were analyzed include the extent to which AI was discussed in the articles, the definitions of media literacy used, and the countries in which the research took place. The results found that despite the widely acknowledged impact that AI has had on the media landscape, most research on teacher media literacy made no mention of AI whatsoever, revealing a significant gap in the research landscape. Furthermore, understanding of what “media literacy” is or should be remains fragmented based on definitions used by researchers, and roughly two fifths of published studies took place in countries that were rated as “difficult” or “very serious” on the 2025 Reporters Without Borders Press Freedom Index, calling into question the potential reliability of such results in a western-oriented democratic context.

Keywords: Media literacy, teachers, systematic review, Press Freedom Index, artificial intelligence

THE CRISIS OF ACADEMIC PROFESSIONALISM AND THE QUALITY OF EDUCATION: PERSPECTIVES FROM AFRICAN HIGHER UNIVERSITIES

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Quality and sustainability are dependent on academic staff stability, autonomy, and professional development for higher education to serve as a key driver of human capital in knowledge economies. However, academic work intersects with political and economic factors that impact teaching quality, institutional function, and lecturers' social status. In Africa, structural adjustment, funding limits and neoliberal reforms have led to casualised academic labour and increased institutional precarity. These changes raise critical questions about the teaching profession's future and its effect on education quality. The study examines how evolving employment structures and governance affect academic professionalism and teaching quality in African universities. Drawing on Human Capital Theory and Labour Process Theory, the study employs a qualitative comparative case study of the University of Johannesburg (South Africa), the University of Zimbabwe, and the University of Ghana (Ghana). Despite diverse settings, these institutions face common challenges such as funding instability, performance management pressures, and growing reliance on contract academic staff.

The analysis reveals that while universities view academic staff as strategic human capital, institutional practices undermine professional autonomy, job security, and career development. Precarious employment disproportionately affects younger, black, and female academics, reinforcing gendered and racial hierarchies. These conditions weaken professional identity, restrict scholarly growth, affect teaching standards, reduces motivation, and threatens institutional sustainability. There is a need for decolonial reforms and a reconceptualisation of academic professionalism that emphasises stable careers, institutional support, and governance aligned with quality as opposes to market-driven metrics. This study contributes to global debates on the future of the teaching profession by highlighting the structural conditions shaping academic work in the Global South and their implications for quality higher education.

Keywords: academic professionalism; higher education; educational quality; academic labour precarity; human capital; African universities

IS THE TEACHER PREPARED FOR MULTICULTURAL CLASSROOM? TEACHERS'INTERCULTURAL COMPETENCE AND PEDAGOGICAL COLLABORATION

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The increasing cultural, linguistic, and social diversity of contemporary classrooms raises critical questions about teacher preparedness for civic participation in multicultural education (Arnold, Rahimi, 2024; UNESCO, 2018).

Drawing on research in multicultural education and teacher development, the study defines intercultural competence as a multidimensional construct encompassing both visible elements, such as culturally responsive instructional strategies, and less visible elements, including attitudes, beliefs, and values. In line with the iceberg model of culture (Banks & Banks, 2019; Hall, 1959), the study emphasizes that collaboration functions as the mechanism connecting these dimensions, enabling invisible attitudes to be reflected upon and transformed into inclusive actions.

The aim is to study whether teachers are prepared for multicultural teaching through the lens of their intercultural competence and responses regarding civic participation in schools.

The research question is how does teachers'intercultural competence and pedagogical collaboration influence their preparedness for multicultural education and support student civic participation in schools?

The study uses data from the IEA ICCS 2022 study in Latvia, and 7 focus group interviews selected from the IEA ICCS 2022 schools with the highest student civic participation scores. Data was collected in spring 2024.

Through a critical synthesis of the ICCS 2022 study data and focus group interviews results highlights the central role of pedagogical collaboration in strengthening teachers'intercultural capacity. The survey demonstrates that pedagogical collaboration provides essential spaces for shared problem-solving, reflection on implicit biases, and the collective development of culturally responsive practices.

The study shows that intercultural competence, when supported by collaborative pedagogical practices, fosters inclusive school environments and promotes equitable student civic participation, highlighting that individual competence alone is not enough for sustainable multicultural teaching. Moreover, effective multicultural education requires not only general awareness of diversity but also the deliberate development of specific professional competencies and structured collaboration among teachers.

Keywords: Intercultural Competence, Teachers'Pedagogical Collaboration, Civic Participation, Multicultural Education, IEA ICCS

FRAMING PHOTOGRAPHY EDUCATORS' PERSPECTIVE ON THE RESPONSIBLE USE OF AI VISUAL TOOLS

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While photography's role in representing reality has been a subject of inquiry since its early days, it now faces an unprecedented challenge, as image truth is increasingly questioned in relation to AI-mediated visual representations. The widespread use of AI-driven technologies calls for a deeper understanding of their aesthetic and ethical implications, promoting critically informed and responsible engagement with AI visual tools in educational contexts. The research questions are: (1) What are photography educators' perspectives on how generative AI visual technologies are reshaping the representation of reality? (2) How can the responsible use of AI visual tools in photography education be defined, considering the associated benefits and risks? The study employed a qualitative methodological approach based on semi-structured interviews with twelve photography education experts from Latvia, all of whom are also practicing photographers. The study applied thematic and discursive analysis to a corpus of twelve photography educator interview transcripts. The findings show that openness toward new technologies is affected by uncertainty. Some applications of AI visual tools are perceived as innovative and potentially beneficial for photography education and education field more broadly, such as efficient post-processing and idea visualization functions. However, other functions, particularly photorealistic image generation, are raising concerns when used without sufficient awareness of associated risks, including the trustworthiness, inaccessibility to technology, misrepresentation, constrained creative agency, authorship disputes, ethical considerations and others. As a result, the study compiles pedagogical insights that could help establish institutional guidelines and support systems for educators to help navigate responsible and critically conscious use of AI visual tools in media education.

Keywords: Media education, Photography education, Generative Artificial Intelligence (GenAI), Responsible AI, AI visual tools, Representation of reality, Qualitative research methodology, Thematic analysis

CILVĒKKAPITĀLA KVALITĀTE LATVIJĀ: PRASMJU LĪMENIS, NEATBILSTĪBAS UN REĢIONĀLĀS ATŠĶIRĪBAS (OECD PIAAC)

Jeļena Muhina

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Referātā analizēta cilvēkkapitāla kvalitāte Latvijā, izmantojot OECD Pieaugušo prasmju pētījuma (PIAAC) 2023. gada datus, kas nodrošina tiešus pieaugušo prasmju mērījumus lasītprasme, rēķinprasme un adaptīvajā problēmu risināšanā, kā arī detalizētu informāciju par respondentu izglītību, dalību mācībās, nodarbinātību un ienākumiem.

Referāta mērķis ir izvērtēt iedzīvotāju prasmju līmeni un to reģionālās atšķirības Latvijā, analizēt izglītības līmeņa, mācību jomas un prasmju neatbilstību, kā arī novērtēt prasmju un neatbilstību ietekmi uz darba samaksu. Analīzē izmantoti OECD PIAAC 2023. gada "Public Use File" (PUF) mikrodati, aprēķinot svērtos vidējos rādītājus un piemērojot lineārās regresijas un beznosacījuma kvantiļu (RIF) regresijas modeļus.

Rezultāti rāda, ka Latvijā rēķinprasme vidēji atbilst OECD līmenim, bet lasītprasme un adaptīvā problēmrisināšana ir zem vidējā. Apmēram trešdaļa pieaugušo uzrāda zemu sniegumu šajās jomās. Prasmes un dalība mācībās ir augstāka Rīgā un Pierīgā, bet zemāka citos reģionos, īpaši Latgalē un Vidzemē. Atdeve no prasmēm Latgalē ir vājāka, kas var liecināt par ierobežotāku kvalificētu darba vietu piedāvājumu.

Latvijā izglītības un studiju jomas neatbilstība ir augstāka nekā vidēji OECD valstīs: ap ceturto daļu nodarbināto ir ar augstāku kvalifikāciju nekā to pieprasa darbs, bet vairāk nekā 30% gadījumu mācību joma neatbilst nodarbinātības nozarei. Pārqualificētība saistīta ar aptuveni 10% algu samazinājumu, bet mācību jomas neatbilstība – ar aptuveni 8% samazinājumu. Savukārt viena standartnovirze rēķinprasme saistīta ar ap 8% augstāku stundas algu neatkarīgi no izglītības līmeņa un pieredzes. Atdeve no prasmēm ir augstāka ienākumu sadalījuma augšējos decīļos, bet neatbilstību negatīvā ietekme – izteiktāka zemākajos decīļos.

Rezultāti uzsver nepieciešamību mazināt reģionālās atšķirības un stiprināt prasmju atbilstību darba tirgus pieprasījumam.

Keywords: PIAAC, prames, cilvēkkapitāls, darba tirgus neatbilstības

Aprēķini veikti sadarbībā ar Ludmilu Fadejevu, LB

PRE-SERVICE LANGUAGE TEACHERS' PERCEPTIONS OF AI ETHICS AND DIGITAL READINESS: INSIGHTS FROM LATVIA AND PARTNER COUNTRIES

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Within the framework of the Erasmus+ KA220-HED project New-Gen Language Teachers: Empowering Language Teaching with Ethical AI-Enhanced Guidance (2025–2027), this study examines pre-service language teachers' perceptions of ethical challenges and digital readiness in integrating generative artificial intelligence (GenAI) into language education, focusing on Latvia and comparative insights from Türkiye and Spain. The analysis draws on two consecutive needs assessments conducted in 2025 and 2026: the first (N = 31) surveyed teachers' self-reported confidence and concerns regarding ethical AI use, algorithmic bias, and data privacy; the second (N = 81) employed the validated EFL Teachers' GenAI Literacy Scale (Wang et al., 2025), complemented by questions on learning priorities and knowledge needs. A focus group in Latvia then discussed the results of the cross-national comparison, exploring context-specific challenges and opportunities, including evaluating AI-generated content for cultural appropriateness, lesson planning, and pedagogical adaptation.

Findings indicate that Latvian pre-service teachers' awareness of the ethical component of AI in education has grown between 2025 and 2026, with ethical use consistently rated as highly important. Competence in designing AI-supported learning tasks remains limited, while engagement with AI tools has increased. Cross-national analysis reveals similar ethical concerns across countries, alongside variation in technical literacy, highlighting the need for pedagogical strategies that are both locally tailored and internationally informed.

The study underscores that AI integration in language teacher education should reinforce the linguistic and humanitarian focus of European and Latvian language education. Training programmes must support technological proficiency while preserving ethical, intercultural, and human-centered dimensions, providing pre-service teachers with the competence to navigate a digitally mediated yet values-driven educational environment.

Keywords: Generative AI, ethics, digital readiness, language teacher education, pre-service teachers

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NOVICE TEACHERS' PERSPECTIVE ON MENTOR SUPPORT IN STRENGTHENING PROFESSIONAL IDENTITY

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Novice teachers' early professional stage involves gaining skills, adapting to the school environment, and forming professional identity, where mentor support is essential. Data from the OECD TALIS 2025 show that the lack of support is one of the reasons why novice teachers discontinue their professional activity in educational institutions (OECD, 2025). Mentor support plays a key role in novice teachers' professional development and identity, influencing both daily teaching and the setting of professional goals. It strengthens teachers' capacity, increases job satisfaction, and improves classroom practice and student achievement (Kutsyuruba et al., 2024).

The study investigated what support novice teachers expect from a mentor to strengthen their professional identity when starting their teaching career at school.

The study was conducted based on a mixed design study, surveying novice teachers ($n = 49$) and mentors ($n = 60$) and conducting interviews with mentors ($n = 3$). The study data were analyzed using the descriptive statistical method and allowed identifying the most important aspects of the novice teacher's professional identity and determining specific needs for the necessary mentor support.

The content analysis of the interview data provided a broader perspective on strengthening the novice teacher's professional identity in the context of mentor support, highlighting an individualized approach and mentor specialization in a specific subject.

The results show that the novice teacher's professional identity is strengthened if mentor support is provided in three main groups – professional support, social integration and psychological support. By ensuring an effective mentoring process, the novice teacher moves from the beginner's level of competence to the expert level, being able to combine theoretical knowledge with practice and research in their daily work, as well as, over time, strengthening their professional identity as a teacher.

Keywords: mentor, mentoring, novice teacher

PHILOSOPHYING IN TEACHING PRACTICE: INNOVATION FOR QUALITY EDUCATION AND FUTURE COMPETENCIES

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Rapid social, technological and cultural changes in the 21st century demand that education moves beyond the transmission of knowledge towards fostering critical, reflective and responsible learners (Oakhill et al., 2015; Schulz et al., 2023). In this context, teachers become key actors in facilitating thinking, dialogue and meaning making (Lombardi et al., 2023; Jegstad et al., 2025). This study examines “philosophying” as an innovative pedagogical approach that supports educational quality and promotes the development of future competencies (García Moriyón, Rebollo, & Colom, 2005; Tomperi, 2025).

The research aims to investigate how teachers integrate philosophy into their professional practice and how this approach contributes to student engagement, critical thinking and collaborative learning. Empirical data were collected within the Erasmus+ project “Growing Reflection and Analytical Skills through Philosophizing”(GRASP), implemented in five European countries, and include classroom observations, teacher reflections and semi structured interviews with practicing teachers who apply philosophy in diverse educational contexts.

The findings indicate that philosophy strengthens teachers’ professionalism by fostering reflective practice, pedagogical creativity and learner centred instruction. Teachers reported increased student participation, deeper understanding of learning content and improved communication skills. Philosophical dialogue supported inclusive learning environments where diverse perspectives were valued, thereby contributing to democratic and socially sustainable education. Moreover, philosophy encouraged the development of key future competencies, such as critical thinking, ethical reasoning, problem solving and learner agency.

The results suggest that philosophy can serve as an effective educational innovation for enhancing teaching quality and reinforcing teachers’ professional identity in a rapidly changing world. Integrating philosophy into everyday teaching practice supports sustainable professional development and aligns with contemporary educational goals that emphasise lifelong learning and responsible citizenship, while underscoring the need for systematic teacher education that equips educators for future oriented education.

Keywords: philosophy, pedagogical method, educational quality, teacher professionalism, future competencies

TEACHER EDUCATORS' LANGUAGE LEARNING BIOGRAPHIES AS DIAGNOSTIC TOOLS FOR REFINING ENGLISH LEARNING WITHIN CONTINUING PROFESSIONAL DEVELOPMENT

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The role of teacher educators and their professionalism in ensuring the quality and sustainability of the education system is widely acknowledged. At the same time, proficiency in English has become a professional necessity for teacher educators, given internationalisation processes and their research activities. However, continuing professional development (CPD) is often designed without systematic attention to their lifelong language learning trajectories. Understanding how teacher educators have learned across their life course may help in designing effective and context-sensitive English learning opportunities within CPD. This paper argues that language (auto)biographical interviews can function as a diagnostic tool for refining English learning practices in teacher educator development.

Drawing on eight semi-structured interviews with teacher educators, the study examines what kinds of professionally relevant data such interviews may generate. Rather than treating biographies as descriptive narratives of past learning, the analysis conceptualises them as structured sources of CPD-relevant information. The findings indicate that language learning biographies yield four analytic layers rarely captured through conventional needs analyses: (1) participant articulated learning mechanisms (implicit acquisition, deliberate self-training, avoidance strategies); (2) language trajectories as linked to institutional and policy contexts; (3) affective memories of language pedagogy (e.g., shame, safety, authority, voice); and (4) markers of memory limits and epistemic uncertainty.

By foregrounding lived experiences as analytically relevant data, the paper outlines a framework for translating biographical insights into concrete CPD design considerations. Such an approach enables English professional development for teacher educators to move beyond deficit framings toward context-sensitive and professionally sustainable English learning practices.

Keywords: Teacher educators; continuing professional development; language (auto) biography; English learning practices

STRENGTHENING THE EMPLOYABILITY AND PROFESSIONAL IDENTITY OF TEACHERS AGED 50+

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Education systems face the dual challenge of teacher shortages and an ageing workforce. While recruitment of new teachers is prioritised, sustaining the employability and professional identity of experienced educators aged 50+ is often overlooked. Late-career teachers navigate rapidly changing educational demands, which may affect their professional identity, motivation, and retention, despite their substantial pedagogical expertise.

This study is guided by a systematic review (Mīkelsone et al., 2025) of peer-reviewed studies published between 2015 and 2025 to identify conceptual frameworks linking professional identity and employability in teachers aged 50+. Findings from the review informed a desktop research, which synthesised additional evidence on late-career teachers' professional engagement, institutional support mechanisms, and policy perspectives. These insights were further enriched through focus groups with school administrators and teacher educators, exploring their perceptions of late-career teachers' needs and readiness to provide support.

The analysis identified three conceptual model types: (1) dynamic-contextual models emphasising adaptation to systemic change; (2) multidimensional models integrating personal, relational, and institutional factors; and (3) agency-oriented models highlighting reflective practice and autonomy. Focus group discussions emphasised the critical role of organisational culture, leadership attitudes, recognition practices, and targeted professional development in shaping late-career teachers' employability and professional identity.

The study confirms a reciprocal relationship between professional identity and employability, highlighting the importance of both individual agency and institutional support. Strengthening this relationship is essential to sustain motivation, engagement, and the pedagogical value of teachers in later career stages.

Keywords: late-career teachers, employability, professional identity, focus group, educational leadership

1.5. sekcija. **SPORTS SABIEDRĪBAS ILGTSPĒJĪBAI:
IZAICINĀJUMI, RISINĀJUMI UN
ATTĪSTĪBAS PERSPEKTĪVAS /**

**SPORTS FOR A SUSTAINABLE
SOCIETY: CHALLENGES, SOLUTIONS
AND DEVELOPMENT PROSPECTS**

PHYSICAL EDUCATION ATTENDANCE AS A PREDICTOR OF OVERALL SCHOOL ENGAGEMENT: A LARGE-SCALE ANALYSIS OF LATVIAN SECONDARY DATA

Edmunds Vanags, Gatis Lāma

University of Latvia : EMU skola

Research increasingly recognizes physical activity as a critical component of sustainable educational systems, promoting both individual health and social equity (Bailey et al., 2009; Rasberry et al., 2011). However, the relationship between physical education (PE) attendance patterns and broader school engagement remains underexplored in large-scale longitudinal contexts. This preregistered study (Open Science Framework) examines whether PE attendance serves as an indicator or predictor of attendance in other academic subjects, addressing three core hypotheses: (1) PE attendance positively correlates with attendance in other subjects; (2) PE participation promotes self-regulation and health behaviors that enhance overall school engagement; and (3) low PE attendance signals broader disengagement patterns.

We analyze administrative records from 331 Latvian schools spanning five academic years (2019-2024), encompassing approximately 120,000 students. Our dataset includes absence counts (excused and unexcused) across all subjects, disaggregated by student demographics and prior academic performance. We employ a mixed-methods analytical strategy combining regression models to establish predictive relationships, network analysis to map subject-specific attendance clustering, and machine learning algorithms to identify latent patterns of disengagement. All models control for gender, socioeconomic indicators, and baseline achievement.

Preliminary analytical framework suggests PE attendance may function as both a consequence and catalyst of school engagement, with particular relevance for identifying at-risk students. Findings will inform educational policy regarding PE's role in promoting educational equity and sustainable student wellbeing, demonstrating how systematic attendance monitoring can support early intervention strategies in diverse school contexts.

Keywords: physical education, school attendance, student engagement, network analysis, educational equity, early intervention

HEALTH BEHAVIOUR SURVEY IN SCHOL-AGED CHILDREN IN LATVIA: TRENDS, SPORTS AND PHYSICAL ACTIVITY INFLUENCE ON HEALTH AND QUALITY OF LIFE.

Iveta Pudule

Slimību profilakses un kontroles centrs

HBSC is an international study coordinated by the World Health Organization (WHO) that regularly examines young people's health behaviours within their social context – family, school, and leisure time – among 11-, 13-, and 15-year-olds. The study enables comparisons of health habits across countries and allows researchers to monitor changes over time.

HBSC data from Latvia indicate that physical activity decreases with age, and girls tend to be less active than boys.

International comparisons show similar trends across the Baltic States between 2006 and 2018, where overall levels of physical activity have declined, while rates of overweight and obesity have increased, despite slight improvements in certain dietary habits.

The HBSC study highlights that regular physical activity, including participation in sports, is associated not only with better physical health but also with fewer subjective health complaints, improved mental well-being, and higher quality of life. Combining physical activity with healthy eating habits and reduced sedentary behaviour further enhances overall well-being among adolescents.

PSYCHOLOGICAL PROFILES OF SPORT COACHES IN RELATION TO EVIDENCE-BASED SPORT SCIENCE PRACTICE

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Rīga Stradiņš University

Introduction. While sport science can enhance athletic performance and the training process, integration of evidence-based knowledge into coaching practice in Latvia remains limited. This study aimed to identify psychological profiles of sport coaches based on perceived benefits of sport science and subjectively experienced barriers to implementation. This study was done by financial support of the research grant No. VPP-IZM-Sports-2023/1-0001.

Methods. A total of 224 Latvian sport coaches (104 women; 120 men; aged 20–77), representing 35 sports, participated. Principal Component Analysis (PCA) with Varimax rotation examined the underlying structure. Components were retained using eigenvalues > 1.0 and scree plot inspection. Factor scores were used for cluster analysis, with the optimal number determined by the Silhouette method and Within-Cluster Sum of Squares (WCSS). Between-cluster differences in age and coaching experience were assessed using ANOVA and the Kruskal–Wallis H test, while gender, education level, and coaching license category were analysed using Pearson's chi-square test.

Results. PCA identified four components explaining 57.5% of the variance. The dominant component (22.4%) reflected perceived practical benefits of sport science, while the remaining components represented (PC2) individual barriers and knowledge gaps, (PC3) infrastructure and material resources, and (PC4) organisational climate and colleagues' attitudes. Cluster analysis revealed three coach psychological profiles: (1) coaches sceptical of the practical value of sport science, (2) coaches with positive attitudes but substantial constraints, and (3) coaches characterised by high perceived benefits and low constraints. No significant differences were found between clusters in age, professional experience, educational level, or license category ($p > 0.05$).

Conclusion. Latvian sport coaches' attitudes toward sport science are primarily shaped by perceived benefits and implementation barriers. The identified profiles reveal a mismatch between positive attitudes toward sport science and its application. These attitudes are independent of demographic and professional characteristics, reflecting distinct psychological patterns of perceived behavioural capacity.

Keywords: Sport coaches; Evidence based practice; scientific methodologies; Psychological profiles; Perceived barriers

FROM LU VSI TO THE THREE-STAR AWARD: A JOURNEY OF EXCELLENCE

Arvis Sprude

I. Zeberiņa Kuldīgas pamatskola

This abstract outlines the professional and personal journey of Arvis Sprude, tracing his development from his studies at LU VSI to receiving the prestigious Three-Star Award. His path reflects long-term dedication to sports education, inclusive practice, endurance athletics, and youth development.

For the past 13 years, Arvis has worked extensively with children in inclusive education settings. He is committed to ensuring that every child – regardless of ability or background – experiences success, belonging, and motivation in physical education. Beyond his daily teaching practice, Arvis actively shares his experience in professional seminars, contributing to the development of other educators and promoting inclusive, evidence-based approaches in sport pedagogy.

Arvis strongly believes that the physical education lesson is the foundation for lifelong engagement in sport. In his view, a positive and inspiring sports class can determine whether a child chooses an active lifestyle in the future. Therefore, the teacher's personal example plays a crucial role. Arvis embodies this principle through his own active involvement in ultra cycling and endurance sports, demonstrating discipline, resilience, and passion.

This conviction was shaped during his studies at LU VSI, where he was inspired by an outstanding academic staff whose professionalism and enthusiasm left a lasting impact. One of the greatest contributions of his study years was the strong and supportive relationships he built with lecturers. These connections allowed him to attend numerous additional classes beyond the mandatory schedule, deepening his knowledge and strengthening his professional identity.

In parallel with his teaching career, Arvis serves as a dance group leader, promoting movement culture and teamwork among young people. The Three-Star Award symbolizes recognition not only of athletic achievement but also of sustained contribution to education, inclusion, and community leadership. Arvis Sprude's journey demonstrates how academic inspiration, professional dedication, and personal example can together form a lasting model of excellence.

Keywords: Education, model of excellence, physical education

SYSTEMATIC DEVELOPMENT OF GENERAL PHYSICAL FITNESS IN SCHOOLS: A PILOT PROJECT IN 15 EDUCATIONAL INSTITUTIONS OF VALMIERA MUNICIPALITY USING THE BST.COACH DIGITAL PLATFORM

Reinis Krēgers

BST.COACH Latvia

Declining levels of physical activity and general physical fitness among school-aged children remain a persistent public health concern in many European countries, including Latvia. Traditional physical education formats often lack systematic monitoring, individualization, and long-term developmental continuity. In response to these challenges, a structured general physical fitness development pilot project was implemented in 15 educational institutions of Valmiera Municipality (Latvia) using the BST.COACH digital platform.

The aim of this report is to describe the conceptual framework, implementation process, and initial practical insights of a system-oriented approach to improving students' general physical fitness within the school environment. The pilot integrates principles of long-term athletic development, age-appropriate strength and movement training, and digital monitoring of key physical fitness indicators. The BST.COACH platform was used to support planning, data collection, and feedback processes for teachers and coaches.

The project was designed to function within real school constraints, emphasizing feasibility, teacher-coach collaboration, and scalability at the municipal level. Preliminary observations indicate improved structure and consistency of physical preparation sessions, enhanced student engagement across varying ability levels, and increased capacity for objective monitoring of physical development. At the same time, the implementation process revealed organizational and methodological challenges that must be addressed for wider adoption.

The findings suggest that digitally supported, system-based physical fitness development models can strengthen the role of school physical education in promoting youth health, physical literacy, and sustainable participation in physical activity.

Keywords: Physical education, physical preparation, digitalization, youth health

THE WORLD ATHLETICS ASSOCIATION'S "CHILDREN'S ATHLETICS COACH AND TEACHER TRAINING PROGRAM" AS AN AUXILIARY TOOL FOR THE SKOLA 2030 SPORTS PROGRAM IN DIGITAL AND PRACTICAL TRAINING FOR TEACHERS

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University of Latvia

This paper presents a scientifically structured analysis of the World Athletics Kids' Athletics Coaches and Teachers Education Programme as a support tool for the implementation of the Skola 2030 sports curriculum, with a particular focus on teachers' digital and practical professional development. The study is based on the objectives of the international programme, pedagogical and scientific arguments, and research on child development and physical activity.

The Kids' Athletics programme, developed by World Athletics, is an internationally recognised physical activity framework aimed at promoting the development of fundamental movement skills, physical health, self-confidence, and lifelong engagement in sport among children. The programme has gained global recognition and is implemented in more than 150 national athletics federations worldwide, reaching over 13 million children and young people from diverse social backgrounds, including Latvia, Estonia, and Lithuania. In several countries, elements of the programme have been integrated into school and pre-school physical education curricula.

The paper analyses the potential of the Kids' Athletics programme to function as a complementary methodological and educational resource for the Skola 2030 curriculum. Particular attention is given to the programme's role in supporting teachers through structured learning materials, digital resources, and practical training approaches that facilitate the development of modern physical education competencies.

The study discusses how internationally standardised teaching materials and training approaches can support teachers in implementing competence-based physical education while improving lesson quality and student engagement. The paper also evaluates the programme's relevance for strengthening teachers' methodological capacity and promoting evidence-based physical activity practices in general education schools.

Keywords: kids athletics, sports, youth, track and field, school

THE IMPACT OF ASSESSMENT LITERACY ON DECISION-MAKING IN TEAM SPORT

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Assessment literacy is a crucial sports coach's pedagogical tool, significantly affecting the athletes' performance and overall health. This study aimed to investigate the associations between assessment literacy and team sport coaches' education and pedagogical experience level. Team sport coaches ($n = 104$) from different sports answered a questionnaire via Google Forms that included open-ended questions and a 32-item scale that focused on eight dimensions of assessment literacy (evaluation, analysis, decision-making, critical thinking, interpretation, reflection, data visualisation, and problem-solving skills). Descriptive statistics, Cronbach's alpha for reliability, Spearman's rank correlation, and the independent t-tests for group differences were utilized in data analysis. The findings reveal that assessment literacy was associated with education level ($\rho = .297, p < .01$) and professional experience level ($\rho = .305, p < .01$). Between coaches' experience levels, the main differences were in analysis, decision-making, critical thinking, interpretation, reflection, and problem-solving skills ($p = .001$ to $.022$), whereas between education levels, in evaluation, analysis, interpretation, and problem-solving skills ($p = .001$ to $.041$). Team sports coaches with higher professional experience and education levels perceive their assessment literacy as higher than lower-level coaches. Sport coaches experience more influence on cognitive assessment literacy dimensions than practical pedagogical components.

Keywords: assessment literacy; team sport; coaches; decision-making; sports data

FROM PHYSICAL LITERACY TO PERFORMANCE: RETHINKING YOUTH TRAINING

Oskars Ernšteins

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General physical preparation should not be seen as a competing priority to modern physical education, but as one of its essential foundations. The real question is not whether it should be included in school sport, but how it should be taught. In my view, youth today do not primarily need more early specialization; they need better fundamental movement skills that lay the foundation for all sports and sport-specific movements. These skills include locomotor abilities, stability skills, and object manipulation skills such as running, jumping, landing, balancing, rotating, throwing, catching, and striking.

This is why general physical preparation deserves a clear place in physical education. However, it should not look the same at every age. In younger children, the main emphasis should be on exploration, play, and game-based movement experiences. As children grow older, that emphasis should gradually shift toward a more structured approach, where technique, coordination, strength, movement quality, and physical capacity are developed more deliberately.

This idea is closely aligned with the Kaizen long-term athlete development model: Discovery, Fundamentals, Foundation, Development, Performance, and Active for Life. The model reflects an important principle: performance should grow out of physical literacy, not replace it. Not every child will become an athlete, but every child should build the movement competence, confidence, and physical habits needed for lifelong activity.

Another major goal is enjoyment. Physical education should help children enjoy being active. If we achieve that, more children will stay active, and in the long run more adults will become healthier, happier, and more physically capable. In that sense, physical literacy is not separate from performance; it is the base from which both performance and lifelong health can grow.

Keywords: youth, sports, kids, activities, performance, training.

SPORT CLASSES AS A FORMATIVE PATHWAY IN THE DEVELOPMENT OF PROFESSIONAL IDENTITY, WELL-BEING AND CAREER TRAJECTORIES

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Across Europe and globally, the alignment of sport and formal education has emerged as a growing priority. Since the introduction of the EU Dual Career Guidelines in 2012, increasing emphasis has been placed on how educational systems can support the balanced advancement of both athletic development and academic achievement.

In Latvia, specialised sports classes occupy a particularly significant position by offering young athletes a structured developmental environment; however, their long term effects remain insufficiently explored within both national and international research landscapes.

The study employed a cross sectional quantitative survey approach. Data were obtained from graduates who had participated in specialised sport classes for a minimum of three years, alongside a comparison cohort of athletes educated within general school environments.

The results demonstrate that participation in sport classes enhances students' health, motivation, and everyday well being. However, to ensure full alignment with the principles of sustainable education and dual career development, further refinement is necessary – particularly in balancing athletic and academic demands, strengthening career related support mechanisms, and placing greater emphasis on mental well being. Moreover, fostering early career exploration and expanding young people's understanding of diverse professional opportunities remain essential priorities.

Keywords: sport classes, dual career, well-being, professional career development

IMPLEMENTATION OF TRANSVERSAL SKILLS ON OLYMPIC DAY IN PRIMARY SCHOOL

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Latvian Olympic Academy

This year marks the 130th anniversary of the modern Olympic movement. The modern Olympic Games continue the traditions and ideas that emerged in ancient times. The Olympic movement is defined by cooperation, participation, fair play, and good relationships between athletes. Over the years, the Olympic games have united people of different countries, cultures, religions, and races. These ideals are important for everyone and should be learned from childhood, both in and out of school. Olympic Day is the only global event organized annually by the Olympic movement, allowing National Olympic Committees to promote the values of excellence, friendship, and respect. Many countries offer youth programs that combine sports with educational activities.

Research aim: To summarize and share experience in organizing Olympic Day in primary schools.

Olympic Day in primary school is an effective way to develop student's transversal skills during sports lessons by combining physical activity with value-based education. The event, coordinated by the Latvian Olympic Committee, is based on the values of friendship, respect, and excellence.

During these activities, students develop cooperation and communication skills, learn to set goals, evaluate their performance, and follow fair play principles. Team relays and activities using Olympic symbols – linked to the achievements of Latvian athletes – provide insight into the importance of sport. Shared reflection helps build social responsibility, self-confidence, and a sense of belonging.

Therefore, Olympic Day is not just a sporting event, but a purposeful pedagogical tool that promotes a child's overall development and a positive attitude toward a healthy lifestyle.

More information

Keywords: Olympic Movement, Olympic Day, primary education, value-based education, transversal skills, physical education

SCHOOL HEALTHY LIFESTYLE PROJECT IMPORTANCE IN SHAPING PHYSICAL ACTIVITY HABITS AMONG STUDENTS BETWEEN GRADES 7–9

Alma Elīze Ezeriņa, Ilvis Ābeļkalns

University of Latvia

The study is carried out to examine the importance of school healthy lifestyle projects in shaping physical activity habits among students in grades 7–9, with particular attention to general education schools in Latvia's region X. The study is based on theories about the role of physical activity in adolescent development, emphasizing the importance of schools in the formation of healthy habits during adolescence.

In one of Latvia's regions X, there are sixteen general education institutions, one of which is a special education institution that is not analyzed in this study. Only five out of fifteen schools participated in healthy lifestyle projects in the previous and current school year. A positive aspect is that all general education schools in the municipality take part in the "Milk and Fruits for schools" program. Data collection revealed that, in the 7th–9th grade age group, only one school is involved in a project specifically targeting this age group. Two additional schools work on shaping students' physical activity habits through sports infrastructure development projects.

The aim of the study is to evaluate the significance of school healthy lifestyle projects in shaping physical activity habits among 7th–9th grade students and to identify the benefits of participation in such projects, as well as to determine the barriers that hinder participation.

The study involves a student questionnaire survey, interviews with school representatives, and an analysis of 2025 self assessment report documents. The results showed that the implementation of school healthy lifestyle projects is associated with higher levels of physical activity and a more positive attitude towards physical activity among 7th–9th grade students. At the same time, factors limiting the broader implementation of such projects were identified. Based on the collected data, recommendations were developed to promote increased participation and more sustainable project development.

Keywords: Physical activity, Healthy lifestyle, Adolescents, School healthy lifestyle projects, Physical activity habits, Healthy living promotion

1.6. sekcija. **TEKSTPRATĪBA KĀ KVALITATĪVAS
IZGLĪTĪBAS PAMATS /**

**LITERACY AS THE FOUNDATION
OF QUALITY EDUCATION**

DAŽI TEKSTPRATĪBAS PĒCTECĪGAS APGUVES JAUTĀJUMI SKOLĀ: TEORIJA UN PRAKSE

SOME ISSUES OF LITERACY SUCCESSION ACQUISITION AT SCHOOL: THEORY AND PRACTICE

Zenta Anspoka

Latvijas Universitāte

Pētījuma aktualitāti nosaka mūsdienās svarīga vajadzība jau skolas pirmajos gados apgūt tādu lasītprasmes līmeni, lai skolēns var mērķtiecīgi strādāt ar dažādu stilu, žanru, izkārtojuma un sarežģītības pakāpes tekstiem un ne tikai iegūt konkrētu informāciju, bet arī prast to analītiski vērtēt un izmantot dažādam nolūkam, tajā skaitā arī savu tekstu radīšanai.

Pētījuma mērķis ir analizēt mācību saturu no tekstpratības pēctecīgas apguves viedokļa un raksturot darbu ar tekstiem dažādos mācību priekšmetos 1.–6. klasē.

Pētījuma rezultāti iegūti, analizējot tekstpratības teorijas, kā arī veicot mācību līdzekļu satura analīzi un skolotāju strukturēto interviju.

Pētījuma rezultāti ļauj secināt, ka mācību procesā, no vienas puses, tiek iekļauti arvien daudzveidīgāki teksti, tajā skaitā arī multimodālie teksti, no otras puses, mērķtiecīgs darbs, kā ar tiem strādāt, bieži netiek nodrošināts. Joprojām 56% gadījumu tekstpratības apguve tiek attiecināta uz latviešu valodas stundām, uzskatot, ka citos mācību priekšmetos galvenais ir mācību priekšmeta saturs, nevis tā apguves metodikai. Bieži trūkst saskaņotības starp dažādos mācību priekšmetos paredzēto darbu ar tekstiem, vairākkārt tiek paredzēti tādi darbi, kuriem skolēnam trūkst vajadzīgās pieredzes.

Atslēgvārdi: teksts, mācību teksts, pēctecības princips, sadarbība, prasmju pārnese

BĒRNU GRĀMATAS VIZUĀLIZPRATNEI UN TEKSTPRATĪBAI

CHILDREN'S BOOKS FOR VISUAL LITERACY AND LITERACY

Austra Avotiņa, Ilze Stikāne

Latvijas Universitāte

Eiropas izglītības telpā arvien lielāka uzmanība tiek pievērsta vizuālizpratnei kā 21. gadsimta kompetencei, to definējot kā zināšanas, prasmes un attieksmes vizuālu vēstījumu uztverei, interpretēšanai un veidošanai. Pētījumi pierāda vizuālizpratnes nozīmi tekstpratības veicināšanā. Lai arī tradicionāli bērnu grāmatu uztveram tieši kā tekstpratības veicinātāju, tā ir objekts, kuru iepazīstot, abas šīs kompetences, savstarpēji mijiedarbojoties, rosina iztēli un pilnveido satura izpratni. Mācību procesā jānodrošina līdzsvars starp tekstuālās un vizuālās lasīprasmes apguvi.

Šī pētījuma mērķis ir noskaidrot, vai bērnu grāmatu ilustrāciju kvalitāte un atbilstība tekstam var uzlabot tekstpratību. Tiek izvirzīti divi uzdevumi:

- 1) izpētīt, kā tiek izmantotas dzīvnieku tēlu personifikācijas (uzmanības lokā – lāča un vilka tēli pasakās) un kā tas ietekmē tekstpratību,
- 2) analizēt piemērus, lai konstatētu ilustrāciju detaļu neatbilstību tekstam un tās iespējamo negatīvo ietekmi uz tekstpratības veicināšanu.

Rezultātā var secināt, ka pasaku tēlu interpretācijā dominē stereotipiski priekšstati, tomēr bērnu grāmatu daudzveidība un mērķtiecīga izvēle var nodrošināt stereotipu mazināšanu. Analizējot ilustrāciju detaļu neatbilstību tekstam, var secināt, ka ilustrators var būt brīvs savā fantāzijā, ja tekstā nav precīzu norāžu par objektiem, to veidolu, krāsām un formām.

Kopumā var secināt, ka, iedziļinoties ilustrācijās, teksts šķietami paplašinās, padziļinās, jo var pētīt un labāk iztēloties to, kas nav pateikts vārdos. Reflektējot par redzēto un lasīto, var fantazēt, zīmēt, gleznot, veidot kolāžas, animācijas un tā realizēt integrētu mācību procesu. Atbildīga lietotāja rīcībā bērnu grāmatu daudzveidība ir ievērojams potenciāls vizuālizpratnes un tekstpratības attīstīšanai, zināšanu un attieksmju pilnveidei atbilstoši mācību mērķiem.

Atslēgvārdi: bērnu grāmatas, ilustrācijas, vizuālizpratne, tekstpratība, personifikācijas

LAIKA PERSPEKTĪVA UN PERSONĪBA ANŠLAVA EGLIŠA ROMĀNA “BEZKAUNĪGIE VEČI” APGUVĒ 12. KLASĒ

TIME PERSPECTIVE AND PERSONALITY IN THE ACQUISITION OF ANSHLAV EGLITIS NOVEL “BEZKAUNĪGIE VEČI” (THE SHAMELESS OLD MEN) IN GRADE 12

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Tekstpratība un laika perspektīvas izpratne ir būtiski kvalitatīvas izglītības priekšnoteikumi, jo tās veicina skolēnu prasmi kritiski analizēt tekstu, saskatīt vēsturisko un kultūras kontekstu, kā arī reflektēt par personības attīstību un nākotnes iespējām. Tekstpratība mūsdienās nozīmē ne vien teksta saturisko izpratni, bet arī prasmi interpretēt tajā ietvertos vērtību konfliktus, paaudžu attiecības un eksistenciālos jautājumus. Šajā kontekstā referātā “Laika perspektīva un personība Anšlava Eglīša romāna “Bezkaunīgie veči” apguvē 12. klasē” tiek atklāts, kā vispārējās vidējās izglītības posmā iespējams stiprināt tekstpratību, īstenojot starpdisciplināru pieeju Anšlava Eglīša romāna “Bezkaunīgie veči” apguvē.

Referāta mērķis ir informēt par teorētiskajā literatūrā iegūtajām atziņām un gūtajiem pētījuma rezultātiem, integrējot laika perspektīvas teoriju, eksistencialisma filosofijas un personības attīstības aspektus latviešu trimdas literatūras analizē. Pētījums tika īstenots 12. klasē, analizējot teorētisko, metodisko un pedagoģiski psiholoģisko literatūru, izvērtējot skolotājas un skolēnu sadarbības rezultātus, skolēnu iedziļināšanos romāna saturā un interpretāciju.

Rezultāti liecina, ka, pievēršot uzmanību uzdevumu kompleksuma pēctecībai (no vienkāršā uz sarežģīto), tiek veicināta skolēnu analītisko un interpretācijas prasmju attīstība, un lasītprasmes veicināšanai ir būtiska vecumposmam atbilstoša teksta izvēle, jēgpilns lasīšanas nolūks un pieeja. Skolēni saskatīja romānā atklātos paaudžu konfliktus, atsvešinātību, eksistenciālos jautājumus un vērtību konfliktus, sasaistot tos ar mūsdienu sociālo realitāti. Starpdisciplinārā pieeja sekmēja dziļāku tekstpratības kompetences attīstību, kultūrientitātes apzināšanos un argumentācijas prasmes, balstot spriedumus teksta satura un vēsturiskajā kontekstā.

Vienlaikus pētījums atklāj aicinājumus, kas saistīti ar skolēnu prasmi padziļināti analizēt literāro varoņu nākotnes laika perspektīvu, saskatot faktorus, kas varētu to būtiski ietekmēt, secinot, ka šajā aspektā ir nepieciešams mērķtiecīgāks metodiskais atbalsts. Kopumā pētījums apliecina, ka metodiski, psiholoģiski un vēsturiski pamatota literatūras mācīšana būtiski sekmē dziļākas tekstpratības kompetences attīstību vidējā izglītībā.

Keywords: Anšlavs Eglītis, romāns “Bezkaunīgie veči”, tekstpratība, laika perspektīva, personība, trimdas literatūra, literatūras pedagoģija

STUDENTU TEKSTU SATURS UN FORMA INTENSĪVA LATVIEŠU VALODAS KĀ SVEŠVALODAS KURSA PĀRBAUDES DARBOS

CONTENT AND FORM IN STUDENTS' WRITTEN TESTS OF AN INTENSIVE COURSE FOR LATVIAN AS A FOREIGN LANGUAGE

Solvita Berra

LU HZF Latviešu valodas institūts

Indiānas Universitātes (ASV) Vasaras valodas skola ir viena no retajām mācību vietām ārpus Latvijas, kas ik gadu nodrošina pieaugušajiem astoņu nedēļu garu (4x60 min nodarbības katru darba dienu) latviešu valodas kursu bez (vai minimālām) priekšzināšanām. Katrai nedēļai ir savs satura temats un apgūstamais leksikas un gramatikas minimums, un liels uzsvars tiek likts uz spēju sazināties mērķvalodā bez starpniekvalodas. Studenti kārtot vidus eksāmenu un gala eksāmenu, un abu pamatā ir piecas daļas: runāšana, klausīšanās, rakstīšana, lasīšana un gramatika. Kopš Covid-19 latviešu valodas kurss notiek tiešsaistē, izmantojot mācību platformu "Canvas".

Katru gadu latviešu valodas kursa grupu veido vidēji 5–6 studenti, t.sk., doktoranti ar pētnieciskajām interesēm par Austrumeiropu un Baltijas valstīm, studenti ar latviešu izcelsmi, studenti ar vīru/sievu latvieti un akadēmiķi ar plānu īslaicīgi dzīvot un strādāt Latvijā. 2024. gadā bija septiņi studenti, 2025. gadā – četri studenti.

Studentu un nodarbību skaits ļauj ne tikai kāpināt studentu lingvistisko kompetenci latviešu valodā, bet arī personiski iepazīt studentu domāšanas veidu, vērtības, intereses un pieredzi, kas atspoguļojas arī viņu tekstos: mutvārdu prezentācijās un diskusijās, viedokļu rakstos un radošajos darbos rakstu formā.

Referāta mērķis ir iztirzāt 2024. un 2025. gada latviešu valodas kursa studentu rakstu darbus vidus un gala eksāmenos (t. i., 11 studentu 22 rakstu darbi), pievēršot uzmanību tam, kā mainījusies studentu rakstīt prasme (lingvistiskais aspekts) un spēja dalīties ar saviem uzskatiem, pieredzi, attieksmi pret aplūkojamo tematu, pieredzi u. tml. (personiskais aspekts) divu mēnešu laikā.

Atslēgvārdi: teksts, latviešu valoda, svešvaloda, rakstu darbi, gala eksāmens

LINGVISTISKĀS AINAVAS IZPĒTES PIEEJAS NOZĪME SKOLĒNU TEKSTPRATĪBAS VEICINĀŠANĀ

THE IMPORTANCE OF THE LINGUISTIC LANDSCAPE APPROACH IN IMPROVING STUDENTS' LITERACY

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Lingvistiskās ainavas izpēte ir viens no veidiem, kā iepazīt valodas lietojumu reālā vidē. Tās pedagoģisko nozīmi nosaka vairāki faktori:

- 1) valoda tiek apgūta ne tikai no mācību grāmatām, bet arī no vides, kurā skolēns regulāri uzturas;
- 2) tiek attīstītas dažādas pētniecības prasmes un spēja saskatīt dažādu nozaru un mācību priekšmetu kopsakarības un savstarpējo ietekmi, paplašināts kultūras un sociālais redzesloks;
- 3) vērtējot valodas zīmju lietojumu, spriežot par to lingvistisko kvalitāti un funkcionālo iederīgumu, iespējams attīstīt gan funkcionālo, gan arī kritisko tekstpratību.

Mainoties jauniešu attieksmei pret mācību procesu un zināšanām, arī pedagogiem ir jāizmanto jaunas pieejas, mācību metodes un metodiskie paņēmieni, kas ne tikai sekmētu valodas sistēmas labāku izpratni, bet arī attīstītu prasmi saskatīt valodas zīmju esamību apkārtējā vidē un to lieto juma dažādību, ietekmi uz cilvēku uztveri, kā arī aktuālu lietišķo un publicistikas tekstu informatīvo pietiekamību un saturisko kvalitāti.

Lai skolēni varētu sekmīgi veikt lingvistiskās ainavas izpēti, analizēt apkopoto informāciju un to radoši interpretēt savos tekstos, pedagogam gan pašam jābūt teorētiski labi sagatavotam, gan jāiepazīstina skolēni ar atbilstošiem zinātniskajiem darbiem, kā arī jāizstrādā pētījuma vadlīnijas, skaidri definējot uzdevumus, sasniedzamos rezultātus un norādot, kuru valodas stilu un runas žanru teksti būs jāizstrādā.

Referāta mērķis ir sniegt ieskatu, kā izmantot lingvistiskās ainavas izpētes pieeju, lai attīstītu skolēnu funkcionālo un kritisko tekstpratību.

Darbā tiks piedāvātas idejas, kā izmantot lingvistiskās ainavas izpētes pieeju latviešu valodas stundās darbā ar dažāda vecuma skolēniem, lai viņi pamanītu saikni starp valodas zīmju lietojumu konkrētā vidē, saskatītu to kultūrkonotāciju, kopsakarības starp vēsturi un sociālo vidi, kā arī izmantotu iegūtos datus savu tekstu radīšanai.

Atslēgvārdi: lingvistiskā ainava, tekstpratība, pieeja, izpēte, tekstu radīšana

MĀKSLĪGAIS INTELEKTS – TEKSTPRATĪBAS IESPĒJA VAI RISKS?

ARTIFICIAL INTELLIGENCE – AN OPPORTUNITY OR A RISK FOR WRITING LITERACY?

Normunds Dzintars

Liepājas Valsts ģimnāzija

Referātā tiek analizēta mākslīgā intelekta (MI) integrācija izglītības procesā, īpašu uzmanību pievēršot tā praktiskajam lietojumam un potenciālajiem riskiem pārspriedumu rakstīšanas apgūvē. Pētījuma centrālais elements ir autora izstrādāts interaktīvs robots, kas balstīts uz “Gemini” modeli un paredzēts kā virtuāls asistents un mentors pārsprieduma vai argumentētās esejas rakstīšanas procesā.

Praktiskais darbs ar robotu tiek organizēts pakāpeniski, īstenojot mērķtiecīgus soļus. Sākotnēji tas palīdz analizēt tematu un ģenerēt idejas, tādējādi pārvarot “baltās lapas” sindromu. Turpmāk tiek veidoti argumenti un pretargumenti, plānota loģiskā struktūra (ievads, iztirzājums, nobeigums) un pilnveidots teksta uzmetums. Šajā procesā MI sniedz tūlītēju atgriezenisko saiti, palīdzot uzlabot stilistiskās un loģiskās nepilnības.

Tomēr tehnoloģijas izmantošana aktualizē arī vairākas būtiskas problēmas. Lielākais risks ir skolēnu pārmērīga paļaušanās uz šo rīku, kas var vājināt kritiskās domāšanas un patstāvīgas analīzes prasmes. Pastāv arī ētiski un akadēmiskā godīguma izaicinājumi, jo robeža starp metodisku atbalstu un plaģiātismu ir trausla. Turklāt skolēnu darbi nereti zaudē individuālo, cilvēcisko “balsi”, kļūstot standartizēti un emocionāli neitrāli. Jāņem vērā arī MI “halucināciju” risks, proti, neprecīzas vai izdomātas informācijas radīšana.

Darba noslēgumā secināts, ka izstrādātais “Gemini” robots ir inovatīvs pedagoģisks rīks, tomēr tā efektīvai izmantošanai nepieciešama pārdomāta metodiskā pieeja. MI jāfunkcionē kā ideju ģenerēšanas un rediģēšanas palīgs, nevis kā gala rezultāta radītājs, saglabājot cilvēka intelektu kā galveno rakstīšanas procesa virzītājspēku.

Atslēgvārdi: mākslīgais intelekts, tekstpratība, argumentētā esēja, virtuālais asistents, akadēmiskais godīgums

DIAGNOSING AND MONITORING ACADEMIC LANGUAGE IN CHATBOT SUPPORTED MICROLEARNING DIALOGUES

SKOLĒNU RUNAS PRASMES NOVĒRTĒŠANA UN UZRAUDZĪBA SARUNBOTA ATBALSTĪTOS MIKROMĀCĪBU DIALOGOS

Eļčins Džafarovs

Datorium

Theoretical framework. The approach draws on analytic language assessment and a functional view of academic language as the linguistic resources learners use to define concepts, ask questions, explain relationships, and justify claims in text-based chats. Digital text literacy is defined as the ability to produce accurate and appropriate language in micro-learning chats, and to maintain coherence, register, and reasoning across multiple turns.

Study design. The paper presents the methodological basis of an implemented assessment tool integrated into microlearning chats and reports an empirical validation plan based on anonymised data. The goal is to diagnose academic language a site merges in authentic learning interaction, provide formative feedback, and monitor development longitudinally. The methodology is universal, but Latvian is used as an implementation case to demonstrate the approach in a morphologically rich language.

Methods and instruments. A stable analytic rubric is applied to message chains rather than isolated messages. Eight dimensions are scored on a 1 to 5 scale: morphological accuracy, syntactic complexity, lexical range, lexical control, academic register for learning functions, coherence and cohesion across turns, orthographic control, and communicative effectiveness. Scoring is performed by a Large Language Model (LLM) configured with explicit descriptors and evidence requirements per dimension, producing dimension profiles and feedback linked to observed text features.

Contribution and implications. As LLM mediated chat-based learning becomes instructionally meaningful, a practical gap remains: there is no widely adopted, standardised approach for criterion referenced language diagnosis from short microlearning chats that also supports consistent longitudinal monitoring. The proposed methodology fills this gap by aggregating evidence across dialogues and applying stable analytic rubric. It provides a scalable and consistent approach to language diagnostics; repeated measurement on the same dimensions enables longitudinal monitoring and provides actionable diagnostic evidence for language support in digital contexts.

Keywords: digital text literacy; academic language; rubric based diagnosis; LLM based scoring; microlearning chat dialogues; chatbot mediated learning; longitudinal monitoring

LISTENING COMPREHENSION SKILLS IN LATVIAN LANGUAGE LESSONS IN GRADE 3

KLAUSĪŠANĀS PRASMJU PILNVEIDOŠANA
LATVIEŠU VALODAS STUNDĀS 3. KLASĒ

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Listening comprehension is one of the four fundamental language skills forming the basis for information perception, understanding, and further cognitive development. In contemporary educational contexts, students are exposed to an intensive flow of information across multiple channels, particularly in digital environments that require sustained attention and the ability to identify meaningful content. Consequently, the systematic development of listening skills is essential for academic achievement, independent thinking, and effective communication.

The relevance of this study stems from three years of pedagogical experience teaching Latvian language in Grade3, during which recurring difficulties in students' listening comprehension were observed. The aim of the study was to investigate how structured, interest-based, and game-oriented teaching strategies contribute to the development of listening comprehension skills.

The theoretical framework is grounded in theories of personality development and listening comprehension, emphasizing the role of attention, motivation, and meaningful engagement in learning.

Empirical data were collected through systematic pedagogical observation, student tests, questionnaires, and analysis of worksheets, followed by qualitative data analysis.

Initial findings indicated that many students struggled to maintain attention while listening, identify key words, and infer the meaning of unfamiliar vocabulary from context. As a result, comprehension was often fragmented and superficial. Following the implementation of structured listening activities, visualization strategies, and formative feedback techniques, significant improvement was observed. More than half of the students were able to accurately respond to comprehension questions, and several demonstrated deeper analytical thinking.

The findings suggest that purposeful and methodologically grounded listening instruction enhances not only listening comprehension but also supports reading comprehension and the development of effective learning habits.

Keywords: listening skills, Latvian language, 3rd grade, pedagogical methods

TEACHING CREATIVE WRITING IN SECOND GRADE USING GROWTH MINDSET

IZAUGSMES DOMĀŠANĀ BALSTĪTA RADOŠĀS RAKSTĪŠANAS SEKMĒŠANA 2. KLASĒ

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In contemporary education, increasing attention is devoted to fostering students' creativity, selfexpression, and positive attitudes toward learning. Recent findings from the Programme for International Student Assessment (PISA) define creativity as the ability to generate original and diverse ideas and emphasize the importance of a growth mindset in students' creative achievement (OECD, 2024). In the Latvian education framework, creativity and growth mindset are embedded as transversal skills, highlighting the need to cultivate innovation and perseverance from the early years of schooling.

The relevance of this study stems from the author's pedagogical experience observing students' difficulties in creative writing, particularly in idea generation, engagement in the writing process, and confidence in their abilities. The aim of the study was to theoretically substantiate and practically validate growth mindset-based methodological strategies for promoting creative writing in the second grade.

The theoretical framework draws on growth mindset theory (Dweck, 2017, 2021) and research in creative writing pedagogy emphasizing the importance of a safe, student-interest-based learning environment (Graham, 2022, 2024; Hoeve, 2022; Truax, 2018). Empirical data were obtained through action research conducted in a second-grade classroom with 22 students. Over a three month period, creative writing exercises were regularly integrated into Latvian language lessons while fostering a growth mindset and creating a supportive classroom environment.

The findings indicate positive dynamics in students' engagement in the creative process, idea generation, and growth mindset indicators. Greater progress was observed among students who wrote about personally meaningful topics, used drawings to plan their ideas, demonstrated a stronger growth mindset in self-assessments, and actively participated in a reading challenge. The results suggest a relationship between reading activity and the development of creative writing skills.

Overall, a growth mindset-based approach combined with student-interest-driven tasks and reading promotion significantly enhances creative writing development and provides practical implications for primary education teachers.

Keywords: creative writing, growth mindset, primary education, action research, reading

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DIAGNOSTIC ASSESSMENT TO SUPPORT DATA-DRIVEN PEDAGOGICAL DECISION-MAKING IN THE DEVELOPMENT OF LATVIAN LANGUAGE SKILLS OF SIX-YEAR-OLD PRESCHOOL CHILDREN

DIAGNOSTICĒJOŠAIS DARBS DATOS BALSTĪTU PEDAGOĢISKO LĒMUMU PIENĒMŠANAI PAR SEŠGADĪGU BĒRNU LATVIEŠU VALODAS PRASMJU PILNVEIDI PIRMSSKOLĀ

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International studies (OECD PISA, 2022; Snow, 2021; Dickinson & Tabors, 2001) emphasize that language skills developed during the preschool years form the foundation for subsequent reading and writing development, as well as for overall academic achievement. However, in Latvia, no unified national diagnostic tool has been developed for assessing the language skills of six-year old children, and responsibility for evaluation largely rests with preschool teachers. Consequently, pedagogical decisions regarding children's language development are often based on professional intuition rather than systematic, data-driven diagnostics, which may hinder the timely provision of necessary support.

The aim of this study is to develop and pilot diagnostic tasks for determining the level of Latvian language skills of six-year-old children in preschool, thereby providing a theoretically grounded and practically applicable tool for pedagogical use. The theoretical framework of the study is based on research in early language development and the principles of formative assessment (Black & Wiliam, 2009). Three sets of diagnostic tasks were developed, including performance level descriptors, worksheets for children, methodological guidelines for teachers, and assessment sheets designed to support data-driven pedagogical decision-making in the planning of the learning process.

Two of the developed diagnostic tools were piloted in six Latvian preschool educational institutions, involving 174 children and eight expert teachers. Data were collected through expert interviews and analysis of children's performance. Qualitative data were analyzed using thematic analysis.

The findings indicate that the diagnostic tool provides substantial support for targeted pedagogical decision-making, facilitates the identification of children's individual needs in the development of Latvian language skills, and promotes teachers' professional reflection. The study highlights that systematic assessment of language skills is essential for ensuring high-quality preschool education and school readiness, and that diagnostic tools can help reduce the existing gap between curricular requirements and the instruments available in pedagogical practice.

Keywords: diagnostics, diagnostic assessment, preschool, six-year-old children, language skills

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REGĪNAS EZERAS STĀSTU CIKLA “CILVĒKAM VAJAG SUNI” APGUVE 8. KLASĒ

STUDYING REGINA EZERA'S SHORT STORY CYCLE “CILVĒKAM VAJAG SUNI” (A MAN NEEDS A DOG) IN GRADE 8

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Regīnas Ezeras (1930–2002) prozas iepazīšana skolā sākas 8. klasē ar 1975. gadā stāstu krājumā “Cilvēkam vajag suni” iekļauto šāda paša nosaukuma piecu stāstu ciklu. Tajā vēstīts par to, kā padzīvojis vīrs aiznes uz tirgu pārdot savas vecās kucis Grācijas četrus kucēnus, par suņu jaunajām mājām un jaunajiem saimniekiem. R. Ezera ir psiholoģiskās prozas pārstāve, kuras darbos aiz šķietami nenozīmīgām un sadzīviskām situācijām atklāta cilvēka iekšējā pasaule: pagātnes pārdzīvojumi, tagadējā mirklā izjūta un nākotnes redzējums. Nozīmīga loma rakstnieces darbos ir jautājumam par cilvēka vērtībām, un tas ir jautājums, kas vienmēr bijis aktuāls arī audzināšanas un izglītības kontekstā.

Referātā aplūkots pētījums “Regīnas Ezeras stāstu cikla “Cilvēkam vajag suni” apguve 8. klasē”, kura ietvaros tika veikta teorētiskās literatūras analīze un atbilstoši Bendžamina Blūma taksonomijai izstrādāts un mācību izmēģinājuma darbībā 17 mācību stundu laikā aprobežots mācību materiāls stāstu cikla apguvei veselumā. Tas darīts, ņemot vērā literatūras metodikā aktualizēto atziņu par nepieciešamību pēc iespējas izvairīties no fragmentāras daiļdarba lasīšanas. Savukārt mērķtiecīga daiļdarba iepazīšana – lasīšana, izprašana, tajā lietoto valodas līdzekļu izzināšana – cieši saistīta ar teksteides prasmju attīstīšanu.

Salīdzinot pirms mācību tēmas apguves veiktā diagnosticējošā darba rezultātus ar mācību izmēģinājumdarbības noslēguma darba rezultātiem, secināts, ka skolēni bija guvuši izpratni gan par stāstu saturu un tēliem, gan arī spēja paust viedokli par stāstos atklātajām vērtībām, kā arī spēja saskatīt tajos atklātās problemātikas aktualitāti mūsdienās. Pētījuma rezultāti sniedza apstiprinājumu par sagatavotā materiāla piemērotību mācību mērķu sasniegšanai. Tika secināts, ka pilnīgu literārā darba apguvi ieteicams turpināt ar papildu pievēršanos rakstnieces lietoto valodas līdzekļu apzināšanai un izpētei.

Atslēgvārdi: “Cilvēkam vajag suni”, literatūra, pamatskola, proza, Regīna Ezera, stāstu cikls

METHODOLOGICAL SUPPORT OF THE LATVIAN LANGUAGE AGENCY FOR PROMOTING TEXT LITERACY OF PRIMARY SCHOOL STUDENTS IN THE TRANSITION TO TEACHING IN THE STATE LANGUAGE

LATVIEŠU VALODAS AĢENTŪRAS METODISKAIS
ATBALSTS SĀKUMSKOLAS SKOLĒNU TEKSTPRATĪBAS
VEICINĀŠANAI PĀREJĀ UZ MĀCĪBĀM VALSTS VALODĀ

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Text literacy in the 21st century is defined as an important condition for a quality learning process, especially in the context of Latvia, starting the transition to teaching only in the Latvian language in 2023. In this situation, the involvement of all educators in the targeted development of students' text perception and comprehension skills in various subjects, introducing integrated learning of language and content, becomes essential. International research confirms the effectiveness of such an approach, however, in practice, teachers face several significant challenges.

The aim of the study is to analyze the views of educators on the risks that affect the development of text literacy of students in grades 1–3 in integrated learning of language and content, as well as to develop theoretically sound and practically applicable methodological support for teachers. In January 2023, an electronic survey of 279 educators was conducted in various regions of Latvia, obtaining quantitative and qualitative data on the main risks: insufficient vocabulary of students, difficulties in perceiving and structuring learning content, and the varying readiness of educators to implement an integrated approach. An additional challenge is the lack of teaching and methodological materials, which limits students' opportunities to develop text literacy in various subjects.

As part of the research, the Latvian Language Agency has developed 18 methodological materials for the acquisition of natural sciences, mathematics and social studies for grades 1–6. The materials are based on the theoretical principles of integrated language and content learning and are intended as a practical resource for professional support of teachers, facilitating the improvement of students' text literacy and the implementation of the transition to teaching in Latvian.

Keywords: content and Language Integrated Learning, text literacy, methodological support for the transition to teaching in the official language, primary education

FREQUENCY OF CONSONANT COMBINATIONS IN THE LATVIAN LANGUAGE

LĪDZSKAŅU KOMBINĀCIJU BIEŽUMS LATVIEŠU VALODĀ

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Text literacy is a fundamental element of quality education at all stages. However, text comprehension is impossible without well-developed reading technique, visual perception, and fluency. Today, children begin learning to read in the preschool period: they first get familiar with letters and then move on to combining letters into syllables. This process takes a considerable amount of time.

This raises an important question: is it possible to reduce the time required for initial reading instruction and the development of reading technique in children?

In addition to methodological approaches, linguistic strategies may also be applied. For example, it is possible to identify which letter combinations in the Latvian language are most frequently used and to focus on these combinations in early reading. When children encounter these frequently used letter combinations in words, they will be able to recognize them more easily. This can increase reading fluency and, consequently, improve overall text comprehension.

The study was conducted using data from the dictionary tezaurs.lv. The research identified the frequency of consecutive consonant blendings consisting of 2, 3, 4, 5, 6, and 7 letters. The findings demonstrate a significant gap between highly frequent consonant combinations in Latvian and those that occur less frequently.

The results provide a basis for further work on developing more effective approaches to teaching children at the stage of reading skill formation.

Keywords: reading skills, literacy, reading fluency, consonant combinations, consonant blendings, sight comprehension, Latvian language

TEKSTPRATĪBAS MONITORINGA DARBU IZSTRĀDE VIENOTĀS SKOLAS KONTEKSTĀ: LATVIEŠU VALODA KĀ MĀCĪŠANĀS INSTRUMENTS

DEVELOPING READING COMPREHENSION ASSESSMENT TASKS IN THE CONTEXT OF THE UNIFIED SCHOOL: LATVIAN AS A TOOL FOR LEARNING

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Vienotās skolas kontekstā latviešu valodai ir centrāla loma kā mācību procesa instrumentam: ar valodu skolēni uztver, strukturē un pauž domas, veido izpratni par mācību saturu un demonstrē sasniegumus dažādos mācību priekšmetos. Tādēļ tekstpratība nav tikai valodas un literatūras jomas mērķis, bet pamatprasmē, kas ietekmē mācību kvalitāti kopumā. Lai mērķtiecīgi atbalstītu skolēnu progresu un nodrošinātu salīdzināmu atgriezenisko saiti skolām, nepieciešami vienoti, uzticami un pedagoģiski izmantojami monitoringa darbi.

Pētījumā tiks prezentēts monitoringa darbu izstrādes process, kura mērķis ir vērtēt, kā skolēni izmanto latviešu valodu kā mācīšanās instrumentu: kā viņi saprot un interpretē tekstu, formulē secinājumus, pamato viedokli, strukturē informāciju un lieto atbilstošus valodas līdzekļus. Monitoringa darbi veidoti, balstoties sasniedzamo rezultātu loģikā un skaidri definētos kritērijos, ietverot dažādu veidu tekstus un uzdevumus, kas atklāj skolēnu spēju atlasīt un integrēt informāciju, izskaidrot cēloņsakarības un argumentēt, radīt saistītu, mērķtiecīgu rakstītu tekstu, lietot precīzu un situācijai atbilstošu valodu. Pētījuma laikā tika raksturoti uzdevumu izstrādes principi, vērtēšanas rubrikas un snieguma līmeņi, kā arī izmēģinājuma un vērtētāju kalibrēšanas pieeja, lai stiprinātu rezultātu uzticamību.

Pētījumā uzsvērts, kā monitoringa darbi kalpo kā vienots instruments skolēnu tekstpratības attīstības izvērtēšanai un kā to rezultāti izmantojami mācību procesa pilnveidē Vienotās skolas ietvarā.

Atslēgvārdi: tekstpratība, monitoringa darbi, Vienotā skola, latviešu valoda kā mācīšanās instruments, mācību kvalitāte

SKOLĒNU VĒSTĪJUMU MORFOLOĢISKĀS IEZĪMES

MORPHOLOGICAL FEATURES OF STUDENTS' NARRATIVE TEXTS

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Mūsdienu izglītībā tekstpratība, īpaši tekstveide, ir kļuvusi par vienu no skolēnu lielākajiem izaicinājumiem, jo ir nepieciešama prasme skaidri un strukturēti formulēt domas, ievērojot gramatisko precizitāti un leksisko daudzveidību.

Pētījumā analizēti septiņo klašu skolēnu vēstījumi no piecām dažādām Latvijas skolām ar mērķi noskaidrot būtiskākās tekstveides problēmas un galvenās morfoloģiskās iezīmes – vārdšķiru lietojuma īpatsvaru un to saistību ar vēstījuma kvalitāti.

Sākotnēji darbus novērtēja skolotāji, pēc tam tie tika analizēti un vērtēti, izmantojot mākslīgā intelekta (MI) modeli *Gemini 3 Flash*. MI izmantošana pētījumā sniedza būtiskus ieguvumus kvantitatīvo datu apstrādē, tomēr uzrādīja arī vērā ņemamus trūkumus, jo katrs darbs bija manuāli jāpārskata, lai identificētu MI pieļautās kļūdas, piemēram, stila kļūdu ignorēšanu vai teksta “izdomāšanu” gadījumos, kad skolēna rokraksts bijis neskaidrs.

Iegūtie rezultāti skaidri parāda skolēnu tendenci vēstījumos ļoti vienkāršoti uzskaitīt dažādus notikumus un darbības. Raksturīga trūcīga leksika, kur dominē tādi vārdi kā *bija, ļoti, tad, un*.

Analīze apliecina, ka augstāku vērtējumu ieguvušajiem darbiem ir raksturīgs sabalansētāks vārdšķiru lietojums, īpaši izmantojot vairāk īpašības vārdus un apstākļa vārdus, kas piešķir tekstam tēlainību un precizitāti.

Būtiski atzīt, ka rakstīt var iemācīties tikai rakstot, taču skolā nereti tiek izmantoti testveida jautājumi, īsas atbildes un formāli veicami uzdevumi, kas neveicina padziļinātu tekstveides prasmju attīstību. Skolēni uzdevumus izpilda ļoti pragmatiski, radošumu atstājot novārtā. Tikai retos darbos vērojama apzināta vēlme padarīt tekstu estētisku un lasītājam baudāmu, kas ir viens no tekstveides būtiskākajiem uzdevumiem.

Atslēgvārdi: tekstveide, skolēnu vēstījumi, vārdšķiru lietojums, leksiskā daudzveidība, mākslīgais intelekts

LATVIEŠU VALODAS DISKRIMINĀCIJAS PĒTĪJUMS (2004–2024) KRITISKĀS TEKSTPRATĪBAS ATTĪSTĪBAI LATVIJĀ

A STUDY OF LATVIAN LANGUAGE DISCRIMINATION (2004–2024) TO DEVELOP CRITICAL LITERACY IN LATVIA

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Referāta mērķis ir dalīties ar jaunākā pētījuma atziņām par latviešu lingvistiskās uzvedības jautājumiem un to, kā mainīt uzvedību latviski runājošajiem (visbiežāk-latviešiem) ar kritiskās tekstpratības palīdzību, lai starpkultūru saziņā Latvijā runātu galvenokārt latviešu valodā.

Longitudinālā pētījumā par sabiedrības divvalodību un starpkultūru komunikāciju Latvijā redzams, ka joprojām – līdzīgi kā padomju varas gados – saziņā ir vērojama latviski runājošo lingvistiskā diskriminācija. Atšķirībā no citām Eiropas valstīm Latvijā arvien biežākt ieši valstsnācijas pārstāvji, saziņā izmantojot latviešu valodu, starpkultūru saziņā nonāk kritiskās situācijās. Kā liecina šī sociolingvistiskā pētījuma dati, katrs otrais latvietis savas dzīves laikā saskāries ar lingvistisko diskrimināciju, radušies dažādi iekšēji un ārēji konflikti, finansiāli, emocionāli u. c. kritiskas situācijas, lietojot latviešu valodu kā vienīgo valsts valodu Latvijā.

Izmantojot kritiskā incidenta metodi un balss došanas metodi (no angļu v. *giving voice*), pirmo reizi latviešiem zinātniskā pētījumā dota iespēja izteikties par to, kā viņi jūtas Latvijas valodas situācijā un starpkultūru komunikācijā. Ir arī cittautiešu grupa, kuru aplūkošu citos referātos.

Pētījums tikai veikts, lai:

- 1) dokumentētu liecības par to, kas noticis (tostarp lingvistiskajā uzvedībā) pēc ilglaicīgās padomju okupācijas;
- 2) rosinātu latviešus mainīt savu iecūto lingvistisko uzvedību, jo, kā liecina dažādas kultūru klasifikācijas teorijas, dzīvojam vienā teritorijā ar atšķirīgu kultūru cilvēkiem, no kuriem saziņā bieži vien nevarēsim sagaidīt, ka viņi rīkosies tieši tā, kā lielākā daļa latviešu;
- 3) aicinātu valsts amatpersonas valsts valodu atbalstīt tieši praktiskos darbos;
- 4) informētu cittautiešus, kuri vēlas palikt krievu valodas telpā, par valstsnācijas izjūtām šādās situācijās.

Pētījuma mērķi sekmē kritiskās tekstpratības attīstību visiem iedzīvotājiem.

Aktuālākais uzdevums latviešu valodas pozīciju stiprināšanā un latviešu lingvistiskās uzvedības maiņā, būtu panākt kvalitatīvu un sistēmisku latviešu valodas apguvi vispārīzglītojošajās skolās.

Kopš atgūta valstiskā neatkarība, latviešu valodas apguve latviešiem atstāta ēnā, priekšplānā izvirzot rūpes par latviešu valodas apguvi cittautiešiem (LAT2), neņemot vērā, ka latviešu valodas apguve latviešiem ir būtiskākais nosacījums latviešu valodas pastāvēšanai un attīstībai.

Atslēgvārdi: latviešu valoda, lingvistiskā diskriminācija, latviešu lingvistiskā uzvedība, kritiskā tekstpratība, kritiskie incidenti

SKOLĒNU ZINĀTNISKĀ PĒTNIECĪBA KĀ TEKSTPRATĪBAS KOMPLEKSO PRASMJU ATTĪSTĪŠANA: RĪGAS ĀGENSKALNA VALSTS ĢIMNĀZIJAS PIEMĒRA ANALĪZE

RESEARCH AT SCHOOL AS DEVELOPMENT OF LITERACY COMPLEX
SKILLS: CASE ANALYSIS OF RIGAS AGENSKALNS STATE GYMNASIUM

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The tradition of research at school (also RS) in Latvian schools has developed since the mid-20th century, and several stages can be identified:

- a) first period (mid-20th century till 1990s) – student participation in scientific conferences;
- b) second period (1990s till the first decade of the 21st century) – development of student research papers to promote learning excellence;
- c) third period (since the second decade of the 21st century) – inclusion of RS in school curricula as an interdisciplinary course.

Today, RS has become an important part of the school pedagogical process, as it develops students' intellectual potential in various aspects. RS fosters cognitive, social, and self-management skills.

RS is directly oriented toward text literacy, since during the development of a research project, a student's knowledge, skills, and competencies are applied across all key stages of text literacy:

1. In the RS process, a textual input is received, as the student must identify and critically evaluate the content of texts, their reliability and usefulness; seek methods of information processing; collaborate with others (students, teachers, and scholars); and use a wide range of digital tools and resources.
2. This is followed by textual processing – the student structures their empirical research by decontextualizing and reconstructing the acquired information and substantiating it with examples from their own empirical material.
3. The development and defense of the student's own text constitutes the textual output. In RS, this is based on critically selected and processed information applied in a new context, simultaneously demonstrating the student's ability to analyze scientific data, identify causal relationships, and apply grammatical, semantic, pragmatic, and stylistic text production skills.

The paper will analyze the main stages of text literacy using the RS projects of Riga Āgenskalns State Gymnasium as examples.

Keywords: research at school, complex skills, textual input, textual processing, textual output

TERMINS – BŪTISKS ZINĀTNISKĀS TEKSTPRATĪBAS KOMPONENTS

TERM – AN ESSENTIAL COMPONENT OF SCIENTIFIC LITERACY

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Nozares terminu sistēma, precīzs to lietojums ir zinātniska teksta būtiska daļa. Ja mācību procesā tiek izmantoti aprakstoši izteiksmes līdzekļi vai semantiski neatbilstoši apzīmējumi, tas skolēniem rada ne tikai neprecīzu zinātnisko ainu, bet arī kļūdainu mācību satura un jēdzienu uztveri, piemēram, morfēmu dēvēšana par vārda sastāvdaļām, teksta tipu dēvēšana par teksta veidiem, temata jaukšana ar tēmu u. tml.

Mācību līdzekļos, dažādos izglītības dokumentos un pedagogiem domātās rokasgrāmatās, kā arī projektos izstrādātajos materiālos vērojama mācību metožu un metodisko paņēmienu dažādība un bieži vien individuāli specifisks lietojums. Latviešu valodas un literatūras mācību metodikā līdztekus klasiskajām un tradicionālajām, laiku lokos pārbaudītajām metodēm un metodiskajiem paņēmieniem ienāk gan jauni paņēmieni un to nosaukumi, kas labi iekļaujas latviešu valodas sistēmā, atbilst terminu izstrādes pamatprincipiem, gan arī pētnieku un pedagogu darināti metaforiski apzīmējumi un leksiskie kalki, kas neatbilst terminrades principiem un latviešu valodas normām.

Referātā semantiski funkcionālā aspektā tiks analizēti daži latviešu valodas mācību materiālos nekorekti lietotie lingvistikas vienību apzīmējumi, kā arī vairāki jauniešiem valodas un literatūras metodikā, kas iegūti gan no izglītības dokumentiem un mācību materiāliem, gan dažādu projektu aprakstiem, skolotāju semināros, augstskolas lekcijās un ikdienas darbā konstatētiem valodas faktiem.

Referātā skatītie jauniešiem lielākoties radušies, tulkojot angļu valodā lietotos apzīmējumus, lai nosauktu konkrētas mācību darbības, norises, atgriezeniskās saites nodrošināšanas paņēmienus. Visbiežāk nosaukumu pamatā ir vizuālie un sadzīviskie priekšstati un metaforisks nozīmes pārnese, piemēram, *4 stūri, ēdienkarte, izejas biļete, lasīšanas stratēģijas, mērķa komunikēšana, stāsts* u. c., kas nepamatoti tiek dēvēti par mācību metodēm. Šie jauniešiem ne tikai atklāj terminrades izpratnes nepietiekamību un liecina par vajadzību rast zinātniskam tekstam atbilstošus apzīmējumus attiecīgo paņēmienu nosaukšanai, bet arī signalizē par akūtu nepieciešamību pievērst nozares speciālistu uzmanību mācību metodikas terminoloģiskās sistēmas izstrādei un korektam lietojumam studentu, pētnieku un izglītības ierēdņu radītos tekstos.

Atslēgvārdi: latviešu valoda, literatūra, metodika, termini, jaundarinājumi

DIGITAL LITERACY PRACTICES OF HIGH SCHOOL STUDENTS IN THE DIGITAL AGE: A SYSTEMATIC REVIEW

VIDUSSKOLĒNU DIGITĀLĀ PRATĪBA DIGITĀLAJĀ LAIKMETĀ: SISTEMĀTISKAIS PĀRSKATS

Rihards Zvejnieks

Rīgas Mākslas un mediju tehnikums

In the 21st-century digital age, high school students operate within rapidly evolving digital environments characterized by social media, algorithm-driven information systems, and participatory cultures. This context makes digital literacy a critical, multidimensional competence essential for responsible academic, social, and civic engagement. This systematic review aims to determine how digital literacy can be effectively established and integrated among high school students, based on the hypothesis that integration is most meaningful when connected to students' real life digital practices. It addresses what digital literacy means, how the digital context shapes its development, and which themes characterize its integration in secondary education. The study employs a systematic literature review and comparative analysis of contemporary definitions of digital literacy, synthesizing key dimensions across scholarly sources. It also examines Latvian national educational standards and policy documents to contextualize how digital literacy competencies are formally embedded within secondary education. The findings reveal a shift from functional, skills-based models toward a holistic and context-sensitive understanding of digital literacy that integrates knowledge, skills, attitudes, ethical responsibility, and critical reflection. The review concludes that digital literacy is most effectively fostered when educational practices align with students' everyday digital experiences and emphasize e-safety, information and media literacy, digital citizenship, and well-being. The study underscores the need for adaptive and integrative educational frameworks that move beyond technical proficiency toward critical, ethical, and participatory engagement. By conceptualizing digital literacy as a dynamic and multidimensional competence, the research contributes to strengthening curriculum design and policy development for secondary education in a digitized society.

Keywords: digital literacy, high school students, digital age

1.7. sekcija. **KĀ NODROŠINĀT SABIEDRĪBAS
ILGTSPĒJĪBU? /**
**HOW TO ENSURE SUSTAINABILITY
FOR SOCIETY?**

THE RELATIONSHIP BETWEEN INDICATORS OF ATTENTION DEFICIT AND HYPERACTIVITY DISORDER, ATTITUDES TOWARD ARTIFICIAL INTELLIGENCE AND JOB CRAFTING IN WORKING ADULTS

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The aim of the study was to investigate the relationship between ADHD (attention deficit hyperactivity disorder) characteristics, attitudes towards AI (artificial intelligence) and job crafting. With the growing popularity of neurodiversity in the professional environment, it is important to understand what techniques can be used to help neurodiverse employees.

The study involved 239 respondents, 24.7% of whom were male ($n = 59$) and 75.3% female ($n = 180$). The age of the participants ranged from 18 to 70 years ($M = 36.14$; $SD = 12.54$). Research method – quantitative research. Research design – non-experimental, cross-sectional, correlation study. Data collection method – surveys. Statistical methods – correlation analysis and regression analysis – were used to answer the research questions and hypothesis posed in the study.

Surveys that were used in the research were: “Adult Executive Functioning Inventory” (ADEXI; Holst & Thorell, 2017), “The Approach-Avoidance Job Crafting Scale” (Lopper et al., 2023) and “The General Attitudes towards Artificial Intelligence Scale (GAAIS)” (Schepman & Rodway, 2020), which was initially adapted into Latvian as part of this thesis.

The results of the study suggest that there is an association between positive attitudes towards AI and the adult executive function ‘impulse control’, and an association between the adult executive functions and three of the four avoidance strategies. Among the approach strategies and the “impulse control” subscale, correlations are observed in two out of four cases. The study hypothesis – “ADHD traits predict avoidance approaches to behavioral resource and demand crafting, as well as cognitive resource and demand crafting” – is partially confirmed, as ADHD traits statistically significantly predict avoidance strategies, although the explained variations are low.

The findings of the study provide practical insights for employers to increase their understanding of the work habits and inclusion of neurodiverse employees.

SOCIAL WELL-BEING AND QUALITY OF LIFE AMONG OLDER ADULTS IN LATVIA – EVIDENCE FROM SHARE DATA

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Objectives: Population ageing is a major challenge of the 21st century and is associated with declining physical and mental abilities, increased disease burden, and higher mortality. Latvia has the lowest healthy life expectancy in the European Union (EU) (54.3 years for women and 51.2 years for men, compared to the EU average of 63.3 and 62.8 years, respectively). Social well-being is a component of healthy and active ageing and may be associated with older adults' quality of life (QoL). This study aimed to assess the relationship between social well-being and QoL among older adults in Latvia.

Materials and Methods. Data from wave 9 of the Survey of Health, Ageing, and Retirement in Europe (SHARE) (2022) were analysed using linear regression. QoL was measured using the Control, Autonomy, Self-realization, and Pleasure scale (CASP-12) (range 12–48, higher scores indicate better QoL). Social well-being factors included education, employment status, financial capacity, place of residence, social network (SN) characteristics, received help, based on self-reported questionnaires. Statistical significance was set at $p < 0.05$.

Results. The study included 1,643 individuals aged 50+ from Latvia, 61.4% of whom were women. The median QoL score was 34. Higher educational level ($\beta = 0.20$), employment ($\beta = 0.23$), better financial capacity ($\beta = 0.19$), larger SN ($\beta = 0.19$), greater satisfaction with SN ($\beta = 0.22$), and participation in social activities ($\beta = 0.13$) were positively associated with QoL. Receiving help in the past year was negatively associated with QoL ($\beta = -0.09$) (all $p < 0.001$).

Conclusions. Higher educational level, employment, better financial capacity, larger and more satisfying SN, and participation in social activities were associated with better QoL. These findings highlight the importance of social and economic resources in shaping older adults' QoL and support the development of targeted support strategies for this population.

BASIC HUMAN VALUES AND HEALTH BEHAVIOURS: A CROSS-NATIONAL ANALYSIS OF ESS ROUND 11 DATA

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Individual health behaviours, including dietary habits, physical activity, and the consumption of tobacco and alcohol, are among the significant determinants of public health outcomes and human capital development. While socio-demographic factors are frequently cited as predictors of these behaviours, the underlying motivational drivers rooted in personal value systems remain less explored in a contemporary, post-pandemic European context. This study investigates how basic human values, as defined by Shalom Schwartz's theory of basic human values, influence health-related choices across European societies.

The study draws upon the recently released data from the European Social Survey (ESS) Round 11 (2023–2024) including the rotating module focusing on social inequalities in health. The key independent variables comprise the 21-item battery which allows for the construction of the ten basic values (e.g., Self-Direction, Stimulation, Hedonism, Security, and Conformity) and the four higher-order value dimensions (Openness to Change, Self-Enhancement, Conservation, and Self-Transcendence). The dependent variables focus on health behaviours, e.g. frequency of fruit and vegetable consumption; engagement in physical activity; cigarette smoking; and alcohol consumption patterns, including frequency and binge drinking. The analysis employs multilevel techniques to identify patterns both within Latvia and in a comparative cross-national perspective across participating ESS countries.

The study aims to determine whether specific value orientations consistently correlate with health-promoting or health-risking behaviours. It is suggested that health interventions may be more effective if they are tailored to the prevailing value systems of specific population segments. This contributes to the conference theme of building a healthy, knowledge-based society by linking psychological theory with large-scale sociological data on health behaviour.

THE RELATIONSHIP BETWEEN MINDFULNESS AND PAIN CATASTROPHIZING AMONG PATIENTS WITH MIGRAINE

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Objectives. Migraine is one of the most prevalent neurological disorders worldwide, affecting 14–15% of the global population (Steiner & Stovner, 2023), and causing a substantial psychological burden, particularly when pain is catastrophized. This study examined mindfulness association with pain catastrophizing in migraine and assessed associations with age and differences by education and gender.

Methods. This cross-sectional correlational study included 324 patients with diagnosed migraine aged 18–68; 92.6% were women. Mindfulness (observing, describing, acting with awareness, non-judging, non-reactivity) was measured using the Five Facet Mindfulness Questionnaire (Baer et al., 2006), and pain catastrophizing was measured using the Pain Catastrophizing Scale (Sullivan et al., 1995). Spearman's correlation coefficient was used to examine associations; Welch's t-test and the Mann–Whitney U test were used to examine group differences.

Results. In the migraine sample, mindfulness was moderately negatively associated with pain catastrophizing ($r_s = -0.32$, $p < 0.001$). Associations differed across mindfulness facets. Describing ($r_s = -0.24$, $p < 0.001$), non-reactivity ($r_s = -0.15$, $p < 0.01$), and acting with awareness ($r_s = -0.23$, $p < 0.001$) showed weak negative associations; non-judging showed the strongest moderate negative association ($r_s = -0.39$, $p < 0.001$), whereas observing showed a weak positive association ($r_s = 0.12$, $p < 0.05$).

Age was weakly positively correlated with mindfulness ($r_s = 0.26$, $p < 0.01$). Women reported higher pain catastrophizing than men ($t(26.19) = 4.00$, $p < 0.01$, $d = 0.88$), whereas men scored slightly higher on mindfulness ($t(34.30) = -2.33$, $p = 0.03$, $d = 0.38$). These results should be interpreted cautiously due to the small male subsample. No differences in total scores by education level were found.

Conclusions. These findings support an association between mindfulness and pain catastrophizing in migraine, with facet-specific directions, and may inform non-pharmacological support planning, including psychological counselling and mindfulness-based interventions.

PRE-FRAILITY AND FRAILITY AMONG OLDER ADULTS IN LATVIA: FINDINGS FROM THE SHARE STUDY

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Background. As frailty is a public health concern in ageing societies, affecting quality of life, functional independence, and participation in social life, and thereby influencing the long-term sustainability of health and social systems, the aim of this study was to examine pre-frailty and frailty among older adults in Latvia and to explore differences across sociodemographic and health characteristics.

Methods. Data from Latvian participants aged 50+ in SHARE Wave 8 (2020) and Wave 9 (2022) were analysed. The proportion of individuals classified as pre-frail or frail was estimated overall and by sex, age group, partnership status, financial strain, self-perceived health, and multimorbidity.

Results. The sample comprised 526 participants from Latvia (61.6% women; mean age \$69.8 \pm 8.9\$ years). The findings indicate an increase in both pre-frailty and frailty between the two survey waves. Women consistently demonstrated higher levels than men. Higher levels were observed among older age groups, individuals not living with a partner, and those with multimorbidity. Poor self-perceived health was strongly associated with frailty.

Conclusions. The results underscore increasing vulnerability among older adults and highlight the need for interdisciplinary, evidence-based strategies that integrate health, lifestyle, and social support to promote quality of life and sustainable societal development.

CLIMATE CHANGE THROUGH THE LENS OF NATIONAL IDENTITY: PATRIOTISM, NATIONALISM, AND THE LIMITS OF PRIMING

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Climate change represents a central sustainability challenge, yet public responses to climate policies and solutions have become increasingly politicised. Debates surrounding climate change increasingly reflect broader societal polarisation and highlight the role of identity dynamics in shaping engagement with sustainability challenges. National identity orientations can structure how individuals position themselves within polarised climate debates. In this context, patriotism and nationalism represent distinct forms of national identification associated with different patterns of climate-related attitudes.

We conducted an experimental study that combined identity priming with psychophysiological measurement. Participants (N = 88; aged 18–25) were randomly assigned a patriotic or nationalist priming condition and then exposed to climate change texts. Autonomic nervous system activity was recorded using an EmotiBit wearable sensor, assessing heart rate, heart rate variability, and electrodermal activity. Participants also completed a patriotism–nationalism scale and evaluated statements assessing climate scepticism and basic climate understanding.

Climate texts elicited clear physiological activation relative to baseline. No systematic differences emerged between priming conditions in physiological or evaluative outcomes. In contrast, dispositional national identity orientations showed significant associations with climate beliefs. Nationalism was positively related to climate scepticism, whereas patriotism was positively related to basic climate understanding. Climate engagement appears to be more closely aligned with enduring identity orientations than with experimentally induced cues. Therefore, identity remains a central factor in how climate information is interpreted. These results suggest that different forms of national identification can foster distinct pathways toward – or away from – constructive engagement with climate change.

THE RELATIONSHIP BETWEEN ADOLESCENT SELF-COMPASSION, ACADEMIC STRESS, AND SELF-ESTEEM

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Studies show that the school environment and learning demands are among the sources of academic stress for adolescents (Wang et al., 2024; Gao et al., 2023). The problem is also relevant in the Latvian context – data from the Centers for Disease Control and Prevention (CDC, 2023) show that more than half of adolescents feel very burdened with their studies and experience high stress.

Given the negative impact of stress, it is important to identify resources that help adolescents maintain healthy self-esteem. One such resource is self-compassion. Based on the theoretical concept of Kristine Neff (Neff, 2003a), self-compassion includes the ability to treat oneself with kindness, support in difficult moments, and not self-criticism. International studies (Neff & McGehee, 2010) confirm that adolescent self-compassion promotes better stress management and emotional well-being, but this relationship has been little studied among Latvian adolescents. The aim of the study was to investigate the relationship between adolescents' self-compassion, perceived academic stress, and self-esteem, as well as to determine whether self-compassion acts as a mediator in these relationships. The study involved 160 adolescents aged 14 to 18.

Data were collected using the Self-Compassion Scale (Neff, 2003b), the Educational Stress Scale for Adolescents (Sun et al., 2011), and the Rosenberg Self-Esteem Scale (Rosenberg, 1965).

The results showed that adolescents at the secondary school stage have statistically significantly lower self-compassion than at the basic school stage. No statistically significant differences were found in academic stress levels between exam and intermediate classes, nor were there gender differences in self-esteem. Self-compassion positively correlates with self-esteem, while academic stress correlates negatively. Self-compassion acts as a partial mediator between academic stress and self-esteem.

ASSOCIATIONS BETWEEN SOCIAL MEDIA USE DURATION, MENTAL HEALTH, AND SOCIODEMOGRAPHIC FACTORS IN ADULTS

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The rapid growth of social media use has intensified concerns about its relationship with mental health and digital well-being. Contemporary digital well-being frameworks propose that psychological outcomes are influenced not only by the duration of social media use but also by patterns of engagement and individual vulnerability factors. Previous research has identified small but consistent associations between intensive or problematic social media use and elevated levels of depression and anxiety. Evidence further suggests bidirectional mechanisms, whereby individuals experiencing higher levels of distress may engage in compensatory social media use, potentially reinforcing maladaptive patterns. However, empirical evidence regarding these relationships among adults in Latvia remains limited.

The present study aims to examine the relationships between social media use duration, mental health indicators (depression and anxiety), and socio-demographic factors among adults in Latvia. It is hypothesized that longer social media use duration will be associated with higher levels of depression and anxiety.

The study employs a cross-sectional design using a non-probability voluntary sample of approximately 800 adults aged 18–65 years recruited through social media advertisements and institutional communication channels. Social media use duration will be assessed using screenshots of device screen-time data from the previous four weeks. Depressive symptoms will be measured using the Patient Health Questionnaire-9 (PHQ-9), and anxiety will be assessed using the State–Trait Anxiety Inventory (STAI). Participants will also answer an open-ended question regarding perceived benefits of social media use and provide socio-demographic information.

Quantitative analyses will examine associations and predictive relationships between variables, while qualitative responses will provide contextual insight into subjective experiences of digital well-being. The findings are expected to contribute to the empirical understanding of digital well-being and support evidence-based policy and intervention development in Latvia.

THE ROLE OF SITUATIONAL REFLECTION IN ROAD SAFETY: DEVELOPMENT AND VALIDATION OF THE DRIVER SITUATIONAL REFLECTION SCALE

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Research on driver behavior should extend beyond isolated descriptions of individual tendencies and instead consider how drivers cognitively construe interactive traffic situations. The presentation will argue that mental representations of dynamic road scenarios, including the ability to anticipate how other road users perceive and interpret the same situation, are central to mitigating risky behavior. On this basis, a new assessment instrument was developed to capture the extent to which drivers engage in situational reflection and perspective-taking within traffic flow, termed the Driver Situational Reflection Scale (DSRS). The validated version of the scale comprises two dimensions, Caution and Perspective-taking. Across multiple studies, these factors demonstrated solid predictive utility with respect to adaptive and maladaptive driving patterns, including prosocial and aggressive behaviors in Studies 1A and 1B, as well as self-reported driving competence in Study 2.

ATTITUDE STRENGTH AND METACOGNITIVE SKILLS AS PREDICTORS OF TRUTHFULNESS JUDGMENTS OF ATTITUDE-CONGRUENT VS. INCONGRUENT SOCIAL MEDIA POSTS

Ivars Austers, Ģirts Dimdiņš, Rihards Olups, Mārtins Priedols, Zanda Rubene, Klāvs Ēvelis

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This study explored how the alignment of social media content with users' existing beliefs (congruency) and the quality of that content shaped the perceived truthfulness of this content, with particular emphasis on whether metacognitive skills helped individuals resist confirmation bias. In a within-participants design, we manipulated the attitude congruency of social media posts and the quality of argumentation of these posts, and measured online metacognitive skills as an individual-difference variable. Two samples – a university student group ($N = 96$) and a social-network community sample ($N = 121$) – evaluated simulated social media posts on two socially salient topics: migration (pre-tested as a moderately polarising topic in the Latvian society) and women's traditional gender roles (a highly polarising topic).

We hypothesised that high-quality posts would be judged as more truthful overall and that congruent content would bias truth ratings, especially among individuals with stronger attitudes. In addition, we hypothesised that metacognitive skills would reduce the effects of congruency on the truth ratings. As predicted, participants rated congruent and balanced high-quality posts as more truthful than low-quality content. Individuals with stronger attitudes showed larger differences in truth ratings between congruent and incongruent posts, reflecting heightened confirmation bias, particularly regarding gender-roles content (the more polarising issue of the two). These patterns were replicated across both samples. In line with the hypothesis, metacognitive skills played a moderating role. When individual differences in metacognitive skills, measured via a novel questionnaire designed for information-processing contexts, were included in the analysis, the influence of content congruency on truth ratings substantially decreased. Participants with stronger metacognitive skills displayed a markedly reduced confirmation bias, evaluating the truthfulness of posts in a more balanced, less belief-driven way. These findings underscore the central role of metacognitive skills in shaping how individuals interpret social media information.

BIOPSYCHOSOCIAL NETWORK PROFILE OF OLDER ADULTS WITH PRESERVED IMMEDIATE MEMORY

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Cognitive ageing research has identified multiple life-course factors contributing to memory performance; however, very few studies have collectively examined their interaction. This study examined the biopsychosocial profile of older adults with preserved immediate memory. Data from 213 adults aged 50-92 ($M=64.42$, $SD=9.46$) participating in the Latvian study from Survey of Health, Ageing and Retirement in Europe (SHARE) demonstrating high immediate recall performance (immediate memory score ≥ 7) were analyzed using network analytic approach. The network included indicators of physical health (frailty, chronic disease, mobility, pain level, quality of hearing, body mass index), emotional state (depressed, irritability, tearfulness, fatigue, loneliness), well-being (quality of life, satisfaction with social interactions), and lifestyle and socioeconomic factors (education, leisure activities). A regularized partial correlation network was estimated using EBICglasso ($\gamma = .65$), and stability was assessed using case-dropping bootstrap (1000 iterations).

The network demonstrated adequate stability (CS-coefficient for strength = .35) and moderate sparsity (46 of 105 possible edges retained; sparsity = .56). Frailty emerged as the most central node ($S = 1.58$), followed by chronic disease ($S = 1.20$) and depressed mood ($S = 1.02$). Quality of life showed the strongest negative expected influence ($EI = -2.08$), suggesting a broadly protective role across multiple domains. Mobility ($S = .42$), fatigue ($S = .42$), and loneliness ($S = .40$) also demonstrated moderate centrality. In contrast, education ($S = -1.42$) and leisure activities ($S = -1.78$) showed low centrality, indicating a more peripheral position. Overall, the network structure reflected close interconnections between physical health, emotional functioning, and well-being.

Current findings suggest that preserved immediate memory in older adults is characterized by close interconnections between physical health, emotional functioning, and well-being. Network analysis provides a systems-level perspective on cognitive ageing and may help identify key factors associated with maintained cognitive functioning in later life.

YOUTH CIVIC ENGAGEMENT IN SUSTAINABLE URBAN DEVELOPMENT: THE POTENTIAL OF CITIZEN SCIENCE AND PHOTO ELICITATION METHODS

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Sustainable urban development requires not only technical solutions, but also active public engagement (Ping et al., 2026; Miguel et al. 2010) and community participation (Yang et al., 2022; Portschy, 2016) in decision-making. Community involvement in planning processes is an important element of sustainable development (Rijal, 2023). Our conference paper is based on the findings of the study “The Potential of Photo Elicitation Methods in Research on Youth Digital Civic Participation: The Case of Riga’s Urban Environment,” analyzing youth engagement with the digital citizen science application “CiVo – Citizen Voice”. Within the scope of the study, the photo elicitation method was used, along with focus group discussions, with a total of 20 young people involved in the project. The aim of the study is to explore how young people’s involvement in shaping the urban environment promotes their social engagement, sense of community belonging, and responsibility for their living environment. The research shows that young people value a safe, attractive, and functional urban environment. They want to actively participate in shaping it, which promotes youth wellbeing by enhancing social connectedness, empowerment, and a sense of meaningful community contribution. The study concludes that citizen science enhances young people’s scientific skills and encourages their active societal involvement, both of which are vital for sustainable and democratic urban growth. The findings highlight the importance of encouraging youth involvement in urban planning and using participatory approaches to increase public engagement and support sustainable development.

THE RELATIONSHIP BETWEEN RESILIENCE AND GROWTH MINDSET AMONG HIGHER EDUCATION STUDENTS IN LATVIA (Poster)

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Objectives. Psychological resources such as resilience and growth mindset play an important role in students' adaptation to academic demands in higher education. The aim of the study was to examine the relationship between growth mindset and resilience among higher education students in Latvia, as well as gender differences and associations with age, year of study, and prior attainment of higher education.

Materials and methods. A quantitative cross-sectional correlational study was conducted with 429 higher education students from 10 Latvian higher education institutions. Resilience was measured using the Resilience Scale (RS-25), and growth mindset was assessed with the Revised Implicit Theories of Intelligence Scale. Data analysis was performed in Jamovi. Spearman's rank correlation, Mann-Whitney U test, and Welch's one-way ANOVA were used for data analysis. Effect sizes were reported using rank-biserial correlation.

Results. A weak but statistically significant positive association was found between students' growth mindset and resilience ($\rho = 0.25$, $p < .001$). No significant gender differences were observed in resilience ($U = 16259$, $p = .861$), whereas women reported significantly higher growth mindset scores than men ($U = 11619$, $p < .001$, $r = -0.29$). No significant associations were found between age and resilience ($\rho = -0.04$, $p = .466$) or growth mindset ($\rho = -0.05$, $p = .261$). Furthermore, no statistically significant differences in resilience or growth mindset were found across years of study or between students with and without prior higher education ($p > .05$).

Conclusions. The results indicate that resilience among higher education students is weakly associated with growth mindset and shows little variation across demographic and educational groups. In contrast, growth mindset varies by gender, suggesting different patterns of relevance for these psychological constructs.

WORKING BEHIND BARS: PRISONIZATION AND WORKERS' WELL-BEING (Poster)

Viktorija Guntra Skrodere

Correctional institutions can be described as socially, physically, and morally oppressive environments. To function in such settings, individuals must internalize the institutions rules and norms in their thoughts and behavior. Haney (2002) defined this adaptation process as prisonization, highlighting its long-term effects on inmates' lives. Although prisonization has historically been researched only among prison population, recent studies (Stevens & Schultz, 2024; Maycock et al., 2020) suggest that prison staff may experience a similar adaptation process with lasting implications on their well-being. This exploratory study examined how prison staff view their workplace and the impact it has on their lived experience. The sample consisted of seven prison staff members. The questionnaire included six open-ended questions, asking for both positive and negative aspects of their workplace and its impact on them personally. Unlike previous studies that primarily emphasize the negative aspects of prison work, this approach aimed to provide a more balanced understanding of their work experience. Data was analyzed using thematic analysis. Four main categories describing work environment were social guarantees and salary, infrastructure and material support, social climate and work organization. Three main categories illustrating the prisonization process were professional competence, professional identity and well-being. The results of this research reveal that sustainable well-being among prison staff cannot be achieved without improving organizational, social, and material conditions, highlighting the need to address the institutional environments in which public service workers perform their tasks.

SOCIAL ROLE OF MUSEUMS IN PROMOTING HEALTH AND WELL-BEING OF SENIORS: OPPORTUNITIES AND CHALLENGES FROM A MUSEUM PERSPECTIVE (Poster)

Elza Ēķe

Latvian National Museum of Art / Latvian Academy of Culture

Historically, museums have played a significant role in the preservation, collection, and research of cultural heritage. However, since the 1980s, with the development of New Museology, a paradigm shift has occurred, highlighting museums' social role and orientation toward contemporary societal processes. Today, museums are increasingly understood as multidimensional organizations – agents of social change, facilitators of participatory engagement, and more recently, as resources for promoting public health and well-being. This direction developed particularly in the United Kingdom in the late twentieth century and later expanded in Europe, the United States, Canada, and beyond.

The relevance of this topic is determined by several factors. First, over the past two decades, international research has increasingly demonstrated the positive impact of cultural participation, including museum engagement, on individual health and well-being. Meanwhile, relevant practices in museums as well as policy planning initiatives have been developing in various countries. Second, Europe and Latvia are experiencing demographic ageing, which is expected additional pressure on health and social care systems and encourage the search for cross-sectoral solutions, including the involvement of cultural institutions.

The aim of the research is to provide an in-depth analysis of practices promoting health and well-being within the framework of museums' social role, and to identify current challenges and opportunities for the museum sector. The study applies analytical and comparative methods, based on a review of scientific literature and policy documents. The findings suggest that while museums possess significant potential to contribute to the quality of life of society, these initiatives require critical examination from a museum studies perspective and are constrained by several significant factors, such as a fragmented theoretical foundation within museum studies, challenges in cross-sectoral collaboration, and limited professional competencies, among others.

DEVELOPING AN INSTRUMENT FOR ASSESSING SEXUALITY EDUCATION MATERIALS FROM A FAMILY FORMATION PERSPECTIVE (Poster)

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In the context of demographic challenges and concerns about relationship stability in Europe, sexuality education is increasingly discussed in relation to family formation and long-term well-being. Building on the concept of Sexuality Education for Family Formation, this study presents the development of an instrument designed to assess sexuality education materials from the perspective of family values and education for family formation. The theoretical framework integrates family systems theory, research on parental relationships and child flourishing, and value-based approaches to sexuality education.

The research follows a theory-based content evaluation design. First, principles of education for family formation were identified through analysis and synthesis of scientific literature and selected educational programmes from Spain, Lithuania, Italy, Germany, and the United States. Second, an expert-informed instrument was constructed, structured into six dimensions: (1) Relationships, family formation and family; (2) Biology, life and physical health; (3) Psychological and emotional aspects; (4) Sexual behaviour; (5) Social aspects; and (6) Ethical aspects. The instrument comprises 18 criteria and 39 indicators, each assessed on a 3–5 level scale.

The instrument contributes to sustainability discussions by offering a structured method to evaluate how sexuality education content supports responsible relationships, family stability, and long-term psychosocial well-being. It complements dominant outcome-based evaluations by foregrounding the value-oriented content dimension of sexuality education.

WORKING WITH UNCERTAINTY: A PSYCHOSOCIAL PERSPECTIVE ON PROFESSIONAL RESPONSES TO ADOLESCENT SEXUAL BEHAVIOUR (Poster)

Kristiāna Kalniņa

University of Latvia

Professional responses to adolescent sexual behaviour are commonly framed as questions of knowledge, attitudes, or correct decision-making. However, empirical practice often confronts professionals with situations that resist clear categorisation and generate uncertainty. Understanding how professionals navigate such moments is increasingly relevant for sustainable psychological practice and social wellbeing.

This presentation explores uncertainty as an analytic focus within qualitative research on professional decision making. Drawing on think-aloud interviews with professionals responding to scenarios involving adolescent sexual behaviour, the study adopts a psychosocial qualitative perspective that attends not only to thematic content but also to moments of hesitation, silence, and disrupted reasoning emerging during verbal reflection.

Rather than interpreting uncertainty as a deficit of competence, findings suggest that ambiguity constitutes an inherent feature of professional practice in sensitive social contexts. A psychosocial analytic approach allows these moments to be understood as sites where institutional expectations, personal responsibility, and relational meanings intersect.

The presentation discusses methodological implications of analysing uncertainty as data and considers how professionals' capacity to remain engaged under conditions of ambiguity contributes to sustainable and psychologically supportive responses within society.

1.8. sekcija. **MOLEKULĀRĀS BIOLOĢIJAS SEKCIJAS
UN LATVIJAS BIOĶĪMIJAS BIEDRĪBAS
9. KONFERENCES SĒDE /**

**MOLECULAR BIOLOGY SECTION AND
LATVIAN BIOCHEMISTRY SOCIETY
9TH CONFERENCE SESSION**

VITAMIN D PATHWAY GENETICS AND NEDA OUTCOMES ACROSS MS THERAPIES IN A LATVIAN COHORT

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Background. Vitamin D signaling and transport are implicated in multiple sclerosis (MS) susceptibility and immune regulation. However, inter-individual variability in treatment response remains substantial, and genetic variation in the vitamin D pathway may contribute to therapy-dependent differences in achieving “no evidence of disease activity”(NEDA).

Aim. To evaluate whether polymorphisms in VDR and GC are associated with NEDA during the first two years after treatment initiation and to explore potential therapy- and interferon (IFN) preparation-specific effects.

Methods. Latvian MS patients were assessed for NEDA at years 1 and 2 after treatment initiation and stratified by therapy (IFN, GA, MX); IFN-treated patients were additionally stratified by IFN preparations (IFN-A, IFN-R, IFN-B/E). VDR (rs1544410, rs7975232, rs731236) and GC (rs7041, rs4588) variants were genotyped by PCR-based assays, and genotype distributions were compared by NEDA status within and between therapy groups. ORs were computed for NEDA- (OR < 1 protective; OR > 1 risk).

Results. Overall, vitamin D pathway loci showed therapy-dependent associations with NEDA, most prominently at year 2. Under IFN, VDR rs1544410 (G > A) was associated with NEDA ($P = 3.98 \times 10^{-2}$; $V = 0.16$), with AA + GA showing a more favorable NEDA profile compared with GG. A similar IFN-stratum association was observed for VDR rs731236 (T > C) ($P = 2.99 \times 10^{-2}$; $V = 0.16$). Within IFN-treated patients, stratification by IFN preparations further indicated preparationspecific heterogeneity for VDR rs7975232 (IFN-R: $P = 1.90 \times 10^{-2}$; $V = 0.40$) and VDR rs731236 (IFN-R: $P = 1.68 \times 10^{-2}$; $V = 0.30$). For vitamin D transport, GC rs4588 (C > A) differed between medication groups at year 2 ($P = 2.04 \times 10^{-2}$; $V = 0.22$) and showed opposite directions across therapies: AA + CA tended toward higher NEDA+ odds under IFN (OR ≈ 1.40) but lower NEDA+ odds under GA (OR ≈ 0.83), consistent with a potential gene-treatment interaction. In addition, GC rs7041 (G > T) showed a between-therapy difference in year 1 under MX ($P = 2.57 \times 10^{-2}$; $V = 0.37$), supporting therapy dependence also at earlier follow-up.

Conclusions. VDR and GC variants, especially VDR rs7975232/rs1544410/rs731236 and GC rs4588/rs7041, show therapy- and IFN preparation-specific associations with NEDA in this Latvian MS cohort, supporting a potential gene-treatment interaction. These findings should be validated in larger independent cohorts and incorporated into integrated prediction models combining genotype, clinical, and treatment variables.

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CANDIDA AURIS ŠŪNAPVALKA ARHITEKTŪRAS RAKSTUROJUMS KASPOFUNGĪNA STRESA APSTĀKĻOS, IZMANTOJOT CIETVIELU KMR UN TEM

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Candida auris (*C. auris*) ir cilvēka patogēna sēne, kas izraisa smagas infekcijas ar augstu mirstības līmeni, kas ir grūti identificējamās un iznīcināmas. Pašlaik ehinokandīni ir visbiežāk lietotie pretsēnīšu līdzekļi *C. auris* infekciju ārstēšanai. Ir pierādīts, ka ehinokandīni var mainīt *C. auris* sēnes šūnapvalka polisaharīdu sastāvu. Tomēr detalizēta šūnapvalka sastāva analīze atomu līmenī joprojām nav zināma.

Šajā darbā mēs apvienojām ¹³C, ¹⁵N un ³¹P cietvielu kodolmagnētiskās rezonanses spektroskopiju (cvKMR) un transmisijas elektronu mikroskopiju (TEM), lai strukturāli salīdzinātu šūnapvalka arhitektūru savvaļas tipa un hog1Δ *C. auris* celmiem pirms un pēc

kaspofungīna iedarbības. TEM analīze ļauj noteikt kopējo šūnas morfoloģiju ar 100–200 nm izšķirtspēju, savukārt cvKMR sniedz iespēju atomu līmenī pētīt dažādas mobilitātes polisaharīdus šūnapvalkā.

C. auris savvaļas tipa un *hog1Δ* mutants tika audzēti ¹³C un ¹⁵N bagātinātā barotnē kaspofungīna klātbūtnē un bez tā. Visi sagatavotie paraugi tika analizēti, izmantojot cvKMR spektroskopiju un TEM. Daudzdimensionālie cvKMR spektri atklāja strukturālas izmaiņas polisaharīdu sastāvā iekšējā un ārējā šūnapvalkā. Tas norādīja, ka kaspofungīna iedarbība gan savvaļas tipa, gan *hog1Δ* mutanta gadījumā ir saistīta ar šūnapvalka polisaharīdu arhitektūras reorganizāciju, nevis ar saražotās šūnapvalka masas atšķirībām. Savukārt TEM analīze parādīja, ka kaspofungīna iedarbība izraisīja izteiktu kopējā šūnapvalka biezuma palielināšanos savvaļas tipa celmā, kamēr *hog1Δ* celms saglabāja līdzīgu kopējo biezumu.

Iegūtie rezultāti parādīja, ka TEM un ssKMR kombinācija ļauj strukturāli detalizēti analizēt zāļu izraisītas šūnapvalka izmaiņas dažādos izšķirtspējas līmeņos.

FTO GĒNA RS9939609 POLIMORFISMA UN TCF7L2 GĒNA RS7903146 POLIMORFISMA IETEKME UZ ĶERMEŅA KOMPOZĪCIJU UN GLIKOZES LĪMENI JAUNĀM SIEVIETĒM

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Aktualitāte. Pasaules mērogā palielināts ķermeņa svars un aptaukošanās ir veselības problēma, kas skar lielu daļu pieaugušo pasaulē. Tā ir kompleksa slimība, kas ir saistīta ar indivīda ģenētiku un dzīvesveidu, t. sk. fiziskām aktivitātēm, uzturu, stresu un apkārtējo vidi. Dati par indivīda ķermeņa kompozīciju, pēcmaltītes glikozes līmeni un ar aptaukošanos saistītu genotipu un zināšanas par šo parametru savstarpējo ietekmi var sniegt iespēju identificēt personas ar paaugstinātu risku vielmaiņas saslimšanām jau agrīnā attīstības stadijā.

Mērķis. Pētījuma mērķis bija izvērtēt FTO gēna rs9939609 polimorfisma iespējamo ietekmi uz ķermeņa kompozīciju, kā arī TCF7L2 gēna rs7903146 polimorfisma iespējamo ietekmi uz ķermeņa kompozīciju un pēcmaltītes glikozes līmeni. Papildu mērķis bija izstrādāt un optimizēt metodoloģiju minēto polimorfismu noteikšanai, izmantojot polimerāzes ķēdes reakcijas (PCR) praimerus.

Metodes. Pētījumā identificējot rs9939609 un rs7903146 genotipu tika iekļauta attiecīgi 21 un 28 sievietes vecumā no 20 līdz 40 gadiem. Tika aprēķināts ķermeņa masas indekss (ĶMI). Tauku masa tika noteikta ar ultrasonogrāfijas metodi. Glikozes līmenis asinīs tika mērīts pēc ogļhidrātiem bagātas maltītes. Ar anketu palīdzību tika apkopoti dzīvesveida dati. DNS tika izdalīts no asins paraugiem, un genotipēšana tika veikta, izmantojot PCR un agarozes gela elektroforēzi.

Rezultāti. Starp rs9939609 genotipa grupām konstatētas statistiski nozīmīgas dispersiju atšķirības taukaudu masas parametros ($p < 0,05$) – indivīdiem ar alēlēm AA novērots augstāks aptaukošanās līmenis. PCR optimizācija rs9939609 noteikšanai tika panākta pie 61 °C praimeru piesaistes temperatūras, izmantojot 0,625 μL katra praimeru šķiduma. Tika izstrādāti praimeri, kas amplificē rs7903146 polimorfolokus sekvencēšanai, kā pamats polimorfisma detektēšanas praimeru izstrādei. Sākotnējie dati liecina par iespējamu saistību starp ķermeņa kompozīciju un pēcmaltītes glikozes līmeni.

Secinājumi. Rezultāti norāda uz iespējamu rs9939609 polimorfisma asociāciju ar adipozitātes parametriem, tomēr secinājumu apstiprināšanai nepieciešami pētījumi ar lielāku pētāmās populācijas grupu. PCR protokola optimizācija uzlaboja rs9939609 genotipēšanas precizitāti. Tika izstrādāti praimeri rs7903146 lokusa amplifikācijai un turpmākai analīzei.

Pateicības. Autori apstiprina interešu konflikta neesamību. Autori izsaka pateicību Dalius Butkauskas par ieguldījumu praimeru izstrādē un DNS sekvencēšanā. Autori izsaka pateicību pētījuma dalībniecēm.

ANALYSIS OF GENOMIC VARIATION AND POPULATION STRUCTURE OF LATVIAN DARK-HEAD SHEEP IN COMPARISON TO OTHER BREEDS IN LATVIA

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The Latvian Dark-head (Latvijas tumšgalve; LT) is the only species native to Latvia, having completely adapted to local climatic conditions. It is the sole national breed, holding cultural significance and contributing to traditional lifestyles, landscape preservation, and regional identity. As commercially advantageous sheep breeds dominate, indigenous genetic resources, particularly in small agricultural communities, face an increased threat of extinction.

This study evaluates the genetic diversity of the LT breed and compares it with that of other dominant sheep breeds in Latvia. Lambs from sire rams of notable breeds in Latvia were genotyped for the first time using the GeneSeek® Genomic Profiler™ Ovine 50K array. The examination of genetic diversity included assessments of minor allele frequency (MAF), and unique breed markers were identified by identifying fixed SNPs (MAF = 0) specific to each breed.

The study detected 27,561 highly polymorphic SNPs (MAF 0.3–0.5) in LT breed samples, indicating significant genetic divergence from other breeds. Among the detected SNPs, 2,668 (5.45%) were fixed in the LT breed, with 55 to 131 SNPs specific to it compared with other breeds. The OvineSNP50 panel is an essential tool for clarifying the genetic structure of the LT breed, enabling the identification of distinct genetic traits and distinguishing it from other breeds.

The findings enhance comprehension of the genetic foundation of the Latvian national sheep breed. Facilitating novel avenues for genetic research and the advancement of genetic selection within the Latvian sheep population.

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ČŪSKU REKOMBINANTO TOKSĪNU PIESAISTE VĪRUSVEIDĪGAJĀM DAĻIŅĀM PRETINDES IZSTRĀDEI

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Katru gadu no indīgu čūsku kodumiem mirst 81 000 līdz 138 000 cilvēku. Čūsku indes ir dažādu vielu maisījums, ko lielākoties veido proteīnu molekulas. Vienīgais drošais līdzeklis pret čūskas indi ir pretinde. Šobrīd joprojām pretindes tiek veidotas tāpat kā aizpagājušajā gadsimtā – imunizējot dzīvniekus ar pakāpeniski lielāku indes daudzumu, lai iegūtu hiperimunizētu plazmu, ko attīrot, iegūst antivielas. Tomēr nav garantijas, ka no dzīvniekiem iegūtās antivielas būs pret vistoksiskāko savienojumu, kā arī process ar čūsku turēšanu nebrīvē nav tas vieglākais un ētiskākais. Tiek ieviestas jaunas metodes pretindes veidošanai, bet tās pagaidām lielākoties fokusējas uz atsevišķiem indes komponentiem.

Šajā darbā mēs rekombinanti *Escherichia coli* BL21(DE3) sistēmā ar pievienotu maltozes saistītājproteīna (MBP) šķīdības tagu producējām un attīrījām 10 toksīnus no melnās mambas *Dendroaspis polylepis* un 11 toksīnus no piekrastes taipāna *Oxyuranus scutellatus* indes. No tiem 19 deva šķīstošu produkciju, un 14 toksīnus bija iespējams nošķelt no MBP taga un tos attīrīt. Šos 14 toksīnus mēģināts kovalenti saistīt pie vīrusveidīgajām daļiņām (VLP), iegūstot konjugātus pretindes izveidei. VLP mūsdienās tiek izmantotas dažādu vakcīnu izstrādē, jo uz to virsmas iespējams saistīt lielu daudzumu antigēnu, nodrošinot spēcīgāku imūno atbildi, un tai pat laikā mēs ceram padarīt pašus toksīnu nekaitīgākus imunizācijām.

Konjugācija pie AP205 VLP ar SpyTag/SpyCatcher sistēmu bija veiksmīga, bet atdalīt konjugātus no nesaistītajiem toksīniem izdevās tikai divos gadījumos. Pašlaik tiek izmēģināta ķīmiskā konjugācija pie Qβ VLP, izmantojot tetrazola un biciklononāna (BCN) iezīmes.

Veiksmīgi iegūtus konjugātus tālāk varēs izmantot imunizēšanai un tālākai analīzei pretindesizstrādē.

Atslēgvārdi: rekombinantie toksīni, VLP, pretinde

STRUKTURĀLO VARIĀCIJU ANALĪZE FARMAKOĢĒNOS LATVIJAS POPULĀCIJĀ

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Ievads. Cilvēka genoma strukturālās variācijas (SV) ietekmē farmakogēnu funkcionālo aktivitāti un cilvēku reakciju uz medikamentiem, taču līdz šim tehnoloģisko ierobežojumu dēļ pētījumi fokusējās tikai uz viena nukleotīda polimorfismu un mazu inserciju/delēciju analīzi.

Šī pētījuma **mērķis** ir noskaidrot biežākās strukturālās variācijas Latvijas populācijā un to ietekmi uz cilvēku reakciju uz medikamentiem.

Metodes. Genoma strukturālo variantu noteikšanai tika izmantoti Oxford Nanopore garo nolasījumu sekvencēšanas (LRS) dati no desmit Valsts iedzīvotāju genoma datubāzes dalībnieku paraugiem. Izmantojot bioinformātikas rīkus minimap2, Sniffles2, bcftools un EnsemblVEP tika atrasti strukturālie varianti genomā un farmakogēnos. SV apkopošana un analīze tika veikta programmā R.

Rezultāti. Vidēji paraugā tika identificēti 20811 kvalitatīvi SV (atrasti vismaz 5 nolasījumos), standartnovirze 3795 SV. Dominējošais SV tips bija insercijas un delēcijas. Visiem 10 cilvēkiem tika konstatēti 3724 SV, kas nav sastopami references genomā. Identificēto SV izmēru mediāna ir 337 bp, to garumi variē no 50 bp līdz 64 Mbp. 38,9% no visiem konstatētajiem SV skar proteīnu kodējošus gēnus. Visbiežāk skartie farmakogēni ir DPYD un HLA-DRB1.

Secinājumi. Pētījuma rezultāti liecina par augstu strukturālo variabilitāti atlasītajā kohortā un apliecina Oxford Nanopore potenciālu garo nolasījumu sekvencēšanas datu ieguvē. Inserciju pārsvars noteiktajos SV apstiprina tehnoloģisko nobīdi (bias) un ierobežojumus, ko rada īso nolasījumu sekvencēšana, īpaši attiecībā uz sarežģītu reģionu un inserciju identifikāciju. Lielais kopīgo variantu skaits (3724 SV) norāda uz sistemātiskām atšķirībām starp pētīto populāciju un cilvēka references genomu (GR Ch38), uzsverot nepieciešamību pēc populācijai specifiskiem datiem. Iegūtie dati kalpos kā pamats tālākai CYP2D6 un citu farmakogēnu kompleksās struktūras analīzei, izmantojot specializētus rīkus kā Stargazer un Clair3.

Atslēgvārdi: strukturālās variācijas, garo nolasījumu sekvencēšana, farmakogēni, bioinformātika.

BAKTERIĀLO GENOMU DE NOVO REKONSTRUĒŠANA NO DZELZS LAIKMETA SENĀS DNS SEKVENCĒM UN TO AUTENTIFIKĀCIJA

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Bakteriālo genomu de novo rekonstruēšana no dzelzs laikmeta senās DNS sekvencēm un to autentifikācija

Bakteriālo genomu de novo rekonstruēšanai mūsdienās plaši pielietota metode moderno metagenomu izpētē, kas pēdējo gadu laikā piedzīvo strauju popularitātes kāpumu senās DNS izpētes jomā. Šajā pētījumā tika pārskatītas jau ģenerētas metagenomiskās sekvences no iepriekš pētītiem un dzelzs laikmetam atbilstošiem indivīdu paraugiem no Latvijas.

No metagenoma rekonstruētie genomi jeb MAG (no angl. – Metagenome-assembled genomes) tika iegūti 23 indivīdiem ar mērķi raksturot tajos esošo armetagenomiskopielāgošanuneidentificēto mikroorganismu klātbūtni un identificēt potenciālās senās sekvences pielāgotajos datos. De novo genomu rekonstruēšana senās DNS analīzes ietvarā ļauj iegūt padziļinātu ieskatu augsnes baktēriju daudzveidībā, kā arī papildināt esošās zināšanas par arheoloģiskajos kaulos un zobos esošo baktēriju sastāvu. Apstrādes ievaros tika izmantotas lietojumprogrammas fastp datu pirmapstrādei un fastqc datu kvalitātes kontrolei. MEGAHIT ļāva veikt metagenoma datu montāžu, savukārt Bowtie2 – iso nolasījumu montāžu. Ar MetaWRAP palīdzību tika apvienotas divas datu grupēšanas (no angl. – binning) programmu stratēģijas MAG izveidei: sākotnējo grupu izveidei, kā arī to pilnveidei. Kontigu taksonomiskā piederība tika noteikta ar MMSeqs2, un MAG – ar GTDB-Tk. Visbeidzot, ar pyDamage palīdzību tika novērtēts senās DNS bojājumu apjoms.

Pētījuma gaitā izdevies konstatēt gan ar cilvēka mikrobiomu asociējamus mikroorganismus, gan arī apkārtējās vides mikroorganismus. Iegūtie dati ir piemēroti turpmākai izpētei, tos apvienojot ar indivīdu vēsturisko un apkārtējās vides kontekstu.

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THE PUTATIVE FUNCTION OF A CONSERVED MOTIF IN THE POTATO VIRUS M COAT PROTEIN

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A conserved motif of the viral coat protein has been previously described in Potexviruses and Carlaviruses.

In this study, the search was broadened to the family level (Alphaflexivirus) and the order level (Tymovirales) using MEME, and a motif of a different length but same location was found. Then, the motif was highlighted in an available Alphaflexivirus VLP structure using PyMOL. This revealed a putative function: the conserved residues are those that interact with the virus RNA.

PERIODONTĪTA VAKCĪNAS PROTOTIPA IZSTRĀDE UN IMUNOLOĢISKAIS RAKSTUROJUMS

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Izmaiņas cilvēka mikrobiotā un mikrobiomā ir ciešsaistītas ar dažādu lokālu un sistēmisku slimību attīstību. Periodontālās slimības, kas skar mutes dobuma cietos un mīksto audus, ir vienas no visizplatītākajām slimībām pasaulē. Periodontīts – hronisks zoba balstaudu iekaisums, kas var novest pie smaganu, zobu un žokļa kaula zuduma – skar aptuveni 12% pasaules populācijas. Slimības attīstībā nozīmīga loma ir mutes dobuma mikrobioma disbiozei. Būtisks periodontīta patogēns ir *Porphyromonas gingivalis*, kas producē virulences faktorus – gingipainus, proteolītiskus enzīmus, kurus citrulinē *P. gingivalis* peptidilarginīna deimināze (PPAD), veicinot neatbilstošu saimniekorganisma imūnatbildi.

Pētījuma mērķis bija izstrādāt periodontīta vakcīnas prototipu, kas balstīts uz augu vīrusu apvalka proteīnu (CP) veidotām vīrusiem līdzīgajām daļiņām (VLP), uz to virsmas prezentējot mērķantigēnu PPAD, un izvērtēt sākotnējo imunogenitāti BALB/c pelu modelī. Antigēna prezentēšanai tika izmantotas vairākas konjugācijas pieejas: ģenētiskā un ķīmiskā konjugācija, kā arī Ecoil/Kcoil un SpyTag/SpyCatcher sistēmas. Par antigēna nesējiem tika izmantotas gan filamentozas VLP no kartupeļu vīrusiem M, Y un X (PVM, PVY, PVX), gan ikosaedrāls VLP no baklažānu mozaīkas vīrusa (EMV) un gurķu mozaīkas vīrusa (CMV).

Tiešās ģenētiskās ekspresijas konstrukcijas veidoja šķīstošus agregātus, savukārt mozaīku ekspresijas pieeja nodrošināja CP-PPADVLP veidošanos, laigān PVM, PVY un PVX gadījumā modificētās VLP bija īsākas un mazāk stabilas nekā nemodificētās. Ecoil/Kcoil sistēma veidoja VLP proteīnu agregātu maisījumā, turpretī SpyTag/SpyCatcher sistēma koekspresijā ar PVY nodrošināja stabili VLP veidošanos.

Imunogenitātes izvērtēšanai tika atlasīti seši VLP-PPAD kandidāti (PVY-SpT/SpC2-PPAD, PVY-SpT/SpC3-PPAD, mPVM-CG4S-PPAD, cPVM-PPAD, mEMV-CG4S-PPAD, mCMV-PPAD) un PPAD kā kontrole. PPAD iekļaušanas līmenis VLP svārstījās no 0,2% līdz 100%, ļaujot analizēt antigēna daudzuma ietekmi uz imunogenitāti. Pelēm subkutāni tika ievadītas trīs 30 µg devas (0., 14. un 28. dienā), un eksperiments ilga 42 dienas.

Anti-PPAD antivielas tika detektētas visās grupās, izņemot mPVM-CG4S-PPAD, kur atbildes reakcija bija novērojama tikai pēc trešās imunizācijas. Augstākais antivielu titrs tika konstatēts PPAD grupā, taču aviditātes analīze liecināja par zemu specifiskumu. Savukārt VLP-PPAD konstrukti inducēja specifiskākas antivielas ar dažādu IgG subklāšu veidošanos (izņemot mPVM-CG4S-PPAD), kas norāda uz iespējamu VLP iepakotās RNS adjuvanto efektu, aktivējot TLR7/8 un TLR3 receptorus un veicinot kļāšu pārslēgšanos. IgA atbildes reakcija netika konstatēta. IgG1/IgG2a attiecība liecināja par jauktu Th1/Th2 imūnatbildi visām VLP-PPAD grupām, izņemot PVY-SpT/SpC2-PPAD. Iegūtie rezultāti apliecina, ka augu vīrusu CP veidotās VLP ir strukturāli fleksiblas platformas, kas ļauj efektīvi prezentēt liela izmēra antigēnus, izmantojot dažādas konjugācijas stratēģijas. Turklāt VLP demonstrē arī adjuvantas īpašības, veicinot specifisku un kvalitatīvu antivielu atbildi, kas padara tās par daudzsoļošu platformu periodontīta vakcīnas izstrādei.

AUGU VĪRUSIEM LĪDŽĪGO DAĻIŅU DZIMUMSPECIFISKĀ PRETAUDZĒJU IEDARBĪBA B16-F10 PEĻU MELANOMAS IMŪNTERAPIJAS MODELĪ

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No augiem iegūtās vīrusam līdzīgas daļiņas (VLP) ir daudzsološa imūnstimulējoša platforma vēža imūnterapijā. Šajā pētījumā mēs sistemātiski izvērtējām vienpadsmit augu VLP kā kandidātus in situ vēža vakcinācijai, izmantojot integrētu pieeju, kas apvieno morfoloģisko raksturošanu, funkcionālos imūnās atbildes testus un validāciju in vivo sistēmā. Visas VLP tika producētas endotoksīnu minimizētā ClearColi™ BL21(DE3) sistēmā, kas ļāva ticami novērtēt to iekšējās imūnstimulējošās īpašības. In vitro analīzes parādīja, ka vairāki VLP aktivē makrofāgus un veicina audzēja šūnu iznīcināšanu, lai gan klasiskie M1/M2 makrofāgu polarizācijas marķieri RAW264.7 šūnās ne vienmēr precīzi prognozēja citotoksisko aktivitāti. Iedzimtās imunitātes aktivācija bija saistīta ar apvalka proteīnā iekļautās RNS klātbūtni un tās strukturālajām īpašībām, ko apstiprināja HEKTLR3 reportieršūnu testi. In vivo terapeitiskā efektivitāte tika novērtēta vāji imunogēnajā B16-F10 melanomas modelī, kur rezultātus būtiski ietekmēja dzīvnieku bioloģiskais dzimums. Lai gan peļu mātītēm tika novērota spēcīgāka sākotnējā imūnšūnu infiltrācija, nozīmīga terapijas iedarbība tika konstatēta tikai tēviņiem. Tēviņu grupā CCMV-ss un CMVt VLP ievērojami samazināja audzēja progresiju un palielināja imūnšūnu infiltrāciju audzējā. Kopumā šie rezultāti uzsver funkcionālās imūnās atbildes skrīninga un dzimuma faktora analīzes nozīmi pirmsklīniskajos pētījumos, kā arī apstiprina no augiem iegūto VLP potenciālu kā daudzsološu platformu iedzimtās imunitātes inducētai vēža imūnterapijai.

IN SILICO PIEEJA FUNKCIONĀLO STRUKTŪRU PROGNOZĒŠANAI JAUNIEM VĪRUSIEM

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Latvian Biomedical Research and Study Centre

In silico modelēšanai pēdējās desmitgadēs ir būtiska nozīme pētniecībā, tajā skaitā molekulārajā bioloģijā un biotehnoloģijā. Izmantojot *in silico* modelēšanu, var ātri, efektīvi un salīdzinoši precīzi iegūt datus, samazinot eksperimentiem nepieciešamo laiku un finanses un nepieciešamību pēc *in vitro* un *in vivo* eksperimentiem.

Šobrīd *in silico* modelēšanu var pielietot arī jaunu vīrusu proteīnu struktūru un funkciju izpētē. Līdz ar sekvencēšanas metožu attīstību, kas ļauj ātri noteikt vīrusu nukleotīdu sekvences, tiek identificēti jauni vīrusi, taču vīrusu kodēto proteīnu un RNS strukturālās un funkcionālās īpašības paliek neskaidras bez papildu analīzes. *In silico* metodes ļauj identificēt RNS sekundārās struktūras, proteīnu strukturāli konservatīvos domēnus un motīvus, katalītiskos centrus, potenciālās saistīšanās vietas un šķelšanas saitus pirms eksperimentālās darbības, līdz ar to *in silico* ir efektīvs pētniecības instruments hipotēžu veidošanai un pētniecības procesa organizēšanai.

Kā viens no modeļobjektiem *in silico* RNS sekundāro struktūru un genomā kodēto proteīnu 3D struktūru modelēšanai tika izmantots jauns, iepriekš literatūrā neraksturots vīruss – smiltisērķšķu asociētais pikorna-līdzīgais vīruss (SBTaPLV). Veicot RNS sekundāro struktūru modelēšanu, konstatējām, ka *de novo* iegūtā sekvenca satur vairāk strukturālo elementu, kas līdzinās IRES nekā verificētā sekvenca, kā arī 5' un 3' gali neveidoja kopēju struktūru, kas tika novērots ar 5' RACE verificētajam 5' galam. Izmantojot proteīnu modelēšanas serveri AlphaFold 3, tika veikta identificēto SBTaPLV genoma kodējošo proteīnu *in silico* 3D struktūru izveide, kas tika salīdzinātas ar datubāzēs un literatūrā pieejamām līdzīgām struktūrām, lai noteiktu potenciālo proteīnu lomu vīrusa dzīves ciklā.

PATOGĒNO MIKROORGANISMU MEKLĒŠANA SENĀS DNS NGS DATOS: METOŽU SALĪDZINĀJUMS UN SINTĒZE

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Infekcijas slimības ir bijušas patstāvīgs cilvēka ceļabiedrs kopš sugas izcelšanās. Patogēno mikroorganismu evolūciju ir ietekmējusi gan vide, gan cilvēka darbība, un izpratne par to ir īpaši svarīga mūsdienās, kad novērojama strauja antibiotiku rezistences evolūcija plašā mikroorganismu sugu spektrā. Senās DNS pētniecība var sniegt ieskatu mikroorganismu evolūcijā un epidemioloģijā, salīdzinot senāku mikroorganismu genomus ar mūsdienās izplatīto sugasbrāļu genomiem. Viena no galvenajām problēmām metagenomu pētniecībā ir nepilnīgās zināšanas par eksistējošo baktēriju genomu daudzveidību, kas samazina iespēju atpazīt iepriekš neaprakstītus mikroorganismus, kā arī rada neprecīzas klasifikācijas risku gadījumos, kad vidē atrodams liels daudzums patogēnam mikroorganismam radniecīgu organismu. Viens no risinājumiem ir *de novo* genomu salikšana, taču ar to saistītās problēmas ir vēl asākas senās DNS gadījumā, kur pieejamā DNS ir fragmentēta un ar zemu koncentrāciju. Abu metožu apvienošana vai paralēls pielietojums varētu kompensēt daļu no šīm problēmām.

Pētījumā apskatīti NGS dati no diviem 16.–17. gadsimta indivīdiem ar kaulu tuberkulozes pazīmēm, no dažādām skeleta daļām, izmantojot divas pieejas – nolasījumu klasifikāciju ar Kraken (k-mēru pieeja), izmantojot zināmu references sekvenču datubāzi; un *de novo* genomu salikšanu jeb MAG (metagenome assembled genomes, no metagenoma salikti genomi). Papildus pielietojumā salīdzinātas divu dažādas Kraken datubāzes – vispārīga bakteriālo genomu datubāze un augsnes baktēriju klasifikācijai pielāgota datubāze.

SLAUGHTER YIELD–ASSOCIATED GENOMIC LOCI IN INTENSIVELY FATTENED LAMBS ACROSS SHEEP BREEDS RAISED IN LATVIA

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Improving the economic efficiency of sheep production largely depends on enhancing traits related to animal productivity. In meat-type sheep, slaughter yield is a key indicator of performance and is influenced by complex biological mechanisms governed by multiple genes and molecular pathways. Identification of DNA markers associated with this trait can support the implementation of marker-assisted selection within specific breeding populations.

This study aimed to identify genomic loci associated with slaughter yield in intensively fattened lambs of sheep breeds raised in Latvia. A total of 160 lambs, including 59.5% Latvian Dark-Head animals, representing the most common local breeds, were subjected to a standardized fattening regime. Slaughter yield (%) averaged 44.45 ± 2.52 and was recorded at 149.65 ± 14.26 days of age. Fifty-seven SNPs within eight candidate genes were genotyped, and their associations with slaughter yield were evaluated using association and regression analyses.

Of the analyzed markers, 23 SNPs (40.35%) showed significant relationships with slaughter yield in the studied population. The most pronounced effects were detected for two SNPs in the UPC2 gene (rs412180048 A > G; rs405808821 C > T) and two in the MTOR gene (rs419418343 C > T; rs160776285 T > C). For both UPC2 loci, superior slaughter yield was observed in lambs homozygous for the common allele, although this genotype occurred at low frequency. For the MTOR gene, the highest slaughter yield was observed in lambs with either the homozygous common or the heterozygous genotype, which together accounted for only 25% of the sampled animals.

The identified variants, particularly within UPC2 and MTOR, demonstrate strong potential as molecular markers for improving slaughter yield in Latvian sheep breeding programs.

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2.

Vēsture, valodas
un identitātes
ilgtspēja /

History, languages
and the resilience
of identity

2.1. sekcija. **EIROPA DAUDZVEIDĪBĀ: DISKURSI,
VALODAS UN KULTŪRAS /**
**EUROPE IN DIVERSITY: DISCOURSES,
LANGUAGES AND CULTURES**

VĒLREIZ PAR REKLĀMAS TERMINA ATTĪSTĪBU: DIAHRONISKS SKATĪJUMS UZ KULTŪRU MIJIEDARBĪBU

ONCE AGAIN ON THE DEVELOPMENT OF THE TERM "ADVERTISING": A DIACHRONIC PERSPECTIVE ON CULTURAL INTERACTION

Gunta Ločmele

Latvijas Universitāte

Reklāmas apzīmējumi ir gājuši garu attīstības ceļu, to nozīmēm un funkcijām gan tuvinoties, gan šķiroties. Referātā to nozīmes pētītas laikposmā no latviešu pirmajiem laikrakstiem 19. gadsimtā. līdz 20. gadsimta beigām. 19. gadsimta sākumā reklāmas kā žanra jēdziens ir visai izplūdis – pastāv ziņas, dažās no kurām sastopami reklāmas elementi, ir dažāda veida sludinājumi – gan tiesu, gan arī, tā sauktās, “Cittas fluddinafchanas” – sleja ar preču un pakalpojumu reklāmām. Arī paša lietvārda ‘sludināšana’ attīstības ceļš ir bijis garš un nozīmēm bagāts. Referātā skatīti ar reklāmu saistīti jēdzieni dažādos to attīstības posmos – gan pašreklāma, gan paziņojumi, vēstījumi, izziņojumi, uzsaukumi, gan arī reklāma, kas kā apzīmējums ienāk no vācu valodas Reklame 20. gadsimta sākumā. Lai arī skausta un kritizēta kā buržuāziska parādība padomju laikā, tā neiegūst jaunu apzīmējumu, tikai tiek piepildīta ar ideoloģisku saturu. Lai arī daži no apskatāmajiem apzīmējumiem savu saiti ar reklāmu ir zaudējuši, to veidošanās atspoguļo kultūru mijiedarbību un latviešu valodas dzīvotspējas stiprināšanos jomās ar spēcīgu tiešo kontaktvalodu spiediedīnu.

EMPATHY AND COMPREHENSION DIMENSIONS IN DOCTOR-PATIENT COMMUNICATIVE DISCOURSE: INTERDISCIPLINARY PERSPECTIVE

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University of Latvia

This study sets out to examine selected doctor-patient communicative discourse aspects that can be considered as significant prerequisites for balancing interactional asymmetries which might develop in doctor- patient verbal relationships. Starting from the beginning of the 90s, extensive research contributions have reported on several approaches that characterize doctor-patient communicative discourse models. They mostly were concerned with analysis of health-illness dichotomy as ‘the organic pathology of an individual patient’ (e.g., Fisher, 1991: 157–182). Most recent contributions in the areas of, e.g., health studies, applied linguistics attempt to share new and constructive approaches that are successfully applicable to research doctor-patient communication in the present time circumstances and social settings. Thus, contemporary research on doctor-patient communication (e.g., Montalt-Resurreccio, et al., 2025: 115) points out that patient-focused and health condition-related information is expected to be shared with patients in a clear, emotionally supportive, comprehensible and emphatic manner to promote their healing, reduce anxiety, increase patients’ self-esteem, thus, to advance the whole recovery process. Within the present study framework, its authors adopt an interdisciplinary perspective within the intersection of applied linguistics and health sciences to examine how empathy and comprehension that function as cognitive categories in doctor-patient interaction can establish meaningful and trustful communication and work in favor of enhancing patients’ healing process in order to reduce their anxiety, uncertainty or even helplessness. The theoretical background of this study is established considering Systemic Functional Linguistics’ theory perspective (e.g., Halliday et al., 2013)) that views language use in situational contexts of its exposure. The empirical study is conducted in an authentic setting, i.e., in the Clinical Hospital Gailezers, in one of its departments that is concerned with abdominal cavity surgery. The research findings illustrate that language applied by the medical personnel that specializes in the field of abdominal cavity surgery attempts to show growing recognition to emphatic and comprehensive manner of communication to promote its patients’ healing outcome process.

Keywords: interdisciplinarity, doctor-patient communication, empathy, comprehension

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LINGUISTIC FEATURES ELICITING REREADING IN DIGITAL TEXTS: AN EYE-TRACKING STUDY

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This study investigates which linguistic features elicit rereading behaviour in Latvian digital texts and how such behaviour relates to reading comprehension outcomes. Reading comprehension is traditionally assessed as the final product of the reading process (Kendeou, McMaster, and Christ, 2016: 65); however, product-oriented approaches rely on post-reading data collection (Carlson, Seipel and McMaster, 2014: 42) and fail to measure real-time processing difficulties. To address this limitation, the present study incorporates eye-movement metrics into comprehension testing to observe real-time cognitive activity and identify linguistic sources of difficulty. For reading comprehension testing in digital environments, real-time data is especially valuable, as digital environments may increase cognitive load and reduce depth of processing, which can hinder the interpretation of complex linguistic structures (Sadiqzade, 2025: 88). This study is conducted within the framework of the MultiplEye COST Action (CA21131), an interdisciplinary initiative dedicated to compiling a multilingual eye-tracking corpus. The Latvian dataset is currently being collected at the University of Latvia through collaboration between the Department of English Studies and the Department of Optometry and Vision Science. The MultiplEye experimental design entails data from 100 participants (per language) collected using the EyeLink 1000 Plus system, which tracks the participants' eye movements while reading ten texts of varying lengths and genres on a computer screen. Each text is followed by global, local, and bridging comprehension questions. For this study, the Latvian MultiplEye data will be analysed using linear mixed-effects models to examine whether linguistic features such as lexical frequency and syntactic complexity predict fixation duration and regression probability. Eye-movement metrics will be interpreted within the E-Z Reader framework (Reichle et al., 2003), linking fixation duration to lexical demands and regressions to integration difficulty. The findings aim to inform Latvian language assessment design, particularly with the aim of improving diagnostic precision in reading comprehension testing.

Keywords: reading comprehension, rereading, eye-tracking, digital reading environment, linear mixed-effects modelling, E-Z Reader model

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QUAND LA CERTITUDE S'AFFAIBLIT : ÉVOLUTION DIACHRONIQUE DE CERTAINS ADVERBES ÉPISTÉMIQUES DU FRANÇAIS (PROBABLEMENT, CERTAINEMENT, SÛREMENT)

WHEN CERTAINTY WEAKENS: A DIACHRONIC EVOLUTION OF CERTAIN FRENCH EPISTEMIC ADVERBS (PROBABLEMENT, CERTAINEMENT, SÛREMENT)

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Cette communication examine l'évolution diachronique de trois adverbes épistémiques du français – sûrement, certainement et probablement – du point de vue sémantique, syntaxique et discursif. À partir de données de corpus (Frantext), nous mettons en évidence un processus de dévaluation au sens de Berrendonner (1984) et de mitigation épistémique (Hummel, 2018), par lequel des formes associées à une certitude forte évoluent vers des lectures plus subjectives et probabilistes. Ce déplacement s'accompagne d'un élargissement de la portée et d'une plus grande mobilité distributionnelle dans l'énoncé. L'analyse montre que ces adverbes, initialement liés à des valeurs de manière verbale, se spécialisent progressivement comme opérateurs intensifieurs portant sur la proposition entière, puis développent des emplois parenthétiques favorisant des interprétations atténuées. Les résultats contribuent à la description des mécanismes d'affaiblissement épistémique et au rôle de la position syntaxique et du contexte discursif dans la reconfiguration des valeurs modales.

TRAITER DES DONNÉES DISCURSIVES MULTIMODALES : RETOUR MÉTHODOLOGIQUE SUR L'ANALYSE DE RÉCITS TRAUMATIQUES BILINGUES

WORKING WITH MULTIMODAL DISCOURSE DATA: A METHODOLOGICAL REFLECTION ON THE ANALYSIS OF BILINGUAL TRAUMATIC NARRATIVES

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L'analyse de récits d'événements traumatiques soulève des questions méthodologiques spécifiques, qui se trouvent accentuées lorsque ces récits sont produits par des locuteurs bilingues. La mise en discours du trauma s'accompagne en effet de discontinuités narratives, de reprises, de reconfigurations énonciatives et d'une mobilisation récurrente de ressources corporelles et prosodiques (Offor et al., 2024 ; Auxéméry & Gayraud, 2025 ; Paniz, 2025). La multimodalité de ces productions engage ainsi, de manière conjointe, les modalités de constitution des données, leurs opérations de traitement et les cadres mobilisés pour leur interprétation. Cette communication propose un retour méthodologique fondé sur l'analyse d'un corpus audiovisuel d'entretiens semi-directifs recueillis auprès de locuteurs bilingues. Les données considérées articulent productions verbales et manifestations non verbales observables – gestes, mimiques faciales, orientations du regard, ainsi que certains indices prosodiques – appréhendées comme parties prenantes de l'activité discursive. Leur traitement a impliqué une série de décisions interdépendantes : définition et segmentation des unités d'analyse et des approches retenues, articulation entre niveaux de description (lexico-syntaxique, énonciatif, gestuel, etc.) et conditions de comparabilité entre récits produits dans des langues différentes. Ces choix méthodologiques ont déterminé le niveau auquel les phénomènes discursifs ont été décrits et, par conséquent, le type d'interprétation qui a pu en être proposé. Dès lors, dans une perspective rétrospective, cette communication reviendra sur les ajustements méthodologiques induits par le traitement de données discursives multimodales dans l'analyse de récits traumatiques bilingues. Elle mettra en évidence la manière dont l'interprétation de certains phénomènes discursifs et non verbaux s'est appuyée, au-delà des cadres strictement linguistiques, sur des apports issus des sciences psychologiques et des neurosciences, mobilisés comme ressources de contextualisation interprétative. L'attention portée aux opérations de traitement et aux cadres mobilisés pour interpréter des données discursives hétérogènes permettra ainsi de situer cette réflexion dans une problématique plus large de gestion et d'exploitation de données en linguistique.

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INDICES PROSODIQUES ET MIMICO-GESTUELS DANS LA CONSTRUCTION DU SENS ET LA RÉGULATION DE LA SCÈNE ÉNONCIATIVE

PROSODIC AND GESTURAL CUES IN MEANING CONSTRUCTION AND THE REGULATION OF THE ENUNCIATIVE SCENE

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Cette communication vise à rendre compte du rôle conjoint des indices prosodiques et mimico-gestuels dans la construction du sens de l'énoncé et dans la régulation de la scène énonciative. Elle montre comment les données gestuelles peuvent être intégrées à l'analyse linguistique, en interaction étroite avec les données prosodiques et discursives et contribuer ainsi à une étude de l'activité de langage. L'analyse repose sur l'étude de plusieurs marqueurs discursifs du français oral (de toute façon, d'une certaine façon, encore, entre autres), envisagés comme des points d'articulation privilégiés entre organisation prosodique, déploiement gestuel et dynamique énonciative. Les exemples étudiés mettent en évidence la manière dont gestes et prosodie contribuent à orienter l'interprétation, à structurer l'espace intersubjectif et à moduler les valeurs des marqueurs. Sur le plan théorique, cette contribution s'inscrit dans une conception de l'activité du langage d'A. Culioli, appréhendée comme l'interaction de trois dimensions complémentaires : la représentation, la référenciation et la régulation. L'intégration des indices prosodiques et mimico-gestuels apparaît ainsi comme un levier essentiel pour comprendre la construction du sens en discours et les mécanismes d'ajustement des positions énonciatives.

ALLA RICERCA DELL'ESPERIENTE: LE COSTRUZIONI LINGUISTICHE DELLE ÉMOTIONS ET DES ÉTATS AFFECTIFS NEI CORPORA MULTILINGUI

IN SEARCH OF THE EXPERIENCER: LINGUISTIC CONSTRUCTIONS OF EMOTIONS AND AFFECTIVE STATES IN MULTILINGUAL CORPORA

Jeļena Gridina

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I nomi di sentimento sono stati ampiamente studiati in relazione alla dimensione esperienziale che li caratterizza (Goossens 2005; Adler 2017; Adler & Feshkol-Taravella 2012). La specifica semantica dei nomi di sentimento influisce infatti sulla loro combinatoria lessicale e, in particolare, sugli elementi lessicali attualizzatori che vi si associano (Gridina & Vladimirska 2020, 2022). La comunicazione intende analizzare, in prospettiva contrastiva (italiano, francese e russo), le modalità linguistiche attraverso cui emozioni, sentimenti e stati affettivi vengono costruiti attraverso processi di approssimazione analogica fondati su modelli esperienziali. Particolare attenzione sarà dedicata alle formulazioni che rinviano a scenari prototipici o alla figura dell'esperiente (fr. *expérienceur*), inteso come il soggetto che prova lo stato affettivo espresso (per esempio : it. entusiasmo da pioniere, fr. *joie d'enfant*, ru. *sroдни entuziazmu pervoprochodca*). Adottando una prospettiva semantica, lo studio esamina l'articolazione tra lessico emotivo, gestualità ed espressioni facciali, distinguendo diverse configurazioni dell'esperienziale. Dal punto di vista metodologico, la ricerca affronta le difficoltà legate all'identificazione e alla raccolta di tali fenomeni nei corpora, poiché le costruzioni analogiche ed esperienziali non sono direttamente indicizzate come categorie linguistiche esplicite. L'analisi si basa su corpora Sketch Engine e pone particolare attenzione alla definizione di strategie di ricerca e alla selezione di occorrenze comparabili nelle tre lingue considerate.

IDENTITÀ REGIONALI NEL DISCORSO DIGITALE: COSTRUZIONE E ANNOTAZIONE DI UN CORPUS DI COMMENTI YOUTUBE

REGIONAL IDENTITIES IN DIGITAL DISCOURSE: THE CONSTRUCTION AND ANNOTATION OF A CORPUS OF YOUTUBE COMMENTS

Paula Lauze

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Il presente studio analizza il discorso identitario regionale che emerge nei commenti pubblicati dagli utenti su YouTube relativi al divario Nord-Sud in Italia. L'analisi si fonda sul modello socio-cognitivo dell'Analisi Critica del Discorso (CDA) elaborato da Teun van Dijk (1998) e integra la nozione di discorso polemico di Ruth Amossy (2014) per esaminare la polarizzazione e le dinamiche conflittuali nei commenti online. Il corpus è costituito da commenti pubblicati nelle sezioni commenti presente nei video di Youtube che tematizzano le differenze tra gli abitanti provenienti dalle due aree geografiche. I video sono stati selezionati in base a diversi criteri: la discussione tematica delle differenze tra gli abitanti del Sud visti da chi proviene dal Nord (e viceversa), la data di pubblicazione in relazione allo svolgimento dello studio e la quantità complessiva di commenti pubblicati sotto i video. I dati vengono elaborati con metodi di ricerca qualitativi e quantitativi. Nella fase qualitativa, i commenti sono annotati con l'utilizzo del software Taguette, che consente una categorizzazione sistematica delle strategie discorsive. La fase quantitativa include un'analisi lessicale computerizzata in Python (Google Colab) al fine di individuare le unità lessicali più frequenti relative all'identità regionale e all'alterità. Il contributo intende mostrare come la combinazione di analisi qualitativa con strumenti digitali riveli non solo come le identità regionali siano riprodotte attraverso stereotipi già consolidati, ma anche come vengano negoziate e rielaborate attraverso l'interazione tra gli utenti. Inoltre, saranno illustrati i vantaggi e gli svantaggi metodologici dell'elaborazione digitale di un corpus di commenti online.

POUR DÉCRIRE LA DIVERSITÉ DES EMPLOIS DE "FRANCHEMENT": ÉTUDE DE CAS DE RIRE + FRANCHEMENT

DESCRIBING THE DIVERSITY OF USES OF "FRANCHEMENT": A CASE STUDY OF LAUGH + FRANCHEMENT

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Cette présentation a pour but de décrire l'emploi de l'adverbe franchement avec le verbe rire aux niveaux syntaxique et sémantique. Dans les études antérieures portant sur cet adverbe, son emploi en tant qu'adverbe de phrase (cf. exemple 1) – ou, selon des chercheurs, en tant que marqueur discursif – a attiré beaucoup d'attention (cf. Anscombe 2024 ; Hermoso 2009 ; Molinier 2009 ; Paillard 2021, etc.). En revanche, son emploi portant sur le verbe (cf. exemple 2) n'a pas été suffisamment traité. (1) Franchement, Paul est bête. (2) Paul a ri franchement. Afin de décrire la diversité des emplois de cet adverbe, nous proposons une étude qui se concentre sur son emploi du type (2). Pour mener à bien celle-ci sur la base d'exemples authentiques, nous ciblons les occurrences où l'adverbe porte sur le verbe rire. Dans cette présentation, nous analyserons des exemples de français écrit. Notre corpus principal est constitué de 56 exemples collectés par la requête CQL (Corpus Query Language) [lemma = "rire"] [word = "franchement"] dans les sous-corpus (« 20ème siècle », « Contemporain ») de Frantext. Nous prendrons également en considération d'autres exemples de Frantext, surtout pour l'analyse syntaxique, ainsi que des exemples tirés d'autres sources écrites (recherches via Google, Europresse, etc.) pour compléter l'observation. Notre analyse procédera en trois étapes. Premièrement, la syntaxe de base de l'adverbe franchement sera examinée afin de mettre en évidence les positions dans lesquelles apparaît l'emploi de rire + franchement. Deuxièmement, nous montrerons un inventaire des types de contexte où se trouve l'emploi de rire + franchement, en observant les éléments linguistiques qui l'entourent. Troisièmement, nous nous proposerons d'examiner la sémantique de rire + franchement. À partir des observations de données en contexte, nous nous interrogerons sur sa structure sémantique < l'actant est franc quand il rit > (cf. Le Querler 1996).

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DONNÉES MULTIMODALES ET SCÈNE ÉNONCIATIVE : UNE APPROCHE OUTILLÉE DES MOMENTS DE TROUBLE ET DE REFORMULATION (ORAL SPONTANÉ EN FLE, B2–C1)

MULTIMODAL DATA AND THE ENUNCIATIVE SCENE: A TOOL-BASED APPROACH TO MOMENTS OF DISRUPTION AND REFORMULATION (SPONTANEOUS SPOKEN FRENCH IN FLE, B2–C1)

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À partir d'un corpus audio-vidéo d'oral spontané en français L2 (locuteurs non natifs B2–C1), recueilli au moyen de brèves tâches (récits contrastés “agréable/difficile” et description d'images), cette communication analyse des micro-épisodes où l'activité de formulation devient particulièrement visible : pauses, hésitations, reprises, recherche lexicale et réaménagements syntaxiques, ainsi que leurs régulations (reformulations, auto-réparations, paraphrases, alternances codiques). En mobilisant la notion de scène énonciative (Paillard), ces “ratés” sont interprétés non comme un simple déficit, mais comme un travail du dire situé, dépendant de la tâche, de la dynamique interlocutive et de l'engagement affectif. La démarche est explicitement outillée : transcription enrichie et annotation multimodale sous ELAN (verbal, pauses/hésitations, indices prosodiques, gestes/regard), avec un appui ponctuel sur le signal audio (waveform) pour stabiliser la segmentation temporelle. L'objectif est double : proposer une description reproductible de séquences “trouble → régulation → stabilisation” et montrer, par comparaison intra-corpus, comment des formes parfois proches de celles des natifs peuvent prendre chez les apprenants des fonctions et une saillance différentes, révélant des mécanismes d'appropriation en cours. L'apport pour l'auditoire tient à l'articulation entre cadre théorique et traitement de données multimodales, ainsi qu'à un micro-modèle d'analyse transférable à d'autres corpus d'oral en L2.

Mots-clés : données multimodales ; scène énonciative ; oral spontané ; trouble de formulation ; reformulation ; auto-réparation ; appropriation en L2.

LE MARQUEUR “MAIS” EN FRANÇAIS ET SES ÉQUIVALENTS EN LETTON: ANALYSE CONTRASTIVE DANS UNE PERSPECTIVE SYNTAXIQUE ET ÉNONCIATIVE

THE MARKER “MAIS” IN FRENCH AND ITS EQUIVALENTS IN LATVIAN: A CONTRASTIVE ANALYSIS FROM A SYNTACTIC AND ENUNCIATIVE PERSPECTIVE

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Cette étude propose une analyse contrastive des différents emplois du marqueur “mais” en français, mis en regard des marqueurs lettons qui, pour au moins l’une de leurs valeurs (celle d’une conjonction de coordination, par exemple) se présentent comme des équivalents de traduction de mais, comme l’attestent les dictionnaires bilingues des deux langues (MLLV ; TLFi ; CNRTL). Le marqueur “mais” a fait l’objet de plusieurs études dans les approches pragmatiques et énonciatives, en particulier pour ses propriétés argumentatives (J.C. Anscombe & O. Ducrot, 1977) ; (Ducrot, 1978) ; (Schlamberger Brezar, 2012) et son rôle dans la construction de la scène énonciative (Culioli, 1998) ; (Razgouliaeva, 2002) ; (Nkoula-Moulongo, 2024). L’étude vise à démontrer le passage d’une valeur d’inverseur argumentatif du “mais” à celle de marqueur de changement de zone de validation. Selon l’approche d’O. Ducrot, nous distinguons le “mais” de type SN (rectificatif) (ex : “ ne... pas, mais...” ; nevis/ne..., bet ») et PA (argumentatif). Ce dernier articule deux propositions aux orientations opposés (p mais q) vers une conclusion (r/non-r). En letton, cet emploi est assuré et correspond à “bet” seul (ex : “ ...fiziski nogurusi bet ļoti ļoti pacilāta...” ; “ ...aizvietot nācās sasirgušo kolēģi, bet, kā izrādās, arī šis darbiņš viņam iet no rokās. »). Ainsi, “mais” organise une argumentation en faveur de non-r contre la proposition p, cependant, cela ne rend pas compte de l’ensemble de ses emplois. Si le “mais” argumentatif équivaut à “bet”, son emploi comme l’opérateur d’altérité intersubjective en letton, en revanche, révèle une complexité. Dans la perspective d’A. Culioli, le marqueur fait altérer les zones de validation (intérieur p – est le cas /extérieur p’ – autre que p) dans telles structures de rupture comme “non mais” et “mais non”, marquant une discontinuité et projetant l’échange hors de validable. Néanmoins, notre intérêt réside dans le fait qu’en letton il existe une rupture d’équivalence. Les opérations de rupture ne se manifestent pas par un marqueur “bet” seul, mais sollicitent une cooccurrence avec d’autres marqueurs, comme “nu”, signalant un changement d’état de conscience (« ...bija ļoti ilgi applausi, nu es nechronometrēju, bet nu (::)... ») ; de plus, “nē” (nē, nu, bet tad tie bij kādi vietējie cilvēki? ») et “tomēr” (ex : “ Nu jā, cik par to var runāt, jūs teiksiet? Bet tomēr es nolēmu runāt »). En nous appuyant sur la théorie des opérations prédicatives et énonciatives d’A. Culioli, telle que développée par D. Paillard (2009 ; 2017) pour l’étude des marqueurs discursifs, et à partir d’un corpus d’oral français (discours sur la ville ; © YouGlish), nous analyserons la diversité des emplois de “mais” (Culioli, 1998 ; Hoang, 2015 ; Agoli-Agbo, 2021 ; Rodríguez Somolinos, 2025) à partir de ses propriétés distributionnelles (positions syntaxiques) et sémantiques (“mais” interlocutif,

monologique, combinatoire). Le corpus letton (korpuss.lv) permettra de confronter ces emplois récurrents aux marqueurs lettons correspondants, afin de mettre en évidence les convergences, divergences et limites discursives et énonciatives entre les deux langues.

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L'USAGE DES LANGUES DANS LES FAMILLES PLURILINGUES LANGUAGE USE IN MULTILINGUAL FAMILIES

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Cette communication présente une recherche en cours en sociolinguistique consacrée au plurilinguisme familial. L'étude porte sur les pratiques langagières au sein de familles plurilingues, ayant un parent francophone et des enfants. La famille y est considérée comme un espace central d'interaction entre langues, discours et cultures dans le contexte européen contemporain. L'objectif est d'analyser l'organisation du répertoire linguistique familial et la mobilisation des langues dans les interactions quotidiennes, ce qui conduit à la problématique centrale de la recherche : comment les pratiques langagières se structurent-elles au sein des familles plurilingues et comment les langues du répertoire familial sont-elles utilisées dans les échanges quotidiens ? Le cadre théorique de cette recherche s'appuie sur plusieurs concepts complémentaires. D'abord, la notion de répertoire linguistique (Busch, 2012 ; Gumperz, 1964) permet d'analyser l'organisation et la mobilisation des langues dans les interactions familiales, tandis que l'alternance codique et les phénomènes d'interférence (Auer, 1998 ; Beardsmore, 1986 ; De Houwer, 2009 ; Genesee, 2001) sont envisagés comme des indices interactionnels de la structuration des échanges. L'approche prend également en compte les stratégies de transmission linguistique observables dans les pratiques quotidiennes (De Houwer, 2007, 2009), afin d'appréhender le plurilinguisme familial comme un phénomène à la fois linguistique et interactionnel. La recherche repose sur une approche qualitative menée auprès de sept familles plurilingues vivant en France ou en Lettonie comprenant un parent francophone et des enfants. Le cadre scolaire est appréhendé à travers le discours familial, sans observation directe. À ce stade, le corpus se compose principalement d'un questionnaire écrit visant à cartographier le répertoire linguistique familial et les contextes d'usage. Ce corpus sera ultérieurement enrichi par des entretiens semi-directifs et, lorsque cela sera possible, par de brèves observations auto-enregistrées basées sur des situations interactionnelles induites. Par la présente recherche, nous voulons montrer qu'au sein des familles plurilingues étudiées, il existe une langue dominante, le plus souvent le français, qui organise les échanges quotidiens. Nous mettons également en évidence que les langues sont mobilisées différemment selon les situations interactionnelles, certaines se spécialisant dans des fonctions spécifiques (autorité, négociation, proximité affective). L'alternance linguistique et la stratégie "une personne, une langue" apparaissent dans plusieurs familles, révélant une organisation pragmatique et interactionnelle du répertoire familial.

Mots-clés : plurilinguisme familial, répertoire linguistique, transmission linguistique, interactions quotidiennes, alternance codique

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L'INTERACTION LINGUISTIQUE ET LE CODE-SWITCHING DANS UNE PERSPECTIVE DE LA THÉORIE DE LA NÉOTÉNIE LINGUISTIQUE : LE CAS DE LA DIVERSITÉ LINGUISTIQUE EN LETTONIE

LINGUISTIC INTERACTION AND CODE-SWITCHING FROM THE PERSPECTIVE OF THE LINGUISTIC NEOTENY THEORY: THE CASE OF LINGUISTIC DIVERSITY IN LATVIA

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Cette communication propose un retour réflexif sur mon mémoire de master intitulé: L'interaction linguistique et le code-switching dans une perspective de la théorie de la néoténie linguistique : le cas de la diversité linguistique en Lettonie. Menée dans un contexte baltique marqué par la coexistence du letton, du russe, de l'anglais et d'autres langues européennes, cette recherche visait à analyser les pratiques plurilingues en interaction et à comprendre comment l'alternance codique participe à la construction du positionnement identitaire. Le cadre théorique repose sur la théorie de la néoténie linguistique développée par Samir Bajrić, qui conçoit le locuteur comme fondamentalement " inachevé " et en constante évolution. Le plurilinguisme est ainsi envisagé comme un processus dynamique, stratifié et négocié. Le corpus se composait principalement de données orales authentiques recueillies dans des situations quotidiennes et semi-formelles : échanges entre étudiants bilingues letton-russe, discussions académiques intégrant des termes anglais, conversations professionnelles dans lesquelles les locuteurs alternaient entre letton et russe selon l'interlocuteur ou le thème abordé. Par exemple, lors d'une discussion universitaire, un étudiant introduisait un concept académique en anglais avant de reformuler en letton pour assurer la compréhension collective, illustrant une stratégie d'ajustement interactionnel. Des entretiens semi-directifs ont complété les enregistrements. Parmi les questions posées figuraient : – " Dans quelles situations changez-vous de langue spontanément ? » – " Ressentez-vous qu'une langue vous permet d'exprimer certaines idées plus précisément qu'une autre ? » – " Avez-vous déjà modifié votre choix linguistique en fonction du contexte institutionnel ou de la présence d'un enseignant ? " Ces données ont été transcrites et analysées qualitativement, en portant une attention particulière aux segments hybrides et aux fonctions discursives des alternances codiques (marqueurs de proximité, atténuation, citation, clarification terminologique). Le traitement des données plurilingues a soulevé des questions méthodologiques liées à la catégorisation des unités linguistiques et à l'interprétation des frontières entre langues. Les résultats montrent que le code-switching ne correspond pas à une instabilité linguistique, mais à une ressource interactionnelle structurante. Dans plusieurs cas, l'alternance vers l'anglais intervenait pour introduire un terme spécialisé perçu comme plus légitime académiquement ; le passage au russe dans un échange majoritairement letton permettait d'exprimer une nuance affective ou humoristique. Ces pratiques révèlent un plurilinguisme fonctionnel et stratégique, au sein duquel le locuteur

ajuste en permanence ses choix linguistiques en fonction du contexte, de l'interlocuteur et des normes implicites. En résonance avec le thème du colloque, cette contribution souligne que la diversité des données – orales, interactionnelles et discursives – est indispensable pour analyser l'impact des interactions linguistiques dans l'espace européen. Elle montre également que le traitement méthodologique de corpus plurilingues exige une réflexion théorique approfondie. Ce travail constitue enfin le point de départ d'une recherche doctorale élargissant l'analyse aux contextes universitaires français et lettons, afin d'explorer plus avant l'articulation entre pratiques langagières, discours institutionnels et construction du statut du locuteur plurilingue.

LAUDATIO RĪGAS 16.–17. GS. EPICĒDIJOS

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Epicēdijs (lat. *epicedium* ‘bēru dzejolis’) ir viens no visiecienītākajiem žanriem Eiropas 16.–17. gs. okazonālajā dzejā, t.i., dzejā, kas tapusi, atzīmējot kādu īpašu gadījumu. Arī Rīgas literārajā ainā sēru dzejoļi, kas veltīti mirušā piemiņai, ir plašākais latīņu okazonālās dzejas korpus šajā periodā. Attīstoties ciešā saistībā ar akadēmisko, pilsonisko un garīdzniecības vidi, šie teksti ir ne tikai nozīmīga neolatiniskās kultūras un literārā procesa daļa, bet arī spilgta plašākas sociālās kultūras liecība. Eiropas dzejas tradīcijā epicēdijām raksturīga noteikta struktūra – *laudatio* (aizgājēja cildinājums), *lamentatio* (tuvinieku un draugu žēlabas par zaudējumu), *consolatio* (mierinājums tuviniekiem), kā arī vairāk vai mazāk noteiktas satura (piem., tikumu uzsvērumi, *vanitas*, *memento mori* u.tml.) un formas iezīmes. Rīgā tapušie veltījuma teksti, kas attīstās humānisma un vēlāk luteriskā baroka kontekstā, ir Eiropas latīņvalodīgās kultūras daļa, un tajos izgaismojas tās literārās un lingvistiskās tradīcijas ietekmes – antīkās kultūras, mitoloģijas motīvi, tēli un simboli, rētoriskās struktūras, paņēmieni un elementi. *Laudatio* ir viena no neatņemamām šo veltījuma tekstu daļām, nereti pat plašākā. Referātā paredzēts aplūkot, kādas ir tās raksturīgās satura un formas iezīmes Rīgas epicēdiju paraugos, kādi tradicionālie elementi izmantoti un cik liela vieta un nozīme lokālam elementam.

JĀŅA AKURATERA PROZA SLĀVU TULKOTĀJU INTEPRETĀCIJĀS

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Jāņa Akuratera proza, īpaši viņa nozīmīgākie darbi: “Kalpa zēna vasara” (1908) un “Degoša sala” (1912) tulkoti vairākās baltu un slāvu valodās: latgaliešu, lietuviešu, krievu, čehu un ukraiņu valodā. Tā kā abi teksti ir apjomīgi, referātā literatūras vēstures kontekstā tuvāk tiks aplūkots “Kalpa zēna vasaras” tulkojums krievu un ukraiņu valodā. Krievu valodā J.Akuratera stāstu tulkojis Sergejs Cebakovskis, tulkojums publicēts 1969. gadā ar nosaukumu То дивное давнее лето : [рассказ] / Янис Акуратер ; [перевод с латышского Сергея Цебаковского ; художник Василий Шелков]. Рига : Лиесма, 1969, savukārt ukraiņu valodā darbu tulkojis Viktors Meļņiks, tulkojums nācis klajā 2023. gadā: Літо юного наймита / Янис Акуратерс ; переклав з латиської Віктор Мельник ; ілюстраторка Марина Шутурма. Львів : Апіопі, 2023. Kā rāda oriģinālteksta un tulkojumu salīdzinoša analīze, S.Cebakovskis latviešu rakstnieka tekstu ir interpretējis sociālistiskā reālisma garā, romantisma un simbolisma kodus transformējot atbilstoši reālisma (sociālistiskā reālisma) tradīcijai. Viņa tulkojums ir drīzāk brīvs, par ko liecina arī tulkotā teksta nosaukums. Tulkojuma tekstā sastopamas modifikācijas, kas saistītas ar teksta adaptāciju, ņemto vērā krievu kultūras normas. Turpretī ukraiņu tulkotājs J.Akuratera darbu uzlūkojis kā klasiskās literatūras paraugu, saglabājot oriģināldarbam raksturīgos romantisma estētikas principus. Īpaša uzmanība referātā būs veltīta transformācijām, kas saistītas ar latviešu mitoloģijas kodiem, proti, to epitētu un metaforu tulkojumu salīdzinošai analīzei, kas saistīti ar latviešu folklorai raksturīgo krāsu pamatgrupu “balta, sarkana un melna” (Janīna Kursīte. Latviešu folklorā mītu spoguļi. Rīga : Zinātne, 1996) .

INTERNATIONALISATION, LANGUAGE TECHNOLOGIES, DISTANT LEARNING

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Rapid development and widespread use of technology in humanities (e.g. in language acquisition and corpus-based studies) have highlighted the topicality of language technology skills advancement for linguists. Once being grounded within computer science, language technologies have expanded into humanities and social sciences equipping linguists with digital solutions for automated text analysis, sound processing, analysis of multimedia data and rich visualisations. In addition, contemporary solutions enable flexible distance learning options that the present study addresses for language technology skills advancement. The goal of the study was to propose a distance learning course “Introduction to Language Technologies” design process and pre-pilot its selected sections. To reach the goal, the exploratory case study was applied as a research method and comprised the existent course content adaptation and administering a questionnaire. The study results reveal that the course content has been adapted successfully and after piloting it to part-time students with limited contact hours, a distance self –paced mode of it will be launched significantly broadening its target audience among international students.

Keywords: Language technologies, distance learning, online learning, digital competence

KĀDS 17. GS. OKAZIONĀLAIS TEKSTS VALODAS TREIŅAM

Ilze Rūmniece

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LU Akadēmiskās bibliotēkas retumos atrodams 1651. gadā publicēts grieķu teksts, kas veidots kā akrostihs un kā veltījums veidots sava laika prominēncu laulību sakarā. Akrostiha izveide ir gana savdabīga, jo ne vien dzejas rindu pirmie vārdi sākas ar kādu no noteiktu vārdu (ΓΑΜΟΣ – precības) veidojošiem burtiem, bet arī visi katrā rindā izmantotie vārdi sākas ar šo rindas sākuma burtu. Tāda pieeja tekstveidei noteikti prasījusi no autora izdomu un lingvistisku izveicību, jo vairāk tāpēc, ka šāds īpatns teksts veidots heksametra pantmērā un pēc sengrieķu prosodijas principiem. Apskatot tekstu kopumā un arī katru tajā izmantoto vārdu, skaidrs, ka tas nav ērts tulkojumam. Bet noteikti ir interesanti apsvērt, vai un kāpēc šāda teksta izveide bijusi noderīga kā valodas vingrinājums 17. gadsimtā un kā tā līdzīgi varētu būt noderīga arī mūsdienu klasisko valodu studijās. Referātā paredzēts izgaismot visus pieminētos aspektus.

CENSORSHIP AND IDEOLOGICAL DISTORTION: THE CASE OF BELS' A VOICE IN THE WILDERNESS

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In the past and today, translations of Latvian literature often aim to brand Latvian culture abroad. Translation inevitably involves change. Beyond the subjective elements of a translator's interpretation and skill, there are institutional influences such as commissioning, objectives, censorship, and editing. Given Latvia's history in the turbulent twentieth century, Latvian literature provides a particularly compelling example of how editorial policies interface with the literary world and translations. While recent studies have examined censorship of translations into Latvian, manipulations of Latvian translations into other languages remain largely unexplored. This paper will examine translation of Bels's *The Voice of the Herald* (*Saucēja balss*), originally published in 1972/1973 and translated in 1980. The English translation was based on a Russian version, and ideological manipulations in the Russian text eliminated much of the original's anti-Russian irony, subtext, and nuanced parallels between the tsarist and Soviet regimes. This translation brings to mind Kundera's views on the translator's duty to preserve the integrity of original content, even at the cost of potential awkwardness or complexity in the translated version. Kundera describes the failure to do so as "amputation, mutilation, castration, rape, and betrayal." Even if these terms are severe, preserving the original cultural and linguistic essence of a work is essential to its identity and impact – fundamental objectives when translating national landmarks.

EROSION OF AUTHORSHIP BOUNDARIES IN TRANSLATION AND EDITING: OSCAR WILDE, JĀNIS EZERIŅŠ, AND LŪCIJA RAMBEKA

Antra Leine, Evita Badina

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By tracing layered textual history of the translation of Wilde's novel "The Picture of Dorian Grey" in Latvian, first translated by Jānis Ezeriņš and later edited by Lūcija Rambeka, the study highlights how translation and editorial processes erode clear boundaries of authorship. A comparative analysis of the 1921 translation, the 1976 edition, and the 1890 and 1891 English versions of the novel illustrate how a literary work is gradually shaped not only by the original author and translator but also by subsequent editorial interventions eventually redefining the original text.

ADDRESSING LATVIAN READERS THROUGH TRANSLATION: IDEOLOGICAL MEDIATION IN SOVIET LATVIA

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This paper examines how translated literature functioned as a mediated form of cultural communication with Latvian readers during the Soviet period. Translation was not merely a linguistic transfer but part of a broader ideological framework that shaped the reception of foreign literature. Drawing on archival materials and selected translation cases, the study focuses on three interconnected aspects: the selection of works for translation, the use of paratextual elements such as forewords and afterwords, and the role of press coverage in framing these publications. Particular attention is paid to how these mechanisms addressed Latvian readers by guiding interpretation and aligning foreign texts with the ideological expectations of the Soviet cultural system. By examining these strategies, the paper highlights how translation served simultaneously as a channel of cultural contact and as a means of ideological mediation in Soviet Latvia.

CROSS-CULTURAL COMMUNICATION: INCOMING EXCHANGE STUDENTS

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University of Latvia (UL) welcomes several hundred exchange students each academic year, which prompts the necessity to analyse the cross-cultural communication within the institutional academic settings. Most of the exchange students are not native speakers of English and use the language as a lingua franca, similarly to the UL students and staff. Consequently, their cultural and linguistic backgrounds impact the pragmatic meaning construction. However, these instances of cross-cultural communication remain underexplored from the pragmatic perspective. The goal of the present study is to analyse such pragmatic microphenomena as deixis, presupposition and implicature in the discourse produced by the UL international exchange students. The research is approached from the qualitative perspective with quantitative research elements. The research methods are discourse analysis and frequency analysis performed using the SketchEngine software. A questionnaire is used as a data collection tool. Preliminary observations demonstrate that incoming students may experience challenges at the pragmalinguistic and sociopragmatic levels, which are reflected in the selection of the three microphenomena for the analysis. The limitations of the study concern the participant scope. Further research can deal with the comparative analysis of incoming student communication across several higher education institutions.

Keywords: internationalisation, student mobility, pragmatic meaning construction, cross-cultural communication, institutional discourse

RESEARCH PAPER WRITING ACQUISITION AT THE TERTIARY LEVEL

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Previous studies on writing skill development emphasize that conducting research and writing a paper is a topical theme at the tertiary level. Bagione (2008) has stated that there is an assumption that students have already mastered research paper writing at school; however, it is not true. Also, experience working with undergraduates in Latvia demonstrates that students encounter several problems while making their first steps in academic writing (Bicjutko and Farneste, 2023; Farneste and Bicjutko, 2025). Besides writing, university level students should also develop their collaboration skills, which are very important in their future career. It is also important to help students to become more autonomous in their writing process (see, e.g. Zang, 2018; Cheong, Luo, Zhu, Lu et al., 2022). Thus, the goal of the present study was to investigate the major problems which undergraduate students encounter in research paper writing acquisition. The study was based on a questionnaire survey data analysis, collected from forty-four full-time students and thirteen part-time students majoring in English at a university in Latvia. The findings revealed that research paper writing should be based on step-by-step work with each student, utilizing the genre-process approach to writing (see, e.g. Hyland, 2003; Ghufon, 2016) to foster their independence in doing research and discussing it. The study also resulted in conclusions on the aspects which need particular attention while developing research writing skills at the tertiary level.

Keywords: research paper acquisition, process-genre approach, undergraduates, survey

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AI IN ESP: ETHICAL AND EFFICIENT USE

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The growing use of artificial intelligence (AI) in all fields and by almost every person has changed tremendously the way we teach and study. AI is an efficient aid to be used to prepare for classes as it saves time and effort. However, it can also be misused, and there is an ongoing debate in academia how far to allow students to apply AI in their work and how to detect its unethical use. Another issue is how to use AI ethically teaching at the tertiary level. Therefore, the study explores the application of AI in acquiring English for Specific Purposes (ESP) at a tertiary level and AI use during classes and while preparing for classes. The research is a case study involving 100 students and applying AI in such tasks as writing a summary, translating an abstract and preparing podcasts to ease understanding of theoretical material of English grammar topics. The results indicate that a wise and efficient use of AI can facilitate the learning process.

TÉCNICAS DE TRADUCCIÓN PARA EVITAR LA ANGLICANIZACIÓN DE UN IDIOMA

Rosario Pareño López

Complutense University

La presente conferencia está enfocada en la creciente anglicanización del español que ha surgido a raíz del uso masivo de redes sociales, donde predomina la lengua inglesa. El uso directo de términos o expresiones en inglés, así como las traducciones literales, han inundado el habla de préstamos, calcos y extranjerismos que llevan a un empobrecimiento de la lengua española, así como de otras lenguas. Como solución, propongo la enseñanza de técnicas de traducción sencillas como medida para detectar traducciones literales y evitarlas. En este sentido, la ponencia analizará ejemplos concretos de este fenómeno en distintos ámbitos de uso, especialmente en el discurso digital de jóvenes hablantes, donde se observan estructuras calcadas del inglés y la adopción acrítica de anglicismos innecesarios. Se prestará especial atención a casos frecuentes en redes sociales, publicidad y comunicación cotidiana, con el fin de ilustrar cómo estos usos se normalizan y se difunden con rapidez.

Asimismo, se reflexionará sobre el papel de la educación lingüística ante este contexto, destacando la necesidad de desarrollar una conciencia crítica en los estudiantes respecto al uso de la lengua. La incorporación de nociones básicas de traducción – como la identificación de falsos amigos, la reformulación idiomática o la adecuación al contexto – puede contribuir no solo a mejorar la competencia comunicativa, sino también a preservar la riqueza expresiva del español.

EL VOSEO: FENÓMENO LINGÜÍSTICO Y RECURSO LITERARIO EN AMÉRICA LATINA. UN EJEMPLO DE LA LITERATURA PARAGUAYA

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El fenómeno del voseo está incluido en el Plan Curricular del Instituto Cervantes para el nivel A2 a pesar de que para muchos en este nivel es un fenómeno desconocido. No debe interpretarse como una incorrección ni como una desviación del sistema lingüístico, sino como una forma gramatical plenamente legítima y normativa en diversas comunidades hispanohablantes de América Latina. Si bien su origen se remonta al español medieval, en la literatura contemporánea, el voseo ha dejado de percibirse como marca marginal para constituirse en una modalidad plenamente legitimada dentro del sistema expresivo. Su uso por parte de autores argentinos, uruguayos y centroamericanos sin mediaciones justificativas evidencia su consolidación como elemento normalizado en la representación literaria. La presente ponencia propone analizar el uso del voseo en la colección de cuentos *Mujeres que matan* (2015), de la escritora paraguaya Lita Pérez. A partir de este corpus, se examinarán las funciones discursivas y estilísticas del voseo, prestando especial atención a su papel en la construcción de la voz narrativa y en la caracterización de los personajes. El análisis permitirá observar cómo el uso del voseo no solo aporta verosimilitud sociolingüística, sino que también contribuye a la creación de una identidad cultural específica, vinculada a contextos regionales concretos.

EL DISCURSO ORAL Y ESCRITO EN LA ADQUISICIÓN DEL ESPAÑOL COMO LENGUA EXTRANJERA

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Esta ponencia aborda la relevancia del discurso oral y escrito en el proceso de adquisición del español como lengua extranjera (ELE). Se examinan las características específicas de ambas modalidades discursivas, destacando la espontaneidad y contextualización propias del discurso oral, frente a la planificación y estructuración del discurso escrito. Asimismo, se analizan las dificultades que enfrentan los aprendices en cada modalidad, tales como la fluidez y comprensión auditiva en la oralidad, la cohesión textual y adecuación del registro en la escritura. Finalmente, se proponen estrategias didácticas integradoras que favorecen el desarrollo de una competencia comunicativa integral y funcional en el aula ELE. Asimismo, se subraya la importancia de diseñar tareas que articulen ambas modalidades de manera complementaria, promoviendo la transferencia de habilidades entre la oralidad y la escritura. De este modo, se favorece un aprendizaje más equilibrado y significativo, orientado al uso real de la lengua en distintos contextos comunicativos.

ÁNGEL GANIVET EN EL AULA DE ELE: LECTURA CRÍTICA Y MEDIACIÓN CULTURAL EN NIVELES INTERMEDIOS

Leonor Inés Cara láñez

University of Latvia

Desde un marco de didáctica de la cultura y educación literaria, esta ponencia parte del diagnóstico de que los materiales de ELE en niveles intermedios suelen ofrecer un tratamiento limitado de códigos culturales y literarios complejos. Se propone el diseño de materiales que atienden esta carencia en la enseñanza del español através de fragmentos seleccionados de obras de Ángel Ganivet, en un seminario práctico de lectura crítica. Se presentan adaptaciones para los niveles B1/B2, materiales de mediación cultural y espacios de debate sobre los géneros literarios, junto con su correspondiente secuenciación didáctica. En este contexto, la propuesta didáctica se articula en torno a una concepción de la lectura literaria como práctica activa, interpretativa y culturalmente situada. A través de los textos de Ángel Ganivet, se busca no solo desarrollar la competencia lingüística del alumnado, sino también fomentar su capacidad de análisis crítico y su comprensión de los marcos históricos e ideológicos en los que se inscriben las obras. De este modo, la literatura se convierte en una herramienta privilegiada para el acceso a significados culturales profundos, que trascienden el aprendizaje instrumental de la lengua.

Por otro lado, la secuenciación didáctica propuesta atiende a la progresión de habilidades, integrando tareas de comprensión, análisis y producción que se ajustan a los niveles B1/B2, sin renunciar a la complejidad inherente a los textos literarios. Esta aproximación contribuye a superar la simplificación excesiva que a menudo caracteriza los materiales de ELE, ofreciendo alternativas más ricas y desafiantes.

PREFERENCIAS, PERCEPCIÓN DE EFICACIA Y ADQUISICIÓN DEL ESPAÑOL COMO LENGUA EXTRANJERA EN ADOLESCENTES: ESTUDIO EXPLORATORIO POR NIVELES

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Esta comunicación presenta un estudio exploratorio sobre las percepciones de estudiantes letones de 16–19 años que aprenden español como lengua extranjera en Rīgas Valsts vācu ģimnāzija (Riga). El programa (10.º–12.º) parte de cero y prevé un nivel A2 al final, con algunos contenidos B1; se imparten tres sesiones semanales de 40 minutos. Con un cuestionario mixto (ítems Likert y preguntas abiertas) a $n \approx 90$ alumnos, se analizarán actividades consideradas más motivadoras y eficaces y las dificultades percibidas, comparando patrones entre cursos. Se discutirán implicaciones para diseñar tareas discursivas en el aula de ELE.

Los resultados preliminares apuntan a una preferencia clara por actividades comunicativas y dinámicas, especialmente aquellas que implican interacción oral, trabajo en grupo y el uso de materiales auténticos, como vídeos o canciones. En contraste, las tareas más tradicionales, centradas en la memorización o en ejercicios gramaticales descontextualizados, tienden a percibirse como menos motivadoras, aunque algunos estudiantes reconocen su utilidad para afianzar estructuras básicas.

MÉTODOS ACTUALES EN LA ENSEÑANZA/ APRENDIZAJE DE LENGUAS

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El enfoque comunicativo en la enseñanza de lenguas surge en la década de 1970 e integra aportaciones teóricas sobre los procesos de adquisición de lenguas de la Psicología, la Lingüística, la Sociología y la Neurolingüística. Sus desarrollos metodológicos siguen todavía en vigor (enseñanza por tareas, contenidos, proyectos, entre otros). Hoy en día, la didáctica de lenguas tiende hacia enfoques más eclécticos, dinámicos e interdisciplinarios, adaptados a las características académicas, institucionales y sociales de cada contexto educativo. Esta conferencia ofrece una visión panorámica de los métodos actuales, que incorporan herramientas como la inteligencia artificial y conceptos como la mediación, la interculturalidad y el plurilingüismo.

MULTILINGÜISMO Y TRANSLENGUAJE COMO RECURSOS DISCURSIVOS. EL EJEMPLO DE PARAGUAY

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Universidad Autónoma San Sebastián

El multilingüismo y el translenguaje se consolidan como enfoques fundamentales en la adquisición de lenguas extranjeras al reconocer el repertorio lingüístico del aprendiz como un recurso dinámico, flexible y productivo, y no como una mera interferencia. Desde esta perspectiva, las lenguas dejan de concebirse como sistemas estrictamente separados para entenderse como recursos que interactúan estratégicamente en el discurso, permitiendo construir significado, negociar identidades – tanto individuales como colectivas – y facilitar los procesos de comprensión.

En el contexto de Paraguay, esta cuestión adquiere una relevancia particular. El país se caracteriza por su condición de Estado oficialmente bilingüe, en el que el español y el guaraní coexisten como lenguas oficiales. Sin embargo, en la práctica comunicativa cotidiana, una gran parte de la población utiliza una variedad híbrida conocida como jopará, que combina elementos de ambas lenguas. Esta práctica no solo refleja una realidad sociolingüística compleja, sino que también incide en la configuración de la identidad colectiva y en determinados patrones de pensamiento y comportamiento social, diferenciando en ciertos aspectos a la sociedad paraguaya de otras comunidades latinoamericanas.

En el ámbito educativo, la valoración del repertorio lingüístico del alumnado favorece el desarrollo de una pedagogía más inclusiva, fortalece la competencia comunicativa y potencia la conciencia metalingüística. Asimismo, la integración de prácticas de translenguaje en el aula fomenta la participación activa, estimula el pensamiento crítico y contribuye al desarrollo discursivo de los estudiantes en contextos educativos cada vez más diversos y globalizados.

EL DEQUEÍSMO: UN ERROR MUY COMÚN ENTRE LOS HABLANTES NATIVOS DE ESPAÑOL

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Los objetivos principales de esta ponencia son: (1) destacar que el dequeísmo constituye un vicio del lenguaje muy frecuente entre los hablantes nativos de español; 2) exponer sus posibles causas para su uso y (3) determinar el impacto que produce; de modo general en la comunicación. En conclusión, el dequeísmo se presenta como un fenómeno lingüístico ampliamente extendido entre los hablantes nativos de español, cuya frecuencia no solo evidencia su arraigo en el uso cotidiano, sino también la dificultad que supone para muchos usuarios distinguir entre construcciones correctas e incorrectas. A lo largo de esta ponencia se ha puesto de manifiesto que no se trata de un error aislado o esporádico, sino de un hábito que, en numerosos casos, pasa inadvertido incluso para quienes poseen un dominio avanzado del idioma. Asimismo, el análisis de sus posibles causas permite comprender que el dequeísmo no surge únicamente por desconocimiento normativo, sino también por factores como la analogía con estructuras correctas, la hipercorrección o la inseguridad lingüística. Estos elementos reflejan la complejidad del sistema gramatical del español y la influencia que tienen tanto la educación formal como el entorno sociocultural en la configuración del habla. En cuanto a su impacto en la comunicación, si bien el dequeísmo no suele impedir la comprensión del mensaje, sí puede afectar la percepción de corrección y competencia lingüística del hablante, especialmente en contextos formales o académicos. Esto lo convierte en un aspecto relevante para la enseñanza del español y para la reflexión metalingüística, ya que pone de relieve la importancia de fomentar un uso consciente y adecuado del idioma.

2.2. sekcija. **IDENTITĀTE, MODERNAIS UN
TRADICIONĀLAIS LATVIJĀ UN
DIASPORĀ /**

**IDENTITY, THE MODERN AND
THE TRADITIONAL IN LATVIA
AND THE DIASPORA**

MITOLOĢIJAS UN ZINĀTNES PRETRUNAS UN SATUVINĀJUMI JĀŅA VESEĻA PROZĀ

Edgars Lāms

Latvijas Universitāte

Jānis Veselis bijis tuvs gan teiku un mitoloģijas, gan zinātnes pasaulei. Tas izpaudies viņa interesēs un uzskatos un integrējies arī viņa literārajos tekstos. Rakstnieka daiļdarbos mitoloģijas un zinātnes attiecībās lielākoties valdījusi mierīga koeksistence, kas gan ne vienmēr bijusi organiska, mākslinieciski pārliecinoša.

Pētniecībā J. Veselis bieži dēvēts par teiksmotāju (Jānis Grīns, Arturs Kaugars, Velta Toma u. c.) un mītu radītāju (Guntis Berelis). Rakstnieks ir teiksmas žanra jaunieviesējs latviešu literatūrā ("Latvju teiksmas", 1942, 1966), vairāki viņa romāni ("Trīs laimes", 1929, triloģija "Cilvēku sacelšanās", 1934, 1938, 1946, "Viesturs Varapoga", 1952) dēvējami par teiksmu romāniem. Pat savas mūža gaitas atmiņas autors nodēvējis par teiksmu (Teiksma par manu mūžu", 1956). J. Veselis ir dievturības ideju adepts, rakstnieka literārajos darbos raksturīga latvisko dievību klātesības apziņa, apliecināti folkloristiskās ētikas pamatprincipi.

No zinātņu disciplinām rakstnieku īpaši saistījusi astronomija, bet interesi raisījuši arī inženierzinātņu, fizikas un citu zinātņu atklājumi un sasniegumi. Dažādu debess ķermeņu– planētu un zvaigznāju– piesaukumi rodami daudzos J. Veseļa prozas un dzejas darbos. Vairākos romānos par galveno varoni izvirzīts inženiera profesijas pārstāvis ("Saules kapsēta", 1921, "Tīrumu ļaudis", 1927, "Tērauda dvēsele"). Triloģijas "Tērauda dvēsele" pirmajos divos romānos ievīti zinātniskās fikcijas satura slāņi, proti, inženieris Rudājs uzbūvē vispirms nelielu izmēģinājuma raķeti, bet pēc tam arī "visuma kuģi", ar ko dodas izplatījumā. Triloģijā risināti pārspriedumi par vielas uzbūves sīkelementiem, par radioaktīvajām vielām, par enerģijas ieguves jaunākām tehnoloģijām (atomu skaldišanu), par "smaguma likuma" (gravitācijas) iedarbību, par kosmosa telpas bezgalību un daudzām citām ar zinātnēm saistītām tēmām. Protams, tie ir literāri interpretēti zinātniskie motīvi, pielāgojot tos vēstījuma mākslinieciskajiem mērķiem.

Teiksmainie un zinātniskie aspekti J. Veseļa daiļradē satuvinājušies, papildinājuši viens otru, bet citkārt tomēr disonējuši. Piemēram, zinātniska satura gultnē ievirzītie triloģijas "Tērauda dvēsele" pirmie romāni īsti neveido organisku pāreju uz trešā romāna "Lielais gājiens" pilnībā teiksmaino skanējumu. Lai arī ir vēl citi neorganisku attiecību piemēri, tomēr kopumā teiksmainības un zinātnes, racionālo un irracionālo elementu saspēle J. Veseļa rakstniecībā ir interesanta un visai inovatīva tendence latviešu literatūrā, vismaz 20. gadsimta 20.–40. gadu periodā.

TRADICIONĀLAIS UN MODERNAIS JĀŅA VESEĻA DZEJAS POĒTIKĀ

Janīna Kursīte-Pakule

Latvijas Universitāte

Jānis Veselis (1896–1962) mūsu literatūrvēsturē iegājis un palicis galvenokārt ar saviem prozas darbiem. Taču periodikā jau kopš 1920. gada drukāta arī viņa dzeja. Kopsummā tie ir trīs dažādos laika posmos sacerēti dzejoļu krājumi (Dzīves vainagi, 1943; Staru būdā, 1947; Laimas mirdzumā, 1954). Referātā tiek akcentēti trīs ar poētiku saistīti jautājumi: a) apvidvārdu lietojums un semantika Veseļa dzejā; b) mitologēmas; c) klasisko metru un strofisko formu samērojums ar jaunām formām un metriskajām iespējām. Krājumā “Staru būdā” lasāma virkne apvidvārdu (“Jūra, mānīgā jūra, mūžam tu plenko un šalc.”; “Sievas piedrāvā bērnus, parājas cita uz citu.” u. c.). Referātā aplūkots, kā Veseļa dzimtās Sēlijas puses apvidvārdi sadzīvo ar viņa interesi par jaunākajiem atklājumiem fizikā, ķīmijā, astronomijā, un kā tā sekmē jauna leksikas slāņa ieviešanu dzejā. Mītiskajā plānā Veseļa dzejā līdzāspastāv senindiešu dievu pasaule ar senlatviešu Māras un Laimas, Dēklas un Kārtas pasauli. J. Veseļa dzejas metrika un strofika, no vienas puses, organiski iekļaujas tradīcijas rāmī. No otras puses, metriskā tradīcija tiek savādota, atkāpjoties no klasiskā kanona, kas Veseļa dzejas vērtētajos izsauca neizpratni, dažkārt pat asu kritiku. Jānis Veselis dzejā ievieš virkni mākslas prozas, folkloras žanru elementu, tādējādi spējot savādot ierasto lirikas tradīcijas gultni. Veseļa dzejā iekodēts laikmeta mainīgais ritms, zemapzinīgi signalizējošs gan par tuvojošies un par piedzīvotajām kara briesmām, gan par nepieciešamību ieaukt svešā mītnes zemē, vienlaikus saglabājot tradīcijas stabilo pamatu.

Atslēgvārdi: apvidvārdi, metrika un strofika, mitologēmas.

GASTROPOĒTISKIE ASPEKTI JĀŅA VESEĻA ROMĀNĀ “TRĪS LAIMES”

Ieva Kalniņa

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20. gadsimta 20.–30. gado tapa vairāki romāni, kas veltīti Latvijas senvēsturei – baltu ienākšanai Latvijas teritorijā – Ivande Kaija (īst. vārdā Antonija Lūkina, 1876–1942) romāns “Dzintarzeme” (1921), Jānis Veselis (1896–1962), romānu “Trīs laimes” (1929), Jānis Sārts (1905–1980) tetraloģiju “Senatne” (“Māra” (1929), “Vienoti” (1930), “Krusts debesīs” (1937), “Ziedari” (1939). To uzdevums bija veidot izpratni par tautas pagātnei, vai kā raksta angļu vēsturisko romānu pētnieks J. de Groot: “vēsturisko romānu varētu uzskatīt par tautas pašdefinēšanas instrumentu”. J. Veseli romānā rāda, kā jaunu mājvietu atrod sēļi.

Vēsturiskos romānos svarīga ir detaļu precīzums un daudzums. J. Veseļa romānā, kur sēļi vada saimnieciskas intereses, atrast labāku un bagātāku zemi, nozīmīgi ir gastropoētiskie aspekti, ēdiens raksturo visdažādākās identitātes (J. Michelle Coghlan). Autors sīki apraksta, kādus traukus izmanto sēļi, kādi ir viņu ēdieni un dzērieni, kādus lopus un labību viņi audzē, piemēram, sēļi izmanto koka karotes, nažus, bet dakšiņu vēl nav, ir pīles, bet nav vistu. J. Veseli rāda, ka mežos un pie ezera ir kāda ne baltu cilvēku grupa, kas tiek dēvēta par sumpurņiem, viņu barība ir zaļa, kamēr sēļi vāra un cep ēdienus, tātad starp cilvēku un sumpurņi arī ēdiena sagatavošanas veids ir nozīmīga robežšķirne.

J. Veselis romānā uzsver sēļu bagātību, maizi un sviestu katrs ņem, cik grib, ir zirņi, ir skābētas sēnes un augļi, ir dažāda tipa gaļa u. c.. Romāna autors cenšas uzvērt, ka sēļi pagātnē bija bagāti (lasītājam ir jānojaus, ka bagātību iznīcināja nākošie gadsimti).

Romānā uzvērtā arī piena nozīme ne tikai kā ēdienam (sviests, biezpiens) vai dzēriens, bet laba gov, tīra slaucene un balts piens ir katras meitas rota.

Romānā tiek uzsvērts, ka sēļi ir sena zemkopju tauta, ar lieliem tīrumiem (rudzus, miežus, linus), tieši tāpēc viņi meklē jaunas zemes. Zemnieku tautas tēls atbilst latvieši nācijas kā zemnieku tautas tēlam.

Atslēgvārdi: vēsturiskais romāns, sēļi, sumpurņi, piens, zemkopība.

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JĀNIS VESELIS PAR LATVIEŠU RAKSTNIEKIEM

Viesturs Vecgrāvis

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Jānis Veselis ir viens no retajiem brīvvalsts (1918-1940) laika latviešu rakstniekiem, kurš intensīvi rakstījis apceres un esejas par sava laika mūsu rakstniekiem. Šīs apceres publicētas apjomīgās grāmatās “Rakstnieļu sejas” un “Pārdomu grāmata”. Veseļa interpretācijās laikmeta un inovatīvu māksliniecisko meklējumu kontekstā raksturota J. Raiņa, K. Skalbes, J. Akuratera, E. Virzas, J. Ezeriņa, K. Zariņa u. c. latviešu rakstnieku jaunrade. Īpašu vērību J. Veselis veltījis Aleksandra Grīna un Jāņa Poruka jaunrades mākslinieciskajām novitātēm, raksturojot tās komparatīvā aspektā, kā arī atklājot šo rakstnieku mākslinieciskās programmas ģenēzi un psiholoģiskos aspektus. Referāta atklāta J. Veseļa skatījuma plašā analītiskā amplitūda un recepcijas oriģinalitāte.

JĀŅA VESEĻA TEĀTRA RECENZIJAS LAIKMETA KONTEKSTĀ

Zane Radzobe

Latvijas Universitāte

Rakstnieks Jānis Veselis, paralēli literārajai darbībai un darbam literatūras kritikā, ir rakstījis arī teātra recenzijas. Veseļa mantojums teātra kritikas laukā joprojām nav apkopots un izvērtēts, tāpēc referāts piedāvā ieskatu Veseļa kritikas darbā, koncentrējoties uz sava laika aktuālo procesu izpratnes, estētikas un teātra kritikas profesionālo elementu lietojumu viņa recenzijās.

REALIĀTE UN ATMIŅA JĀŅA LEJIŅA KRĀJUMĀ “MŪSU STACIJA”

Ingus Barovskis

Latvijas Universitāte

Referātā paredzēts pievērsties Jāņa Lejiņa stāstu krājumam Mūsu stacija, kas iznāk 1988. gadā sērijā Pirmā grāmata. Ar attiecīgā laika realitātes tēlojumu Lejiņš šajā krājumā pievēršas cilvēku rīcības un rīcības iemeslu izpētei, kā arī vēsturisko procesu reminiscencēm, kas tāpat ietekmē varoņu motīvus un darbības. Jāņa Lejiņa krājums ir pieskaitāms 20. gadsimta beigu posma jauno autoru modernisma tendencēm, tomēr saglabājot ar tradicionālā naratīva aspektus.

AKADĒMISKĀ HUMANITĀRĀ TRADĪCIJA LATVIJĀ UN ZENTA MAURIŅA: DZIMUMDIFERENCES ASPEKTI

Ausma Cimdiņa

Latvijas Universitāte

Universitāšu un akadēmiskā tradīcijas izcelsme ne vien Latvijā, bet arī Eiropā kopumā augusi un veidojusies maskulīnās kultūras tradīcijas ietvarā, un tas sakāms arī par jaundibināto Latvijas Universitāti (1919). Pētījuma uzmanības centrā ir Zentas Mauriņas (1897–1978) pieredze Latvijas Universitātē, un to var skatīt vairākos aspektos: sieviete, demokrātija un dzimumu līdztiesība, sieviete un nacionālās humanitārās kultūras Latvijā iedibināšana, sieviete un zinātne, sieviete kā “citāda” un spilgta radoša individualitāte tradicionālās akadēmiskās dzīves kanonā. Pirmkārt, salīdzinoši vēsturiskā pieejā, jo sievietes vieta un loma Latvijas zinātnē laika gaitā ir mainījusies – no sievietes kā reta izņēmuma gadījuma²⁰. gs. 20–30. gadu zinātnē līdz totālai atsevišķu zinātņu nozaru (valodniecība, literatūrzinātne, pedagoģija) feminizācijai padomju okupācijas gados. Vai un kur ir problēma? Zentas Mauriņas akadēmiskās darbības sakarā būtisks arī jautājums par mūsdienu humanitāro zinātņu iekšējo būtību un pretmetiem jautājuma “sieviete un zinātne” kontekstā (terminoloģija, metodoloģija, varas diskurss u. c.)

Zenta Mauriņa ir pirmā sieviete, kas Latvijā un Latvijas Universitātē ieguvusi zinātņu doktora grādu humanitārajās zinātnēs. Viņa studēja Latvijas Universitātes Filozofijas un filoloģijas fakultātē (1921–1929), sākumā Filozofijas nodaļā, vēlāk Baltu filoloģijas nodaļā, darbs “Friča Bārdas pasaules uzskats” iesniegts Latvijas Universitātes Filozofijas un filoloģijas fakultātei Dr. phil. grāda iegūšanai 1938. gadā, piedzīvojot spēcīgu maskulīnās akadēmiskās vides pretestību, kas fiksēta gan promocijas procesa dokumentācijā, gan attēlota Zentas Mauriņas autobiogrāfiskajā romānā “Iedriksēties ir skaisti” (Toronto, 1958).

VALODAS ELEMENTU LOMA IDENTITĀTES IZPAUSMĒ DIASPORAS AUTORU AGATES NESAULES UN INĀRAS VĒRZEMNIEKS MEMUĀROS

Zigrīda Vinčela, Alise Alute

Latvijas Universitāte

Nacionālās identitātes atklāsmē literārajā tekstā var tikt īstenota caur noteiktu valodas elementu lietojumu, tostarp radniecību apzīmējošiem lietvārdiem, piemēram, vectēvs, māte, tēvs, brālis, māsa u. c. Šo lietvārdu lomas analīze nacionālās identitātes klātbūtnes izpētē tika veikta divu atšķirīgu paaudžu latviešu diasporas autoru angļu valodā rakstīto memuāru fragmentos: A. Nesaules “A Woman in Amber” un I. Vērzemnieks “Among the Living and the Dead”. Analizējamo lietvārdu un to lietojuma piemēru atlasē vispirms, izmantojot Lankasteras Universitātes korpusa analīzes rīka Wmatrix 7 semantisko pazīmju kopu, tika izveidots minēto lietvārdu saraksts. Tālāk, pielietojot konkordances funkciju, tika identificēti un grupēti šo lietvārdu lietojuma piemēri. Izgūto piemēru analīze atklāja atšķirības radniecību raksturojošo lietvārdu izvēlē un lietojumā identitātes atklāsmē abu paaudžu autoru memuāros – A. Nesaule minētos lietvārdus galvenokārt izmantojusi identitātes atklāsmē, raksturojot ģimenes saites, savukārt I. Vērzemnieks darbā šie lietvārdi kalpo, lai paustu identitāti caur iepriekšējo paaudžu stāstiem.

PĒCATMIŅU (POSTMEMORY) IETEKME UN PERSONĪGĀS PIEREDZES ATSPUGUĻOJUMS ILZES BĒRZIŅŠ AUTO-BIOGRĀFISKAJĀ ROMĀNĀ “HAPPY GIRL” UN BIOGRĀFISKAJĀ STĀSTĪJUMĀ “PORTRAIT OF A LATVIAN BEAUTY”

Ildze Šķestere

Latvijas Universitāte

Latviešu diasporas, sevišķi trimdas autoru, pieredzes atspoguļojums literatūrā ir plaši apskatīts, taču mazāk uzmanības vērsts darbiem, kas tapuši angļu valodā pēdējās desmitgadēs. Viens šāds piemērs ir Ilzes Bērziņš daiļrade, kas akadēmiski ir apskatīta minimāli, lai gan kopumā autore sarakstījusi vairāk kā 10 kriminālliteratūras romānus, kā arī vairākus biogrāfiskus darbus. Šajā pētījumā apskatīts Ilzes Bērziņš autobiogrāfiskais romāns “Happy Girl”, kas sākotnēji tika publicēts 1997. gadā, bet vēlāk pārizdots 2014. gadā un tulkots latviski 2019. gadā, un viņas mātei veltītais biogrāfiskais stāstījums ar fotogrāfijām “Portrait of a Latvian Beauty”, kas tika izdots 2011. gadā. Apskatot šos izdevumus, ņemot vērā Mariannas Hiršas pēcatmiņu konceptu, var secināt, ka abas publikācijas viena otru papildina, dodot kontekstu gan asajām izjūtām “atgriešanās dzimtenē” naratīvā romānā “Happy Girl”, gan poētiskajam biogrāfiskajam stāstījumam par autores mātes un ģimenes dzīvi un likteņiem “Portrait of a Latvian Beauty”. Īpaša uzmanība tiks pievērsta abos darbos atspoguļotajām lokācijām un ar to saistītajām epizodēm, kas spilgti izceļ autores pieredzi uz laiku atgriežoties Latvijā.

LATVIETĪBA EKOKRITISKĀ SKATĪJUMĀ: DABAS UN IDENTITĀTES SASAISTE DIASPORAS RAKSTNIECES EVAS SAULĪTIS DAIĻRADĒ

Madara Stāde

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Eva Saulītis (1963–2016) bija otrās paaudzes ASV latviešu diasporas rakstniece un jūras bioloģe, kas lielāko dzīves daļu aktīvi nodarbojās ar vides aktivismu; 1989. gadā Saulītis piedalījās naftas noplūžu likvidēšanā Aļaskā, kas atstāja uz viņu ilgstošu iespaidu un ietekmēja viņas literāro stilu. Rakstnieces darbos būtiska vieta atvēlēta dabas motīviem un ekoloģiskas dabas jautājumiem, kas nereti tiek pozicionēti līdztekus pārdomām par latvietību. Referāta mērķis ir skatīt Evas Saulītis literāro daiļradi, īpaši koncentrējoties uz vides un nacionālās identitātes mijiedarbi. Pētījums īstenots, kombinējot ekokritikas teoriju un semiotiku, lai atklātu, kā Latvijas dabas motīvi tiek pārrādīti vai interpretēti mītnes zemes ekosistēmas un ekoloģiskās krīzes kontekstā. Pētījumā koncentrēti skatīti divi rakstnieces darbi: dzejas krājums “Prayer in the Wind” (2015) un eseju krājums “Becoming Earth” (2016).

LATVIEŠU DIASPORAS JAUNIEŠU IDENTITĀTES LINGVISTISKIE ASPEKTI

Daniels Kevins Berkans, Ojārs Lāms

Rīgas 2. Valsts ģimnāzija, Latvijas Universitāte

Referātā tiek skaidrotas diasporas jauniešu identitātes lingvistiskās dimensijas, apkopojot aptauju un interviju datus, kas iegūti četros lauka pētījumos dažādās latviešu diasporas kopienās angļiski runājošajā pasaulē. Empīriskais pētījums tika veikts jauniešu latviešu valodas nometnē Ziemeļīrijā, vasaras skolās “Garezers” un “Kursa” ASV, kā arī Annas Ziedares Latviešu vasaras skolā Austrālijā. Šis pētījuma norises vietas piedāvā papildinošus vēsturiskus kontekstus, lai izpētītu, kā mantojuma valodas prakses mijiedarbojas ar identitātes veidošanu jauniem latviešiem, kas dzīvo diasporā dažādās paaudzēs un ir saistīti ar dažādām diasporas grupām. Metodoloģiski pētījums izmanto jauktu kvalitatīvo un kvantitatīvo pieeju, apvienojot antropoloģisku līdzdalību, intervijas un anketēšanu. Datu vākšana koncentrējās uz divvalodības pieredzes dimensijām: ikdienas valodas lietojumu ģimenes un vienaudžu vidē, emocionālajām un kultūras saiknēm ar latviešu valodu, kā arī pašveidotām stratēģijām divvalodības līdzsvaram. Kvalitatīvo lauka piezīmju un kvantitatīvo anketu datu integrācija ļauj veikt rezultātu triangulāciju un sniedz niansētu izpratni par to, kā lingvistiskās prakses gan atspoguļo, gan veido identitāti transnacionālā telpā. Analīze liecina, ka latviešu diasporas jaunieši izstrādā elastīgus un situatīvus valodas repertuārus, kas ļauj viņiem orientēties starp kultūras sfērām, vienlaikus saglabājot simbolisku saikni ar savu mantojumu. Tālākās diasporas paaudzēs mantojuma valodas lietojuma intensitāte mazinās, tomēr tā joprojām spēlē nozīmīgu lomu gan pašidentifikācijai, gan uzturot starppaaudžu pēctecību un stiprinot transnacionālās saites globālajā latviešu kopienā. Atslēgvārdi: latviešu diaspora, jauniešu identitāte, divvalodība, mantojuma valoda, antropoloģisks lauka darbs, jauktās metodes pētniecība, transnacionālisms.

STARPKULTŪRU IDENTITĀTES KONSTRUĒŠANA LATVIJAS DIASPORĀ ZVIEDRIJĀ

Māra Simons

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Šajā pētījumā tiek analizēts, kā Latvijas mūsdienu diaspora Zviedrijā veido identitāti, izmantojot bilingvālas un bikulturālas prakses. Pētījumā izmantota Komunikatīvā pielāgošanās teorijā (Solizs, Džails, 2014), kura ar refleksīvās etnogrāfijas palīdzību aplūko, kā latviešu–zviedru bilingvāļi izmanto saplūšanu (convergence) un atdalīšanos (divergence), lai pozicionētu sevi starpkultūru situācijās, atklājot savu piederību, autentiskuma problemātiku un sociālā attāluma jautājumus. Pamatojoties uz vienpadsmit padziļinātām intervijām un ilgtermiņa dalību diasporas kopienā, pētījums parāda, ka bilingvāļi nav tikai divu valodu lietotāji: viņi aktīvi izmanto valodu kā resursu, lai orientētos dažādās kultūru vidēs. Pētījuma rezultāti liecina, ka bilingvālisma un bikulturālisma procesi ir saistāmi ar dinamisku un nevienmērīgu pieredzi, ko veido valodas iedarbība, kultūras atbalsts un sarunbiedru gaidas. Raksts paplašina starpkultūru komunikācijas teoriju, parādot, kā bilingvālā diaspora izmanto valodas pielāgošanos un hibrīditāti, lai radītu nozīmi un pozicionētu sevi starpkultūru mijiedarbībā. Pētījumā uzsvērts, ka tieši bikulturāla iesaiste – nevis tikai bilingvālā kompetence – ir izšķiroša minoritātes valodas uzturēšanā un starpkultūru identitātes veidošanā.

Atslēgvārdi: diaspora, starpkultūru komunikācija, bilingvālisms, identitātes veidošana, hibrīditāte

IDENTITĀTE STARP BALSI UN KLUSUMU – LITERATŪRAS KĀ REGULĀCIJAS PRAKSE

Inese Dāvidsone

Latvijas Universitāte

Referātā identitātes veidošanās literārajā tekstā tiek analizēta kā dinamisks process, kas norisinās starp balsi un klusumu, starp izteikto un neizteikto, starp redzamo un strukturāli klātesošo. Pētījuma centrā ir literatūra kā regulācijas prakse, kurā valodas poētiskie paņēmieni, pauzes, fragmentācija un klusuma struktūras funkcionē kā mehānismi identitātes kontinuitātes uzturēšanai sociālu un kultūras pārmaiņu situācijās.

Balstoties literārās analīzes un identitātes studiju pieejā, referāts argumentē, ka klusums literārajā tekstā nav interpretējams kā nozīmes trūkums, bet gan kā aktīva semantiska telpa, kurā iespējama identitātes stabilizācija situācijās, kur tieša pašdeklarācija kļūst ierobežota vai problemātiska. Šādā skatījumā literārais teksts funkcionē kā mediācijas telpa, kur tradicionālās kultūras struktūras un modernās subjektivitātes formas sastopas nevis konfliktā, bet regulācijas un līdzsvara konfigurācijā.

Piedāvātais analītiskais skatījums iekļaujas identitātes pētniecības, valodas prakses un kultūras atmiņas problemātikā, aktualizējot literatūras lomu kā starpniekmehānismam starp individuālās pieredzes artikulāciju un kolektīvo nozīmes struktūru uzturēšanu gan nacionālās kultūras, gan diasporas kontekstā.

VĀRDA 'PIONIERIS' DEFINĪCIJA UN IZMANTOŠANA URBANONĪMOS – BAUSKAS UN OGRES NOVADA PAŠVALDĪBAS GADĪJUMU ANALĪZE

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Referātā tiek analizēts valodas, ideoloģijas un pilsētvides savstarpējā mijiedarbība, izvēloties analizēt vārda “pionieris” semantisko transformāciju Latvijas vēsturiskajā un politiskajā kontekstā. Darba teorētiskais pamatojums balstīts atziņā, ka valoda nav neitrāls saziņas instruments – tā vienlaikus atspoguļo un veido sabiedrības domāšanu, vērtības un kolektīvo atmiņu. Darbā skaidrots urbanonīma jēdziens, analizēts normatīvais regulējums vietvārdu piešķiršanā un lietošanā, balstoties uz Latvijas Republikas Satversmi, Valsts valodas likumu un Ģeotelpiskās informācijas likumu. Referāta autors iepazīstinās ar vārda “pionieris” skaidrojumu un semantiskās nozīmes atšķirības ar vēsturisko un politisko kontekstu, kā arī autors skaidros Ogres un Bauskas novada pašvaldības vēlmi mainīt Pionieru ielas nosaukumu Ogres un Bauskas pilsētas teritorijā. Divas iepriekšminētās pašvaldības tika izvēlētas, jo publikajā telpā par tām tika aktualizēta informācija ar dažādiem viedokļiem par ielas nosaukuma mainīšanas nepieciešamību un to pamatojumu, kā arī tika sasniegti dažādi rezultāti Pionieru ielas pārdēvēšanā. Aktuāla ielas nosaukumu nomaiņa kļuva pēc Krievijas veiktā iebrukuma Ukrainā 2022. gadā.

Aktualizējot Bauskas un Ogres novada gadījumus un salīdzinot tos, nākas secināt, ka ielas nosaukumu ir iespējams mainīt, izmantojot “juridiskas sviras” un “stingru vēlmi” mainīt ielas nosaukumu. Tiek salīdzinātas abu pašvaldību pieejas, sabiedrības reakcija, politiskā griba un juridisko mehānismu izmantošana. Ogres novada gadījums ilustrē mērķtiecīgu rīcību un komunikāciju ar Valsts valodas centru, rezultātā panākot nosaukuma maiņu uz “Celmlaužu iela”, savukārt Bauskas situācija atklāj atšķirīgu politisko un sabiedrisko dinamiku. Referātā secināts, ka vārda “pionieris” nozīme Latvijā joprojām ir semantiski noslogota ar padomju perioda ideoloģisko pieredzi, lai gan vispārīgajā leksiskajā nozīmē tas apzīmē jaunatklājēju vai aizsācēju. Urbanonīmu maiņa tādējādi nav vien tehnisks vai administratīvs process, bet gan simbolisks notikums, kas atspoguļo sabiedrības centienus pārskatīt vēsturisko mantojumu, stiprināt nacionālo identitāti un saskaņot publisko telpu ar mūsdienu vērtībām. Darbs apliecina, ka valodas politika un vietvārdu izvēle ir būtisks instruments kolektīvās atmiņas veidošanā un ideoloģisko slāņu aktualizēšanā pilsētvidē.

Atslēgvārdi: urbanonīmi, valodas politika, ideoloģija, pilsētvide, pionieris, kolektīvā atmiņa, semantika.

MANTOTI, PIELĀGOTI UN AIZGŪTI PRIEKŠSTATI UN TEKSTI: LATVIEŠU TAUTAS TICĒJUMU DZĪVOTSPĒJA

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Ticējumi ir viens no tiem folkloras žanriem, kas visdziļāk ieteicas ikdienas praksēs. Tie aktualizēti un pielietoti vienlīdz ikdienas dzīves nepieciešamībām un arī sevišķos notikumos, mūža gados un kalendārajos svētkos. Turklāt tas darīts dažādos nolūkos. Ticējumu lietojums, gluži tāpat kā kā priekšstati, kuros tie balstīti, ir bijis cilvēkam līdzās no paaudzes paaudzē. Un arī mūsdienās, kad vides pieredze šķietami atšķiras no tā, kas bijis līdzās agrāk, tiek uzskatīts par svarīgu vērot dažādas likumsakarības, veikt darbības, kas vērstas uz labu izdošanos vai nelaimes atvairīšanu dažādās dzīves jomās, un ticēt tām.

Latviešu tautas ticējumu tekstiem nav vienas noteiktas gramatiskās struktūras, un to vēstījums var tikt ietverts savstarpēji atšķirīgos tekstos, tomēr cilvēka izpratne par to, kas ir ticējums, ir teju intuitīva un paaudzēs pārmantota. Tipiski ar ticējumu tiek saprasts īss, cēloņsakarības raksturojošs izteikums. Lielākoties praktiskā lietojuma motivēti, šie teksti to īsajā, ikdienas komunikācijai ērtajā formā tomēr ietver plašākus naratīvus – tautas zināšanas un līdzās tām arī personīgo pieredzi. Kā priekšstati, kas tiem pamatā, tiklab arī situācijas, kurās tie aktualizēti un ticējumu lietojuma funkcijas lielā mērā attiecināmas uz cilvēka pasaules pieredzes universālījām. Ticējumu dzīvā lietojuma ciešā klātbūtne un iekļaušanās cilvēka ikdienā veicina nepieciešamību pēc tiem, un tā – arī jaunu priekšstatu rašanos vai aizgūšanu. Analizē ilustratīvam piemēram izmantojot 19. gadsimta beigās un 20. gadsimta sākumā pierakstītos un, no otras puses, mūsdienās lietotos ticējumu tekstus, referātā raudzīts izvērst minētos aspektus plašāk, iezīmējot latviešu tautas ticējumu dzīvotspēju un pielāgošanos laika gaitā, ļaujot tos uzlūkot kā daļu identitātes.

ETNOGRĀFISKĀ UN MĪTISKĀ SINKRĒTISMS LATVIJAS VIZUĀLĀ TĒLA ORNAMENTIKĀ

Sintija Anča

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Lai gan etnogrāfisko elementu lietojums valsts vizuālajā tēlā ir plaši izplatīts nacionālo valstu prakse, Latvijas gadījums ir īpatnējs vairākos aspektos. Tradicionālais ornaments un citi etnogrāfiskie elementi Latvijas oficiālajos simbolos un reprezentācijas materiālos parādās īpaši bieži, turklāt atsevišķi ornamenta elementi, kā piemēram, ugunskrusts, zalkša zīme vai auseklis, bieži vien lietoti ārpus to etnogrāfiskā konteksta, izceļot tiem jaunākos laikos piešķirtās ideoloģiskās un mitoloģiskās nozīmes. Šāds ornamenta lietojums Latvijas sabiedrībā ir populārs arī ārpus oficiālās valsts identitātes robežām. Šī referāta ievirze apvieno folkloras un dizaina skatpunktus. Lai gan folklorā kopš nozares pirmsākumiem ir bijusi izteikti galvenokārt uz tekstu orientēta nozare, tās pētījumu objekts ietver arī vizuālos materiālus, kas gluži tāpat kā mutvārdu folklorā ir kolektīvas jaunrades rezultāts. Vizuālās folkloras pētījumi kļūst arvien aktuālāki, palielinoties attēlu īpatsvaram kultūras vidē, turklāt tie var sniegt jaunus ieskatus kolektīvās atmiņas un etniskās identitātes formēšanās procesos.

Referātā aplūkotas latviešu tradicionālā ornamenta izpausmes Latvijas vizuālajā identitātē: kādi etnogrāfiski citāti tajā sastopami, kā ornamenti ietekmējis kopējo vizuālo izteiksmi, un kā tas darbojies kā mitoloģiskā vēstījuma nesējs. Analizēti Latvijas vizuālās identitātes piemēri no tās veidošanās sākumposma 20. gs. sākumā, kā arī mūsdienās pēc 1990. gada. Šāds diahronisks skatījums ļauj spriest par izvēlēto vizuālo stratēģiju ilgtspēju un pārvērtībām ilgākā laika posmā. Salīdzinājumam izmantoti arī piemēri no Igaunijas un Lietuvas, kas ļāvis secināt, ka pastāv zināmas likumsakarības starp tradicionālā ornamenta pētniecības virzienu un ornamenta lietojumu valsts vizuālajā identitātē. Latvijā ornamenti ticis un joprojām tiek mitoloģizēti izteiktāk nekā Lietuvā un Igaunijā, ornamenta lietojums ir arī biežāk sastopams, un parasti tas ir ieturēts ģeometriskā ornamenta stilistikā, kas sasaucās ar 1920. un 1930. gados populāro art deco stilu un turpina būt aktuāla arī mūsdienu estētikā.

Atslēgvārdi: latviešu dizains, latvju raksti, tradicionālais ornamenti, vizuālā folklorā

NACIONĀLĀ IDENTITĀTE UN FOLKLORA LATVIEŠU FANTĀZIJAS LITERATŪRĀ

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Krasu sociālo pavērsienu laikos, kad sabiedrība un kultūra piedzīvo lielas pārmaiņas, nacionālās identitātes un folkloras savstarpējā saikne pastiprinās. Spilgts šīs likumsakarības piemērs ir tautiskā romantisma laikmets, kad folkloras un mitoloģija tika izmantotas nacionālās identitātes veidošanai un stiprināšanai. Līdzīgi procesi ir vērojami arī jaunākos laikos, tāpēc šajā referātā izgaismota latviešu folkloras saistība ar nacionālo identitāti jaunāko laiku latviešu fantāzijas literatūrā, pamatojoties uz līdzšinējām pētnieciskajām atziņām par folkloras lomu nacionālās identitātes veidošanā latviešu literatūrā.

Latviešu fantāzijas literatūrā, kas izdota laikā no Latvijas neatkarības atjaunošanas līdz mūsdienām, iezīmējas trīs atšķirīgi posmi, kuros folkloras motīvu lietojums atspoguļo katrā laika periodā aktuālus jautājumus un norises – vispirms ar tautiskās pašapziņas celšanas mēģinājumiem, kas ietvēra folkloras motīvu lomas un funkciju paplašināšanos ārpus teksta līmenī, lai pamatotu un izplatītu naratīvus par latviešu kultūras līdzvērtību citām pasaules kultūrām, turpinot ar pievēršanos strauji ienākušajai Rietumu kultūrai un tās piedāvātajiem fantāzijas kanoniem, kas īpaši novērojama jaunajiem autoriem, un beidzot ar vietējo fantāzijas tradīciju iezīmēšanos pašos jaunākajos darbos, kam citstarpā raksturīga folkloras motīvu pašpietiekamība sižetu un vēstījumu veidošanā. Vienlaikus šie posmi izgaismo fantāzijas žanra un tā novirzienu attīstības tendences nacionālajā literatūrā, tādējādi veidojot savdabīgu mijiedarbi starp trim dažādām perspektīvām – nacionālo identitāti, folkloras motīvu lietojumu un žanrisko piederību.

Lai pētītu šo mijiedarbi, izvēlēti septiņi latviešu autoru daiļdarbi un analizēta to žanriskā piederība, balstoties uz sešu fantāzijas žanra pazīmju modeļiem – darbības vide, pārdabiskā eksistence, specifiska valoda, meklējuma ceļš, tipveida tēli un tematika. Paturot prātā vēsturisko un sociālkulturālo kontekstu katra darba tapšanas laikā, analizētas arī katram laika posmam raksturīgās folkloras motīvu nozīmju un vēstījuma īpatnības. Perspektīvas paplašināšanas nolūkos sniegts ieskats cittautei piemēros gan attiecībā uz folkloras motīvu lietojumu fantāzijas literatūrā, gan attiecībā uz fantāzijas literatūras un nacionālās identitātes mijiedarbības niansēm.

Rezultātā konstatētais jaunāko fantāzijas literatūras žanru teorijas tendenču gaismā vedina vērtēt, vai pašos jaunākajos latviešu fantāzijas darbos folkloras motīvu lietojums nacionālās identitātes kontekstā var liecināt par iespējamu jauna nacionāli specifiska fantāzijas žanra novirzienu – latviešu folkloriskās fantāzijas – iedīgļiem.

IDENTITĀTE KUSTĪBĀ. CIRKS KĀ TRANSKULTURĀLA MĀKSLAS UN SOCIĀLĀ SISTĒMA

Signe Bahšteina

Latvijas Universitāte

Cirks jau kopš modernā cirka sākumiem 18. gadsimtā veidojies kā izteikti transkulturāla mākslas un sociālā sistēma – dinamiska kultūru mijiedarbības telpa. Cirka transkulturālo raksturu veido vairāku faktoru kopums: mobilitāte un kultūru saskarsme, mākslinieku kopienas vienlaikus noslēgtā un heterogēnā struktūra, kā arī performances balstīšanās ķermeniskā, lielākoties neverbālā izteiksmē, kas vēsturiski ļāvusi relatīvi viegli pārvarēt lingvistiskās robežas. Eksotisma imperatīvs – centieni piedāvāt skatītājam neparasto, sensacionālo un citādo – darbojās kā pastāvīgs transkulturācijas katalizators, veicinot kultūras elementu cirkulāciju, apropriāciju un hibrizāciju cirka praksēs. Tā izplatību būtiski veicināja gan koloniālās trajektorijas, gan no cirka specifiskas izrietošais nomadiski klejojošais raksturs, jo katra jauna numura izstrādei nepieciešamais ilga laiks lika nepārtraukti meklēt jaunu auditoriju jaunā vietā. Kopš 20. gadsimta beigām laikmetīgajā cirkā vērojama paradigmas maiņa – uzvedumos dominē konceptualitāte, nostiprinās institucionalizēta starptautiskā sadarbība un individuālā mākslinieka radošā autonomija. Latvijas kontekstā šo pavērsienu spilgti iezīmē atjaunotais Rīgas cirks, kas demonstrē strauju virzību prom no padomju cirka tradīcijas uz eiropiešu laikmetīgā cirka modeli. Tādējādi cirks iezīmējas kā īpaši auglīga vide mobilu un hibrīdu identitāšu veidošanās procesiem.

2.3. sekcija. **ATMIŅAS INSTITŪCIJAS STARP
DABĪGO UN MĀKSLĪGO INTELEKTU /**
MEMORY INSTITUTIONS
BETWEEN NATURAL AND
ARTIFICIAL INTELLIGENCE

ZINĀŠANU NOZĪME, IEGŪŠANA, IZMANTOŠANA UN GLABĀŠANA

Juris Dzelme

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Sabiedrības lielākā bagātība ir zināšanas, tādēļ svarīgi izprast, kā un kādas zināšanas iegūt un glabāt. Apziņas pamats ir saistīts, pašsaskaņota, hierarhiski organizēta atvērta modeļu kopa. Modeļu kopā ietilpst atsevišķi, autonomi modeļi, kuri apraksta vidi (ārējo un iekšējo) un tās pārvērtības (statiskie un dinamiskie modeļi, fakti un metodes, sastāvi (uzbūve) un likumi (vienādojumi)), tostarp arī modeļi (metodes) modelēšanai (modeļu veidošanai, metamodelēšanai). Galveno lomu spēlē rīcības modeļi, kurus izmanto visas dzīvās būtnes un kuru četras nozīmīgākās daļas ir aktuālais vides modelis, nākotnes prognozes, ceļi uz nākotni un to vērtējumi. Arvien svarīgāks kļūst uzdevums apkopot visas uzkrātās zināšanas tālākai izmantošanai ērtā veidā, lai turpinātu pasaules izziņāšanu. Zināšanu glabāšanai tiek izmantoti galvenokārt rīcības modeļi un modeļu konceptuāli apkopojumi – paradigmas, kuru maiņa iezīmē etapus pasaules izziņā. Jauna zināšanu apkopošanas veida (otrā veida pārejas) neizbēgamību aprakstīja Jūdžins Vigners (*Wigner*), lai padarītu zināšanas pieejamas cilvēka psihei (jauna apraksta, jaunas valodas radīšanas vajadzība, tostarp izmantojot rīcības modeļus), jo vienkārša paradigmu maiņa kļūst nepietiekama. Mākslīgā intelekta (MI) iespēju izskatīšana, izmantojot aptaujas un intervijas, ļauj piedāvāt kolektīvās atmiņas veidošanas un izmantošanas principu pārveidošanas ceļus. MI sniedz iespējas uzkrāt, iegūt un izmantot zināšanas un īstenot otrā veida pāreju izziņas procesā. Kā pamatu jāizmanto modelēšanas un modeļu vērtēšanas kritēriju (emociju) saskaņota lietošana. Sistēma zināšanu iegūšanai un glabāšanai ir autonomu subjektu (cilvēku, robotu, kiborgu, MI) kopa, kura veido saistītu (globāli) tīklu (kolektīvu). Kolektīvā atmiņa ir pašsaskaņota, atvērta. Jārada nosacījumi tās nepārtrauktai izmantošanai un papildināšanai, balstoties uz modelēšanu un MI sadarbību ar cilvēci.

Atslēgvārdi: apziņa, izziņa, mākslīgais intelekts, modelēšana, paradigma, valoda

BIBLIOTĒKA – REVIDĒTĀ ATMIŅA: STARPDISCIPLINĀRI FILOSOFISKS SKATĪJUMS

Ineta Kivle

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Bibliotēka ir dinamisks, strukturēts process, kas nekad nav pilnībā stabils un pabeigts. Ne atmiņa, ne bibliotēka nav reducējama uz vienkāršu uzkrāšanas modeli. Šādā nozīmē bibliotēka funkcionē kā atmiņas institucionāli organizēta ārējā forma, kas vienlaikus gan saglabā, gan pārveido pagātņi. Bibliotēkas, kultūras vērtību krātuves, arhīvi darbojas kā revidētas atmiņas mehānismi līdzīgi kā institūcijas, kas veic atlasu un izslēgšanu. Tādējādi bibliotēka nav atmiņas pagarinājums, bet tās sekundāra, politiski un epistemoloģiski nosacīta ilgtspējīga kultūras un intelekta dinamiska forma. Dažkārt veidojas spriedze starp atmiņu un bibliotēku. Dažkārt šī spriedze pāraug auglīgā konfliktā ar perspektīvi nākotnē. Tieši šajā spriedzē kļūst redzams, kā atmiņa pārtop par vēsturi, kā pieredze kļūst par dokumentu un kā dzīvais laiks tiek pārrakstīts visiem pieejamā kārtībā. Pētījums balstīts Sv. Augustīna, Edmunda Huserla, Valtera Benjamīna, Mišela Fuko u. c. filosofu atziņās.

BIBLIOTĒKAS UN DIGITĀLĀ VIDE: VAKAR, ŠODIEN UN RĪT. IESKATS PĒTĪJUMĀ PAR LATVIJAS PUBLISKO BIBLIOTĒKU DIGITĀLAJIEM RESURSIEM UN PAKALPOJUMIEM

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Informācijas un zināšanu sabiedrības laikmetā digitālā transformācija skar visas sabiedrības jomas: ekonomiku, zinātnei, izglītību, kultūru, politiku u. c. Ir būtiski izprast Latvijas publisko bibliotēku aktivitātes digitālās transformācijas kontekstā, pētīt digitālo tehnoloģiju integrācijas praksi, kā arī identificēt problēmsituācijas un attīstības potenciālu. LKA Latvijas Kultūras koledžas pētījums “Digitālās transformācijas izaicinājumi un perspektīvie risinājumi Latvijas publiskajās bibliotēkās” īstenots laika posmā no 2024. gada 1. jūnija līdz 2025. gada 31. maijam.

Pētījuma mērķis bija apzināt Latvijas publisko bibliotēku digitālās inovācijas 2020.–2024. gadā, izpētīt, kādos virzienos un kādu faktoru mudinātas vai kavētas, Latvijas publiskās bibliotēkas veikušas savu resursu klāsta, pakalpojumu un darba procesa digitalizāciju. Pētījuma empīriskā daļa balstīta uz reģionu galveno bibliotēku gada pārskatu un sociālo mediju analīzi, veiktajām piecām bibliotēku vadītāju intervijām, kā arī uz 2025. gada februārī veiktu publisko bibliotēku darbinieku aptauju (517 respondenti).

Pētījuma rezultāti liecina, ka publiskās bibliotēkas elastīgi reaģē uz sabiedrības paradumu maiņu un jaunajām tehnoloģijām. Būtiskākās aktivitātes saistītas ar digitālo pakalpojumu attīstību un pieejamības veicināšanu – ieviesta jauna, lietotāju iesaisti veicinoša publiskā kataloga versija, digitālās lasītāju kartes un attālināta lietotāju reģistrācija. Bibliotēku darbinieki bieži sniedz pakalpojumus lietotājiem digitāli, izmantojot e-pastu un sociālās saziņas platformas. Bibliotēkas aktīvi izmanto īsteno komunikāciju ar lietotājiem digitālajā vidē, piedāvā digitālās datubāzes, e-grāmatu platformu “3td e-grāmatu bibliotēka”, interaktīvas virtuālās izstādes un, nelielākā apmērā, organizē tiešsaistes izglītojošas norises un pasākumus. Aizvien vairāk bibliotēku iesaistās novadpētniecības dokumentu digitalizācijā un kolekciju veidošanā platformā “Digitālā bibliotēka”. Vērojama arī strauja digitālo risinājumu integrācija bibliotēku iekšējos darba procesos.

Problēmas digitālajai transformācijai rada ierobežotas iespējas tehniskā nodrošinājuma iegādei, darbinieku kompetenču trūkums, paaugstinātā noslodze un darbinieku mainība. Var secināt, ka digitālā transformācija sniedz vērtīgas iespējas rast ceļus bibliotēkas klātbūtnei sabiedrības digitālajā telpā, un tai ir jābūt atbilstošai lietotāju vajadzībām un paradumiem, plānotai, mērķtiecīgai, kontrolētai un nozīmīgai bibliotēkas darbā.

Atslēgvārdi: publiskās bibliotēkas, digitālā transformācija, digitālie informācijas resursi, digitālie pakalpojumi

PUBLISKO BIBLIOTĒKU DARBINIEKU IZDEĢŠANAS SINDROMA PAZĪMJU IZPĒTE UN TO MAZINĀŠANAS IESPĒJAS

Maruta Pētersone, Aldona Dadzīte

Latvijas Kultūras akadēmijas Latvijas Kultūras koledža

2018. gadā zinātnieki veica pētījumu 1628 akadēmiskajās bibliotēkās Amerikas Savienotajās valstīs, izmantojot Kopenhāģenas izdeģšanas rādītāju aptauju (A Survey Using the Copenhagen Burnout Inventory (CBI)), kur tika aptaujāti 10 260 bibliotekāri. Akadēmisko bibliotekāru kopējais ar darbu saistītās izdeģšanas līmenis bija 49,6. Kopumā sievietes, dalībnieces vecumā no 35 līdz 44 gadiem, ziņoja par augstāko ar darbu saistītās izdeģšanas līmeni, bet vīrieši un vecāka gada gājuma cilvēki ziņoja par zemāko ar darbu saistītās izdeģšanas līmeni (Wood, 2020). Sasniegtie rezultāti liecināja, ka izdeģšana sindroms ir problēma, kas skar daudzas profesijas, tostarp arī bibliotekārus. 2020. gadā BENU Aptiekas Veselības monitoringa dati liecina, ka kopumā 9 no 10 jeb 91% aptaujāto Latvijas iedzīvotāju ir saskārušies ar izdeģšanas sindromu. Latvijā šāds pētījums bibliotekāru vidū nav veikts. Lai noskaidrotu bibliotekāru izdeģšanas pakāpi un tā saistību ar stresu, kas ir blakus faktors izdeģšanai, tika veikta bibliotekāru aptauja digitālās anketas veidā, kurā tika iekļauti divi testi – MBI jeb Maslača stresa pakāpes tests (*Maslach Burnout Inventory*) un Stresa pašnovērtējuma anketa. Aptaujā piedalījās 320 publisko bibliotekāru bibliotekāri no visas Latvijas, [t.sk.](#) 98,4% (315) sievietes un 5 vīrieši (1,56%), vecumā no 21 līdz 70 gadiem. Bibliotēkā strādājošo darbinieku vidējais vecums tika fiksēts 50,6 gadi. Aptaujas dati liecina par vidējo darba ilgumu 17,3 gadi un maksimālu 51 gads. Bibliotekāru izdeģšanas sindroms nav viendimensionāls stāvoklis, bet komplekss un ar savstarpēji ietekmējošām parādībām. Bibliotēkā strādājošo vidējais vecums ir 50,6 gadi, jaunākais darbinieks 21 gadu vecs un vecākajām bibliotekārēm 70 gadi (3), kas nozīmē, ka Latvijas bibliotekārs ir pusmūža darbinieks, un ir novērojama maza daļa gados jaunu darbinieku. Visaugstākais emocionālais izdeģšanas (EI) līmenis ir vecuma grupā 31–40 gadiem (45%).

NOŠU BIBLIOGRĀFISKO METADATU VIZUALIZĒŠANA LATVIJAS NACIONĀLAJĀ BIBLIOGRĀFIJĀ: IESPĒJAS ANALĪZEI UN DATU KVALITĀTES IZVĒRTĒŠANAI

Marta Kivkule

Latvijas Nacionālā bibliotēka

Atmiņas institūciju digitālajās vidēs arvien lielāka nozīme ir strukturētu datu analīzei un vizualizācijai, kas ļauj gan pētniekiem, gan speciālistiem labāk izprast krājumu saturu, vēsturiskās tendences un metadatu kvalitāti. Referāts pievēršas nošu bibliogrāfisko metadatu vizualizēšanai, izmantojot Latvijas Nacionālās bibliogrāfijas datus, un analizē vizualizāciju potenciālu zināšanu radīšanā un informācijas pakalpojumu attīstībā. Analīzes pamatā ir nošu resursu bibliogrāfiskie metadati, kas eksportēti no Latvijas Nacionālās bibliotēkas vienotās datubāzes Kopkatalogs un veidoti atbilstoši MARC un RDA standartiem. Metadatu apstrādē apvienotas bibliotēku un informācijas zinātnes pieejas, digitālo humanitāro zinātņu metodes un datorizēta datu analīze. Datu kopa tika strukturēta tabulu formātā, veikta tās tīrīšana un normalizēšana, savukārt analīze un vizualizācijas īstenotas ar programmēšanas rīkiem. Izveidotās vizualizācijas ietver laika skalas, diagrammas, tīkla grafikus, ģeogrāfiskās un intensitātes kartes, kas ļauj analizēt nošu izdevējdarbības aktivitāti, valodu sadalījumu, izdevēju un autoru lomas, mūzikas laukus, kā arī bibliogrāfisko metadatu kvalitāti. Rezultāti izgaismo atšķirīgus vēsturiskus izdevējdarbības periodus, dominējošās muzikālās formas un autoru tīklus, vienlaikus atklājot sistemātiskas metadatu nepilnības.

LVM UN PAKEŠAPSTRĀDE MARC21 BIBLIOGRĀFISKO METADATU ĢENERĒŠANAI

Matīss Bolšteins

Latvijas Nacionālā bibliotēka

Nesenie sasniegumi mākslīgā intelekta jomā ir veicinājuši eksperimentu skaita pieaugumu saistībā ar automatizētas metadatu veidošanas pieejām bibliotēkās. Šī pētījuma mērķis ir novērtēt lielo valodas modeļu un pakešapstrādes piemērojamību un uzticamību strukturētu MARC21 bibliogrāfisko metadatu ģenerēšanā. Pētījumā izmantots Latvijas Nacionālajā bibliotēkā izstrādāts pakešapstrādes rīks, lai ģenerētu bibliogrāfiskos ierakstus balstoties uz skenētu titullapu attēliem. Trīs lielo valodu modeļu ģenerētie rezultāti izvērtēti, novērtējot to strukturālo atbilstību MARC21 prasībām un salīdzinot ģenerētos laukus ar cilvēka veidotiem laukiem. Rezultāti liecina, ka, lai gan visi modeļi spēja ģenerēt semantiski salīdzināmus bibliogrāfiskos aprakstus, to atbilstība MARC21 struktūrai un citiem aspektiem ievērojami atšķīrās.

ATMIŅU PUBLIKĀCIJAS TRIMDĀ 20. GS. 60. GADOS

Viesturs Zanders

Latvijas Universitāte

Latviešu grāmatu klāstā pēdējā gadsimta ietvaros kvantitatīvi arvien prāvāku vietu ieņem dokumentālā literatūra, tostarp atmiņu izdevumi. Izņēmums nav arī nacionālās grāmatniecības daļa, kas veidojusies ārpus Latvijas pēc Otrā pasaules kara. Nozīmīgu latviešu trimdas publikāciju daļu veido atmiņu izdevumi, kuru skaitliskā apjoma noteikšanu ietekmē arī tas, kā interpretējam atmiņu literatūru un ko ietveram šajā izdevumu grupā.

20. gadsimta 60. gados versijas (vairāk kā 80 grāmatas) par savu vietu Latvijas jaunāko laiku vēstures norisēs publicē zinātnieki, pedagogi un militārpersonas, bet visbiežāk kādreizējie politiķi, diplomāti un kultūras darbinieki. Tajā skaitā vairāki mediju un grāmatu videi piederošie (Jānis Grīns, Jānis Kārklīšs, Jānis Porietis un Žanis Unāms). Gan Latvijā, gan pārsvarā ārpus tās tapušus atmiņu tekstus, arī vairāku no Latvijas brīvajā pasaulē nonākušu personību (Jānis Simsons, Lilija Zariņa) dzīves pieredzes fiksējumus publicē kā pazīstami (Daugava, Grāmatu draugs), tā arī jaunizveidoti apgādi (Memento un citi).

Periodiskie izdevumi un dažādās atmiņu institūciju krātuvēs (tajā skaitā Latvijas Universitātes bibliotēkā, Latvijas Nacionālajā bibliotēkā, Latvijas Nacionālajā Rakstniecības un mūzikas muzejā) atrodamie dokumenti ļauj precīzāk izprast atmiņu autoru atklātības pakāpi, izdevumu atbalsi trimdas latviešu sabiedrībā un arī okupētajā Latvijā, kā arī saskatīt pašcenzūras klātbūtni šajās publikācijās. Izdevēju, autoru un literatūrpētnieku epistulārais mantojums dod ieskatu atšķirīgās tekstu rediģēšanas praksēs (raksturotas Dagnijas Šleieres un Helmāra Rudziša pieejas).

AUTORTIESĪBU AIZSARDZĪBA DIGITĀLĀ LAIKMETĀ: MĀKSLĪGĀ INTELEKTA RADĪTO DARBU PROBLĒMAS UN RISINĀJUMI

Ilze Ķirse-Ķirša

Latvijas Universitāte

Bakalaura darba pētījums par mākslīgā intelekta mijiedarbību ar cilvēka radošumu un autortiesībām. Galvenie jautājumi, kādi ir juridisko regulējumu un normatīvo aktu izaicinājumi saistībā ar mākslīgo intelektu, kāda ir mūsdienu sabiedrības izpratne par autoru, vai mākslīgais intelekts var tikt norādīts kā autors, kā noteikt autorību mākslīgā intelekta radītiem darbiem un cilvēka līdzdalības līmeni šo darbu radīšanā, kā arī noskaidrot sabiedrības un ekspertu viedokli šajā jautājumā.

MĀKSLĪGAIS INTELEKTS – GRĀMATNIECĪBAS NĀKOTNE VAI EKSISTENCIĀLS APDRAUDĒJUMS?

Linda Kusiņa-Šulce

Izdevniecība "Latvijas Mediji"

Mākslīgais intelekts neuzkrītoši, bet stabili ienāk visās dzīves jomās, arī rakstniecībā: īpaši sociālajos tīklos bieži pamanāmi ne tikai īsi ieraksti, bet pat diezgan izvērsti dokumentāli stāsti, kas šķiet rakstīti pēc konkrēta parauga un formulām, radot aizdomas par MI izmantošanu.

Paši MI rīki uz jautājumu, vai mākslīgais intelekts spēj atpazīt MI radītus tekstus, atbild noliedzoši – īpaši gadījumos, kad MI uzrakstītu tekstu pārlasījis un rediģējis autors, atbilde var būt viltus negatīva – savukārt, ja tekstu rakstījis cilvēks, kurš daudz lasījis MI radītus tekstus, atbilde var būt arī viltus pozitīva.

Augot MI tekstveides spējām, ir ļoti iespējams, ka jau ticis publicēts kāds vai kādi manuskripti, kas ir pamatā promptu radīti (kopš šo tēžu radīšanas jau izraisījis pirmais starptautiskais skandāls – ASV izdevniecība atteikusies publicēt Mias Balardas šausmu romānu "Shy Girl", un arī Lielbritānijas izdevums, kas iznāca novembrī, netiks pārpublicēts).

Jautājums, vai MI ir risks grāmatniecībai, vai tās nākotne, skatāms no vairākiem aspektiem.

1. Runājot par autortiesībām, svarīgi, lai teksti, kas tiek izmantoti MI promptiem, būtu iegūti legāli, lai autori varētu atteikties no savu tekstu izmantošanas MI trenēšanā, savukārt tie, kuri šādam izmantojumam piekrīt, saņemtu godīgu atlīdzību.
2. Jautājums par teksta kvalitāti nav viennozīmīgs. Godīgi jāatzīst, ka arī ne visi cilvēku radītie teksti ir izcili, un ne visiem lasītājiem nepieciešama augstvērtīga literatūra. Arī šajā gadījumā, līdzīgi kā jau tagad notiek ar attēliem, obligāts būtu marķējums, ka teksts – vienalga, raksts, dzejolis, stāsts, romāns, eseja – radīts, izmantojot MI. Tālākā izvēle paliek lietotāja rokās – līdzīgi kā pirkt istu sviestu vai sviesta izstrādājumu, cilvēks var pirkt rakstnieka vai MI radītu tekstu. Neiznīcinot MI pilnībā, nav iespējams novērst, ka šādi teksti top, tādēļ svarīgi būtu tos marķēt.
3. Vismaz pagaidām MI nav spējīgs uz patiesu jaunradi, proti, spilgtu, novatorisku formu un izteiksmes līdzekļus izmantošanu. Tādējādi varētu būt iespējams, ka grāmatniecība nākotnē sadalīsies, nosacīti sakot, MI lubenēs un augstvērtīgā jaunrades literatūrā.

Noslēgumā: pats svarīgākais būtu radīt normatīvos aktus, kas apstieidz MI izmantojumu, nosakot, ko ar to noteikti nedrīkstētu darīt, un izveidot kārtību, kā MI izmantot, iespējami maz kaitējot radošajām industrijām un autortiesībām.

GLOBĀLIE IZAICINĀJUMI UN VIETĒJĀ IZDEVĒJDARBĪBA: PANDĒMIJAS UN KARA IETEKME UZ MŪSDIENU LATVIJAS GRĀMATNIECĪBU

Anete Saulīte-Stačkune

Latvijas Nacionālā bibliotēka

Plaša mēroga globālās norises neizbēgami ietekmē ne vien tieši ar tām saistītās nozares – arī citi, šķietami nesaistīti procesi mainās to ietekmē. Kā to rāda pēdējo gadu pieredze, krīzes un izaicinājumi pasaulē spēj mainīt sabiedrības ekosistēmu, un kultūras nozari – tai līdzi. Tā diskusijā par mūsdienu Latvijas izdevējdarbības norisēm nereti tiek uzsvērtas jo sevišķi Covid-19 pandēmijas, bet reizē arī kara Ukrainā sekas – šie apstākļi kļuvuši par atskaites punktu pārmaiņām nozarē pēdējo gadu laikā.

Plašāki procesi pasaulē atstājuši ilgtermiņa ietekmi gan uz kvalitatīvajiem, gan kvantitatīvajiem rādītājiem, pārveidojot realitāti arī izdevējdarbībā. Šīs izmaiņas atklājas gan statistikas datos, gan plašākos procesos, ar ko sastapusies nozare pēdējo gadu gaitā, un arī publiskajā diskursā ap tām. Sākot no izmaiņām ražošanas un piegādes izmaksās un nepieciešamību tām pielāgoties, līdz pat lasītāju paradumu maiņai un digitālās vides attīstībai – skaitļus, kas raksturo mūsdienu Latvijas izdevējdarbību papildinot ar laikmeta kontekstu, izprotama gan nesenā pagātne, gan arī šībrīža situācija.

Referāta nolūks ir koncentrētā veidā aplūkot, kā mainījusies Latvijas izdevējdarbība laika posmā no 2019. gada, pievēršoties tieši grāmatām kā centrālajam skatītajam izdevuma tipam. Grāmatu izdošanā kultūras un sabiedrības procesi uzskatāmi savijas ar ekonomiskajiem, kā arī dati par grāmatām, kas tiek apkopoti ik gadu, ir vispilnīgākie un publiskā diskusija ap tām un nacionālo grāmatniecību kopumā – nereti vispamanāmākā. Tādēļ aplūkoto plašāko norišu konteksts un to radītā ietekme uz grāmatizdošanu un ar to saistītajām praksēm izvēlēta par reprezentatīvu piemēru globālo izaicinājumu virzītu pārmaiņu Latvijas izdevējdarbībā raksturojumam.

INFORMĀCIJAS UN BIBLIOTĒKU STUDIJU NODAĻAS STUDENTU PĒTNIECĪBAS EKOSISTĒMA ILGTERMIŅA SKATĪJUMĀ

Liene Viļuma

Latvijas Universitāte

Pētījumā analizēta studentu noslēguma darbu ekosistēma laika posmā no 2006. līdz 2023. gadam – darba vadītāju un recenzentu iesaiste, tematiskās izvēles un to savstarpējās sakarības. Pētījums parāda pārmaiņas darbu tematos, ko ietekmējušas nozares transformācijas – digitalizācija, datu pārvaldība, lietotāju uzvedības izmaiņas un bibliotēku lomas paplašināšanās. Analīze izgaismo gan stabilas tematiskās līnijas, gan jaunas tendences, kas atspoguļo profesionālās vides attīstību. Rezultāti sniedz ieskatu studiju programmas attīstības virzienos un studentu profesionālajās interesēs.

MAĢISTRA STUDIJU PROGRAMMAS “BIBLIOTĒKZINĀTNE UN INFORMĀCIJA” STUDENTU PRIEKŠSTATI PAR PERSONĪGAJEM LASĪŠANAS PARADUMIEM

Sandra Cīrule

Latvijas Universitāte

2024. gadā Latvijā veiktā pētījuma “Publisko bibliotēku loma Latvijas sabiedrības lasīšanas veicināšanā” rezultāti vēsta, ka lasīšanas paradumiem pēdējo gadu laikā ir tendence mainīties. Šīs izmaiņas iniciē tādi faktori, kā IKT ietekme, darba vides un dzīvesveida izmaiņas, kā arī sociāli un politiski notikumi. Taču rezultāti arī liecina, ka lasīšana, tostarp drukāto grāmatu lasīšana, joprojām ieņem ievērojamu vietu cilvēku brīvā laika aktivitātēs. Šajā kontekstā ir interesanti uzzināt, kāda attieksme pret lasīšanu un kādi lasīšanas paradumi ir LU Ekonomikas un sociālo zinātņu fakultātes maģistra studiju programmas “Bibliotēkzinātne un informācija” studentiem, proti, cilvēkiem, kuru esošais vai potenciālais darbs ir cieši saistīts ar informācijas apriti un lasīšanu. Vai šie paradumi noteiktā laika periodā ir mainījušies? Ja jā – kas tieši ir mainījies? Referātā tiek analizētas studentu pašvērtējuma anketas, kas aizpildītas, uzsākot studiju kursu “Lasīšanas teorētiskie un praktiskie aspekti”. Apkopotas anketas no 2020. gada līdz 2025. gadam. Anketā ietverti jautājumi par lasīšanas mērķiem un motivāciju, par lasīšanai nepieciešamiem apstākļiem, kā arī par iespēju atrast laiku un vietu lasīšanai.

JAUNO VECĀKU VESELĪBAS INFORMĀCIJAS HORIZONTI: KARTĒŠANA UN MI VIZUALIZĀCIJA

Santa Darge

Latvijas Universitāte

Jauno vecāku veselības informācijdarbību pētījums analizē veselības informācijas horizontus un veselībpratības ietekmi uz informācijas avotu izvēli. Dati iegūti ar aptauju un intervijām ar informācijas horizontu kartēšanu. Rezultāti analizēti, izmantojot MI un datu automatizāciju, pielietojot grafu teoriju, kas ļauj modelēt informācijas avotu tīklus, noteikt centrālos informācijas mezglus un informācijas plūsmas jauno vecāku veselības informācijas vidē.

DOKUMENTU TEMATISKĀ APSTRĀDE MĀKSLĪGĀ INTELEKTA IZPILDĪJUMĀ

Baiba Holma, Daina Pakalna

Latvijas Universitāte

Dokumentu tematiskā apstrāde ietver klasificēšanu, priekšmetošanu, atslēgvārdu piešķiršanu. Tā pamatā ir dokumenta satura tematiska analīze un tam atbilstošu tematiskās pieejas punktu piešķiršana un / vai izdalīšana, kas savukārt ir nepieciešama informācijas izguves nodrošināšanai. Tematiskā apstrāde jau kopš 20. gs. otrās puses ir gan intelektuāla (cilvēka veikta), gan automatizēta (programmatūru veikta) darbība. Mākslīgā intelekta rīku darbība ir nodrošinājusi tematiskās apstrādes īstenošanu piedāvājot atbilstošus klasifikācijas indeksus, priekšmetus un atslēgvārdus. Šī referāta mērķis ir raksturot mākslīgā intelekta rīka īstenoto dokumentu tematisko apstrādi atbilstoši dokumentu Indeksēšanas teorijai, novērtējot rezultātu atbilstību domēnorientētai un dokumentorientētai pieejai.

2.4. sekcija. **AR DIEVU UZ PUSĒM: NO
VIDUSLAIKIEM LĪDZ MŪSDIENU
POLITIKAI /**

**GOD À LA CARTE: FROM THE MIDDLE
AGES TO CONTEMPORARY POLITICS**

PUBLISKĀS RUNAS UN RUNAS PIRMS KAUJĀM VECĀKAJĀ LIVONIJAS ATSKAŅU HRONIKĀ. RETORISKS INSTRUMENTS TEKSTA AINAVĀ

PUBLIC SPEECHES AND SPEECHES BEFORE BATTLES
IN THE OLDEST LIVONIAN RHYMED CHRONICLE.
A RHETORICAL DEVICE IN THE TEXTUAL LANDSCAPE

Gustavs Strenga

Latvijas Kultūras akadēmija

Publiska uzruna viduslaiku hronikās kalpoja dažādiem mērķiem. Politiskās runas bija vērstas uz runātāja tēla veidošanu vai tā leģitimitātes uzsvēršanu. Uzrunas pirms kaujām hroniku lasītājiem un klausītājiem, no kuriem daudzi paši varēja nonākt kaujas laukā, vēstīja par drosmi, ticību, tikumiem un centās motivēt bruņiniekus cīņai. Viduslaiku hronikās visas uzrunas bija izdomātas, taču tās sekoja antīkās retorikas un militāro rokasgrāmatu piemēriem. Referāta mērķis ir parādīt, kā šādas runas tika izmantotas nosacīti šaurai publikai sarakstītā darbā – Vecākajā Livonijas Atskaņu hronikā.

*“Publiskā runa Livonijas kultūrā: Politisks un sociāls fenomens Eiropas performatīvajā tradīcijā (1200–1600)”,
LZP FLPP projekts Nr. lzp-2024/1-0296.*

PERFORMATIVIĀTE UN NARATIVITĀTE ROMAS IMPERATORU UZRUNĀS PIRMS KAUKAS AMMIĀNA MARCELLĪNA *RES GESTAE*

PERFORMATIVITY AND NARRATIVITY IN THE SPEECHES
BEFORE BATTLES OF ROMAN EMPERORS BY
AMMIANUS MARCELLINUS *RES GESTAE*

Rūdolfs R. Vītolis

Latvijas Universitāte

Romas imperatoru uzrunas pirms kaujām ir būtiska Ammiāna Marcellīna *Res gestae* satura daļa. Tās ir fiktīvas publiskas politiskas runas, kas atdarina antīkajā historiogrāfijas tradīcijā sastopamos paraugus un atspoguļo politiskos satricinājumus 4. gs. Romas impērijā. Šī referāta ietvaros tiks skatītas Ammiāna sacerētās imperatoru Valēna, Prokopija un Juliāna uzrunas karavīriem, pievēršot uzmanību uzrunāto reakcijām (vairogu dauzīšana, kļiedzieni, klusēšana). Kontekstā ar valdnieka portretējumu un runas skanēšanas situācijas raksturu tiks meklētas atbildes uz šādiem jautājumiem: kāda sociālā funkcija piemīt šīm reakcijām uzrunas medija kontekstā, kā runas emocionālā performance ietekmēja imperatora leģitimitāti un formēja izpratni par politiskās varas stabilitāti.

“Publiskā runa Livonijas kultūrā: Politisks un sociāls fenomens Eiropas performatīvajā tradīcijā (1200–1600)”,
LZP FLPP projekts Nr. lzp-2024/1-0296.

DRAUDZĪBAS PUBLISKIE SPAIDI. APDRAUDĒJUMA RETORIKA RĪGAS RĀTES POLITIKĀ 1297. GADA VASARĀ

PUBLIC PRESSURES OF FRIENDSHIP. THE RHETORIC OF THREAT IN RIGA CITY COUNCIL POLITICS IN THE SUMMER OF 1297

Andris Levāns

Latvijas Universitāte

Par politisku briedumu liecina prasme lūgt un iegūt palīdzību no sabiedrotajiem, ja eksistenciālais apdraudējums nav novēršams bez ārēju resursu iesaistes. Atgādinājums par patiesu draudzību, kuru draugs apliecina grūtā brīdī, bija retorisks paņēmieni, ar kuru 1297. gada vasarā Rīgas pilsētas rātskungi vēstulē “draugiem” Lībekas rātē izteica lūgumu pēc steidzamas palīdzības. Šajā vasarā Rīgas pilsoņu kopienas konflikts ar Vācu ordeņa brāļiem bija sabiezējis līdz fiziskas vardarbības eskalācijai. Vēstules saturs atklāj precīzi veidotu naratīva struktūru un izteismīgos tēlos izteiktas emocijas, ar tiešās un netiešās runas palīdzību attēlojot publiskas komunikācijas situācijas, kurās strīdus puses izklāsta savus argumentus. Šie un citi struktūras, kompozīcijas un satura elementi liecina, ka vēstulei tika piešķirts publiskas runas formāts. Referāta fokusā ir šī gadījuma analīze, lai atbildētu uz dažiem būtiskiem jautājumiem: kā vārdi konstituē publisku un politisku realitāti viduslaiku pilsētu sabiedrībā, kā publiska runa rada vai atjauno rīcības leģitimitāti un kādus paraugus atdarina vēstules autori.

“Publiskā runa Livonijas kultūrā: Politisks un sociāls fenomens Eiropas performatīvajā tradīcijā (1200–1600)”, LKP FLPP projekts Nr. lzp-2024/1-0296.

APPELLATIO KĀ INSTITUCIONĀLO FAKTU NOSTIPRINĀŠANAS AKTS UN TĀ PERFORMATĪVIE ASPEKTI: RĪGAS ARHIBĪSKAPA FRĪDRIHA APELĀCIJA PĀVESTAM KLĒMENTAM V (1305)

APPELLATIO AS AN ACT OF STRENGTHENING INSTITUTIONAL
FACTS AND ITS PERFORMATIVE ASPECTS: THE APPEAL OF
ARCHBISHOP FREDERICK OF RIGA TO POPE CLEMENT V (1305)

Līva Rotkale

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Rīgas arhibīskapa Frīdriha apelācija pāvestam Klēmentam V (1305) uzrāda sadursmi starp de jure un de facto varu, tātad varas leģitīmācijas krīzi. Apelācijas mērķis ir no jauna pamatot Rīgas arhibīskapijas autoritātes likumību iepretim Vācu ordeņa lietotajiem prettiesiskajiem piespiedu mehānismiem. Ja mērķis netiek sasniegts, tad, piemēram, “arhibīskaps” ir tukšs tituls, nevis varas orgāns ar reālu politisku funkciju. Taču, ja apelācija ir veiksmīga, tiek nostiprināti vai iedibināti varas likumību pamatojoši institucionāli fakti, piemēram, pāvesta aizsardzība. Institucionāli fakti ir spēkā, daļēji pateicoties direktīviem runas aktiem, kas tiek izdarīti ar konvencionālām frāzēm vai performatīvām formulām. Frīdriha apelācijā lietotās formulas (appellamus, provocamus, petentes, ponentes) ir rūpīgi izraudzīts instruments, lai panāktu likumīgās varas, t. i., attiecīgu institucionālu faktu un no tiem izrietošu normatīvu saistību īstenošanos.

*“Publiskā runa Livonijas kultūrā: Politisks un sociāls fenomens Eiropas performatīvajā tradīcijā (1200–1600)”,
LZP FLPP projekts Nr. lzp-2024/1-0296.*

KARŠ KRISTĪGĀS PASAULES NOMALĒ: PUBLISKĀ RUNA KĀ IETEKMES INSTRUMENTS VĀCU ORDEŅA UN NOVGORODAS KŅAZISTES ATTIECĪBĀS UN LIVONIJAS POLITISKAJĀ REALITĀTĒ 15. GADSIMTĀ

WAR ON THE EDGE OF THE CHRISTIAN WORLD: PUBLIC SPEECH AS A TOOL OF INFLUENCE IN THE RELATIONS BETWEEN THE TEUTONIC ORDER AND THE PRINCIPALITY OF NOVGOROD AND THE POLITICAL REALITY OF LIVONIA IN THE 15TH CENTURY

Sofija Gasjuļa

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Divi izvēlētie publiskās runas gadījumi atspoguļo sarežģīto diplomātisko spēli Livonijas-Novgorodas kara (1443–1448) apstākļos starp Hanzu, Vācu ordeni, Poliju, Lietuvu, Livoniju un Novgorodas kņazisti. Avoti norāda uz asu politisku polemiku, kurā publiskās runas bija svarīgs ietekmes instruments tirdzniecības un militāras pretestības jautājumos. Saturiski avoti norāda gan uz Vācu ordeņa, gan uz Novgorodas kņazistes politisku pagrimumu, retoriski – tie ir Vācu ordeņa pret-shizmatīķu polemikas daļa.

“Publiskā runa Livonijas kultūrā: Politisks un sociāls fenomens Eiropas performatīvajā tradīcijā (1200–1600)”, LZP FLPP projekts Nr. lzp-2024/1-0296.

CULTURE IN THE MEDIATION OF A POLITICO-ECCLESIASTICAL CONFLICT? NOTES ON A 1473 LAMENT FROM THE CHANCERY OF THE ARCHBISHOP OF RIGA

KULTŪRA POLITISKA UN BAZNĪCAS KONFLIKTA MEDIĀCIJĀ?
PIEZĪMES PAR 1473. GADA ŽĒLABĀM RĪGAS ARHIBĪSKAPA KANCELEJĀ

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Those who recount crises to secondary and tertiary audiences rightly sense a need to be credible. Amidst tensions with the Livonian Order over political primacy in Riga in 1472–1473, the Archbishop's Chancellor addressed a written appeal to a fellow cleric down the coast in Warmia. Elements of his letter do not belong to strict narration, but to the Latinate educational culture he and his correspondent likely shared, including to a long tradition of performative public oratory. These details indicate a common cultural vista beyond the exigencies of the political arena and so imply a disinterested impartiality – which, however, the author is able to marshal for his in fact very interested ends.

*“Publiskā runa Livonijas kultūrā: Politisks un sociāls fenomens Eiropas performatīvajā tradīcijā (1200–1600)”,
LZP FLPP projekts Nr. lzp-2024/1-0296.*

DIEVS UN DZIMTBŪŠANA: RELIĢISKAIS DISKURSS BALTVĀCU MĀCĪTĀJA UN ABOLICIONISTA HEINRIHA JOHANNA FON JANNAUA DARBĀ “VERDZĪBAS VĒSTURE UN ZEMNIEKU RAKSTUROJUMS” (1786)

GOD AND SERFDOM: RELIGIOUS DISCOURSE IN THE WORK
OF THE BALTIC GERMAN PASTOR AND ABOLITIONIST
HEINRICH JOHANN VON JANNAU, “HISTORY OF SLAVERY
AND CHARACTERISTICS OF THE PEASANTS” (1786)

Karīna Janova-Jannava

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Referāts veltīts reliģiskās valodas un teoloģisko jēdzienu politiskā lietojuma analīzei 18. gadsimta Baltijas apgaismības literatūrā, fokusējoties uz Heinriha Johanna fon Jannau darbu “Geschichte der Sklaverey, und Charakter der Bauern in Lief- und Ehistland” (1786). Luterāņu mācītājs un agrīns dzimtbūšanas kritikas ideju paudējs Jannaus (1753–1821) piedāvā asu vēsturisku un morālu kritiku par to, kā reliģija gadsimtiem ilgi kalpojusi varas leģitimācijai, vienlaikus argumentējot, ka tās patiesajam uzdevumam būtu jābūt sabiedrības morālai un sociālai pārveidei. Pirmkārt, referātā tiks analizēta autora piedāvātā vēsturiskā dekonstrukcija attiecībā uz Krusta kariem un Reformāciju. Jannaus pauž viedokli, ka agrīnie iekarotāji un bīskapi Livonijā aizbildinājās ar “svēto reliģijas vārdu”, lai slēptu alkātību, un reliģija tika reducēta līdz aklai paklausībai savam dzimtkungam. Arī 16. gadsimta Reformācija autora skatījumā kalpoja primāri politiskiem mērķiem, dodot muižniecībai iespēju atbrīvoties no katoliskās hierarhijas, kamēr zemnieku stāvoklis būtiski nemainījās. Otrkārt, pētījums pievērsīsies autora dzimtbūšanas kritikā izmantotajiem reliģiskajiem argumentiem. Atsaucoties uz “kristīgo mīlestību” un “kristīgiem labiem tikumiem”, viņš vērš reliģisko argumentāciju pret apspiedējiem. Jannaus uzsver, ka necilvēcīgie sodi, ar kuriem dzimtkungi soda zemniekus, nav savienojami ar “kristieša jūtām” (Empfindungen eines Christen), tādējādi padarot teoloģisko morāli par sociālā taisnīguma instrumentu. Treškārt, tiks analizēta publiskās runas performativitāte un kancele kā komunikācijas medijs. Jannaus pauž atklātu neapmierinātību ar valsts praksi izmantot luterāņu mācītājus kā laicīgo likumu un patenšu nolasītājus no kanceles. Gari, sarežģīti juridiskie teksti nogurdina gan mācītāju, gan draudzi, tādējādi deformējot garīdznieka garīgo misiju. Šī kritika kalpo kā netiešs aicinājums nošķirt baznīcas garīgo misiju no laicīgās valsts birokrātijas funkcijām. Kopumā referāts argumentēs, ka Jannaua darbā teoloģiskā valoda transformējas no pakļaušanas instrumenta par konceptuālu pamatu cilvēcības un tiesību pieprasījumam, iezīmējot būtisku pavērsieni Baltijas apgaismības diskursā.

PĀRVALDOT RELIĢIJU: RELIĢISKO KULTU LIETU PADOMES DARBĪBU DOKUMENTĒŠANA UN PĀRSKATU SNIEGŠANA BALTIJAS REPUBLIKĀS, 1944–1965

ADMINISTRATING RELIGION: DOCUMENTING AND REPORTING
PRACTICES OF THE COUNCIL FOR RELIGIOUS AND CULT
AFFAIRS IN THE BALTIC REPUBLICS, 1944–1965

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This paper examines the administrative and reporting practices of the Council for Religious and Cult Affairs (CARC) in the Baltic Soviet republics between 1944 and 1965, prior to its merger with the Council for the Affairs of the Russian Orthodox Church. The study is based primarily on archival materials from the Baltic republics and Church archives and focuses on the institution's internal hierarchy, its documentary routines, and the terminology applied to various Protestant movements and so-called "sects." Orthodox institutions are not included, as they were supervised by a separate administrative body. In the paper, the author explores how CARC's republican representatives operated within a vertically structured system subordinated to Moscow. Particular attention is paid to the language used to classify Protestant communities and more marginal religious groups. Terms such as "sectarianism," "illegal gatherings," and "anti-Soviet manifestations" reveal the normative framework through which religious activity was administered. The paper argues that the first post-war decade was largely devoted to identifying, registering, and systematising religious movements while establishing administrative control. From the mid-1950s onward – especially during and after the anti-religious campaigns – the process of Sovietization led to a more standardised system of supervision and control. Reporting became increasingly formulaic, reflecting a perception of administrative "success" and a stabilised model of regulated religious life. CARC documentation not only recorded religious developments but also demonstrates the gradual normalisation of Soviet religious administration in the Baltic republics.

FORMU KRITIKA UN KRITISKĀ DOMĀŠANA BAZNĪCĀS UN SABIEDRĪBĀ

FORM CRITICISM AND CRITICAL THINKING IN CHURCHES AND SOCIETY

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Teoloģijā viena no klasiskajām kritiskās pētniecības metodēm ir Formu kritika (*Formgeschichte*). Tā ir pašu teologu sistemātiski un tekstu zinātniskajā pētniecībā rūpīgi attīstīta analīzes metode, kas pēta tekstu literārās formas, izcelsmi, sociālo kontekstu un sākotnējo funkciju kopienā. Šodienas Latvijas baznīcu aprindās un teoloģiskajā kontekstā valda visnotaļ savāda izpratne un pat mīti par šo metodi, pēdējā laikā vērojams, ka tā tiek piesaukta kādu “liberālu” saimēšanai un atmaskošanai, sevišķi jau reakcijās uz sabiedrisko mēdiju un žurnālistu darbību. Redzams, ka nereti pašiem teologiem trūkst elementāru zināšanu par šo metodi, tās pielietojumu un nozīmi. Izpratne par šīs metodes būtību un praktisko pielietojumu var būt ļoti noderīga ne tikai teologiem to darbā ar tekstiem (eksegēzē, hermenētikā, laikmetīgās interpretācijās), bet arī sabiedrībai kopumā, jo māca uzdot būtiskus jautājumus par jebkuru informāciju – kas ir autora nolūks un dažādu līmeņu konteksts, kādos apstākļos teksts radies, kāda ir tā auditorija un žanrs, un galu galā, kāda ir katra konkrētā diskursa vai narratīva forma, kā to labāk saprast un analizēt. Tā palīdz atšķirt faktus no interpretācijām, atpazīt retorikas paņēmienus un kritiski vērtēt autoritātes. Līdz ar to formu kritikas principi stiprina medijpratību, veicina analītisku domāšanu un palīdz cilvēkiem apzināties, kā tradīcijas, naratīvi un komunikācijas formas ietekmē sabiedrisko viedokli arī ārpus šauri teoloģiskiem un reliģiskiem kontekstiem.

SVĒTAIS GARS POLITISKA SPIEDIENA ĒNĀ: KARLA BARTA PNEIMATOLOĢIJA PIRMS UN PĒC BĀRMENES DEKLARĀCIJA

THE HOLY SPIRIT IN THE SHADOW OF POLITICAL
PRESSURE: KARL BARTH'S PNEUMATOLOGY BEFORE
AND AFTER THE BARMEN DECLARATION

Līga Puriņa

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1930. gadu sākumā Vācijā nacistu režīms centās panākt, lai Baznīca kļūtu paklausīga valstij. Tas nozīmēja mēģinājumu ietekmēt Baznīcu ne tikai politiskos, bet arī teoloģiskos jautājumos, proti, jautājumos par kristiešu “pareizo” autoritāti un Kungu. Šajā situācijā teologs Karls Barts (*Karl Barth*) kļuva par vienu no skaļākajām balsīm, kas pretojās Baznīcas pakļaušanai, un kopā ar līdzīgi domājošiem teologiem sarakstītā Bārmenes deklarācija (1934) kļuva par būtisku robežšķirtni un apliecinājumu, kam pieder Baznīca, un no kā tā dzīvo. Izejot no šī konteksta, mans referāts virzās tālāk uz citiem teoloģijas loci. Proti, jautājums ir ne tikai par to, ko Barts teica politiskā spiediena laikā, bet vai šāds spiediens atstāj būtisku iespaidu arī uz viņa pneimatoloģiju? Vai brīdī, kad Bartam ir jāaizstāv Kristus autoritāte pret nacistu mēģinājumiem to aizvīstot ar citu “kungu”, mainās arī tas, kā Barts runā par Svēto Garu? Referāts balstās kvalitatīvā satura analizē, salīdzinot Barta tekstus par Svēto Garu pirms Bārmenes deklarācijas un pēc tās, fiksējot, kā mainās uzsvari, formulējumi un argumentācijas virziens. Referāta mērķis ir aplūkot, vai Barta pneimatoloģija pēc Bārmenes posma paliek kristocentriskāka, vai arī tā tāda ir bijusi jau pirms tam.

SIEVIEŠU LOMAS SALĪDZINOŠĀ VĒSTURE KRISTĪTĪBĀ UN ISLĀMĀ: NO IZCELSMES STĀSTIEM LĪDZ MŪSDIENĀM

COMPARATIVE HISTORIES OF WOMEN IN CHRISTIANITY AND ISLAM: FROM FOUNDATIONAL NARRATIVES TO MODERN ROLES

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The historic and contemporary role of women in their respective religions has been marginalized. Instead of understanding women in religion as their own agents of change for their respective religions, they are written out of religious history or subjected to the periphery of their religious experiences. Religious feminists are not entirely invested on what can be known about the religion, rather on why women have been absent from textual canon and the lived religion that a woman associates with. This research addresses this sentiment as the main problem in discovering, rediscovering, and understanding women agency and meaning in their respective religions; with the initial inquiry asking, how do women find meaning in their respective religions, when historically, they have been written out of their religious history? It is recognized that the works of Elisabeth Schüssler Fiorenza, Elizabeth A. Johnson, Amina Wadud, and Lelia Ahmed have dealt with discovering, rediscovering, and understanding women agency in their own individual analysis from their own respective religions of Christianity and Islam, but can there be an inquiry to create a comparative approach between Feminist Christian Theology and Muslima Theology? The relevance of this research is to connect different forms of feminist theology outside of their religious paradigms through a comparative theological approach that employs Christian Feminist theology and Muslima Feminist theology. The purpose for exploring a comparative theological approach for this inquiry is on the historical and present day connection between Christianity and Islam to create interfaith dialogue that focuses on women agency.

TRANSNACIONĀLA EMANCIPĀCIJA? LATVIEŠU MISIONĀRES STARP IMPĒRIJU, NĀCIJU UN GLOBĀLO KRISTĪTĪBU (1896–1946)

TRANSNATIONAL EMANCIPATION? LATVIAN MISSIONARIES BETWEEN
EMPIRE, NATION, AND GLOBAL CHRISTIANITY (1896–1946)

Kristīna Ēce

Lutera Akadēmija

Referāts analizē latviešu luterāņu misionāres no Latvijas teritorijas laikposmā no 1896. līdz 1946. gadam, no Krievijas impērija perioda caur Latvijas Republika līdz koloniāli strukturētiem kontekstiem pēc Otrā pasaules kara. Pētījums aplūko viņas kā transnacionālas intelektuālas darbinieces, kas darbojās starp impērisku pārvaldību, jaunveidojošos nacionālo valsti un globālajiem luteriskās misijas tīkliem. Balstoties arhīvu dokumentos un misijas periodikā, referāts rāda, kā misionāres formulēja savu darbību emancipācijas, aicinājuma un kristīgās modernitātes kategorijās. Pārvietojoties starp dažādiem politiskiem režīmiem un kultūrtelpām, viņas vienlaikus artikulēja nacionālu piederību un piederību pārnacionālai kristīgai kopienai. Šī pozīcija ļāva publiski iesaistīties diskusijās par izglītību, modernizāciju, dzimumu lomām un “civilizēšanas” misiju. Referāts argumentē, ka transnacionālā misijas pieredze radīja specifisku sieviešu autoritātes modeli: balstītu nevis formālā institucionālā varā, bet teoloģiski pamatotā morālajā un intelektuālajā kompetencē. Vienlaikus šī valoda funkcionēja politiski, strukturējot hierarhijas starp centru un perifēriju, kristīgo un “nekrīstīgo”, modernitāti un tradīciju. Šāda pieeja ļauj pārskatīt Austrumeiropas sieviešu vietu globālajā intelektuālajā vēsturē un analizēt, kā reliģiskā domāšana kļūst par instrumentu politiskas kopienas veidošanā dažādos režīmos.

2.5. sekcija. **BALTIJAS AUSTRUMPĒTNIEKU
IEGULDĪJUMS NOZARES ATTĪSTĪBĀ /**
THE CONTRIBUTION OF
BALTIC ORIENTALISTS TO
THE DEVELOPMENT OF THE FIELD

BEYOND MILLISECONDS: BALTIC ORIENTALIST ANTICIPATIONS AND CRITIQUES OF COGNITIVE MEASUREMENT

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This study explores the ways in which Baltic Orientalists engaged with or subverted the measurement of cognitive abilities, particularly their early intuitions and critiques regarding time in cognition studies. It revives a neglected intellectual current that resists reducing thought to laboratory metrics. The study brings together two thinkers from different periods and disciplines: Leopold von Schröder (1851–1920), a Baltic German Indologist at the University of Dorpat (Tartu), Estonia, and Jaan Valsiner (b. 1951), an Estonian cultural psychologist now at Aalborg University in Denmark. By reading their works together, the study shows that foundational critiques of cognitive measurement predate the institutionalization of experimental psychology as a science. Cognitive psychology formalized its scientific agenda decades after Leopold von Schröder began exploring mental processes through Vedic texts, mantras, and ritual language. His work highlights the importance of rhythm, repetition, time, and the body as essential to understanding consciousness, resisting the reduction of thought to metrics of speed, rapid response, or quantified output. Although situated within philological traditions, his analysis recognizes the distortions that occur when mental life is reduced to numerical data. Jaan Valsiner critiques cognitive psychology from within the field, examining reaction-time tests, standardized tests, and other laboratory procedures to understand how minds work. He argues that such tests reveal little about cognition itself, functioning instead as symbolic constructs within a culturally defined laboratory environment. This study makes the case for recognizing Baltic Orientalist thought as a vital component of ongoing discussions about the role of measurement, meaning, and context in cognition studies.

ERNST A. STREHLNEEK AND THE BALTIC MEDIATION OF CHINESE ART IN THE EARLY TWENTIETH CENTURY

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This paper explores the contribution of Ernst A. Strehlneek (c. 1870–1940s), a Latvian-born art dealer and writer active in Shanghai, to the early global circulation of Chinese pictorial art (*guhua*). While Baltic Oriental Studies are often associated with philological scholarship, Strehlneek represents a different mode of engagement: the mediation of Chinese art through commercial networks, exhibitions, and publications. Arriving in China in the 1890s and later establishing his gallery in Shanghai, Strehlneek became a key intermediary between Chinese artists and Western collectors. In 1913, he privately sold a major collection of Chinese painting to the Swedish collector Klas Fåhræus; the subsequent auction of this collection in Stockholm contributed to the growth of Scandinavian interest in Chinese art and collecting. In 1929, Strehlneek transported another collection from Shanghai to Tokyo in an attempt to access the exclusive Nyūsatsu auction system, illustrating his efforts to position Chinese art within expanding international markets. His richly illustrated book *Chinese Pictorial Art* (1914) further shaped Western perceptions of Chinese painting and broadened aesthetic appreciation beyond the traditional literati canon. By situating Strehlneek within the intellectual history of Baltic engagement with Asia, this paper argues that his activities complicate conventional center–periphery narratives of Orientalism. Operating from Shanghai rather than from a European imperial capital, he occupied a hybrid position between dealer, mediator, and cultural interpreter. His career demonstrates how knowledge of Chinese art in the early twentieth century was produced not only within academic institutions but also through transnational commercial and cultural networks linking the Baltic region, China, Scandinavia, and Japan.

HIDDEN MESSAGES IN CHINESE PORCELAIN PAINTING IN LATVIAN MUSEUM COLLECTIONS

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Chinese porcelain painting functions as a structured visual language grounded in stable cultural codes. This paper examines the unpacking of concealed visual messages encoded in non-narrative motifs – plants, animals, symbolic items, and compositional structures – on selected Chinese porcelain objects from Latvian museum collections. The focus is on motifs in which meaning is constructed through visual signs rather than through human figures or narrative scenes. The analysis employs a semiotic framework combined with a cultural-historical approach to Chinese visual tradition and introduces an analytical classification of visual motifs based on their mechanisms of meaning formation. The study demonstrates that these visual elements convey culturally specific ethical and social values. When the cultural principles governing these images are not recognized, such motifs are commonly interpreted as purely decorative, resulting in the loss of their semantic and communicative function.

NĀVES KONCEPTS ĶĪNIEŠU LINGVOKULTŪRĀ BALTIJAS PĒTNIECĪBAS KONTEKSTĀ

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Šajā referātā tiek analizēts nāves koncepts ķīniešu lingvokultūrā Baltijas pētniecības kontekstā, pievēršoties tam, kā valodnieciskie un kultūras dati ļauj pāriet no mehāniskas analogiju veidošanas uz dziļāku izpratni par Ķīnas kultūras semantiskajām struktūrām. Pētījuma mērķis ir parādīt, kā Baltijas akadēmiskajā telpā izstrādātās pieejas ķīniešu valodas un kultūras izpētē veicina precīzāku un konceptuāli pamatotāku interpretāciju, īpaši analizējot ar nāvi saistītos jēdzienus, simbolus un valodas vienības. Referātā nāves koncepts tiek aplūkots kā daudzslāņains lingvokulturāls fenomēns, kas ietver leksiskos, frazeoloģiskos un diskursīvos aspektus, kā arī sociāli un rituāli nosacītas nozīmes. Analīze balstās uz ķīniešu valodas frazeoloģismiem, semantiski marķētiem hieroglifiem un to lietojumu dažādos komunikatīvos un kultūras kontekstos. Īpaša uzmanība tiek pievērsta tam, kā nāve ķīniešu kultūrā tiek konceptualizēta nevis kā absolūts beigu punkts, bet gan kā pārejas, transformācijas vai sociālās kārtības elements, kas atspoguļojas valodas struktūrā un lietojumā. Referāts iezīmē arī Baltijas pētniecības tradīcijas ieguldījumu ķīniešu lingvokultūras izpētē, uzsverot metodoloģisku līdzsvaru starp Rietumu teorētiskajiem modeļiem un empīrisku darbu ar autentiskiem valodas materiāliem. Tiek argumentēts, ka šāda pieeja ļauj izvairīties no vienkāršotiem kultūras salīdzinājumiem un veicina niansētu izpratni par ķīniešu pasaules skatījumu, vienlaikus bagātinot mūsdienu austrumpētniecības diskursu Baltijas akadēmiskajā vidē.

JAUNĀKĀ INFORMĀCIJA PAR ĶĪNAS UN JAPĀNAS PĒTNIECĪBU LATVIJĀ 18. UN 19. GADSIMTĀ

Agnese Taivāne-Pizāno

Latvijas Universitāte

Ķīnas un Japānas pētniecība 18. un 19. gadsimtā ir līdz šim vismazāk pētīta salīdzinot ar jaunākiem periodiem vēsturē. Pēdējā laikā atrasti jauni fakti par vācbaltiešu lomu šajā procesā. Līdz šim bijusi arī nepietiekami apskatīta Kurzemes Hercogistes loma šajos jautājumos, kas atklāj jaunu skatījumu uz situāciju. Ķīnas un Japānas pētniecības saistībā parādījušās jaunas personības, aktivitātes un darbības vietas un jomas, par kurām tiks stāstīts prezentācijā.

BALTIC SCHOLARSHIP AND ASIAN KNOWLEDGE: THE CASE OF FRIEDRICH WILHELM RADLOFF

Leons Gabriels Taivāns

University of Latvia

Friedrich Wilhelm Radloff (Vasily Vasilievich Radlov), one of great turkologists, occupies a distinctive position in the intellectual history of the nineteenth-century Russian Empire as a mediator between German, Baltic, and Russian scholarly worlds. Born and educated in Berlin, he was formed within the traditions of German philology and comparative linguistics, yet he pursued his career largely within imperial Russian institutions. His primary interest were Turkic peoples and their culture, but the bulk of turkish peoples were subjects of Russian colonial empire. In doing so, Radloff became one of the scholars who helped construct a specifically Baltic–German field of academic contact linking Central European scholarship with the modernization and Westernization of Russia. Radloff's early teaching activity in Gymnasium Kaiser Alexanders II zu Birkenruh bei Wenden (Cēsis), and his honorary doctorate from the University of Dorpat (Tartu) placed him within the Baltic German academic milieu, which functioned as a crucial intermediary zone between St Petersburg and the German intellectual sphere. Baltic institutions, operating in German, provided a cultural and scholarly bridge through which methods of philology, ethnography, and historical linguistics circulated into the Russian empire. Radloff's subsequent career in St. Petersburg – as director of the Asiatic Museum and of the Museum of Anthropology and Ethnography (Kunstkamera) – institutionalized these exchanges. These were institutions where Baltic Germans previously set many academic norms. Radloff advanced a conceptual reorientation of the empire's identity. Through his monumental collections of Turkic folklore, his comparative dictionary of Turkic dialects, and his publications of Old Turkic inscriptions, contemplating on its religion he demonstrated that the Russian Empire was not simply a European polity undergoing Westernization, but also the entity to profound Asian cultural legacies. By introducing Turkic, Siberian, and Central Asian anthropological materials into European academic discourse, Radloff effectively integrated the empire's Asian dimensions into the broader intellectual map of Europe. In this sense, he exemplifies a generation of German and Baltic scholars who were the real modernizers of Asiatic Russia trying to incorporate it into the European knowledge system.

THE EARLY HISTORY OF ĀSANAS IN YOGA

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This paper will examine the early history of āsana (yogic posture), covering the time period up to the composition of the Pātañjalayogaśāstra (c. 4th–5th century CE). It will use philological methodology to illuminate the links between āsana in “Classical” Patañjali's yoga and earlier yogic and meditative traditions, such as early Buddhism. It will argue that the prehistory of yogic ideas and terms surrounding āsana in Patañjali's yoga can be studied by paying close attention to terminological changes between Middle-Indic languages and Sanskrit. Finally, it will be argued that there were two main paradigms of postural practice in ancient India. One of these valued sukha (bliss, ease, pleasure) and informed the seated meditative practices of both early yoga and Buddhism. The other valued duḥkha (pain) and informed the practice of more complex non-seated postures that became more closely associated with yoga at a later date.

MONĒTAS, IEROČI UN PAT MŪMIJA: TUVO AUSTRUMU UN ZIEMEĻĀFRIKAS MATERIĀLĀS KULTŪRAS LIECĪBAS LATVIJAS MUZEJOS

Ingrīda Kleinhofa

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Latvijas muzeju ekspozīcijās un krājumos atrodami atsevišķi Tuvo Austrumu un Ziemeļāfrikas mākslas priekšmeti, ieroči, monētas un citas materiālās kultūras liecības. Pētījumā apzināti esošie resursi un to potenciāls Latvijas austrumpētniecības studiju attīstībā, uzsverot iespēju studējošajiem praktiski iesaistīties artefaktu dokumentēšanā un analizē. Īpaša uzmanība tiek pievērsta Latvijas vēsturiskajiem sakariem ar Tuvajiem Austrumiem un Ziemeļāfriku, informācija par kuriem varētu būt noderīga sadarbības attīstībā ar šo reģionu arī mūsdienās. Tādējādi šis darbs var tikt uzskatīts par sākumpunktu turpmākai sistemātiskai starpdisciplinārai pētniecībai minētajā jomā, potenciāli piesaistot arī starptautiskus partnerus.

SENO TUVO AUSTRUMU KOSMISKĀ ĢEOGRĀFIJA UN REĀLIJAS PSALMU TULKOJUMOS LATVIEŠU VALODĀ

Jānis Priede

Latvijas Universitāte

Poētisku tekstu tulkošana no oriģinālvalodām ir sagādājusi grūtības tulkotajiem visos laikos. Grūtības ir arī tad, ja tulkojamā izmantotā teksta valoda ir dzimtā, bet kultūrvidē atšķiras par dažiem gadsimtiem, kā to varam novērot senajā psalmu tulkojumā no ebreju valodas grieķu valodā (Septuāģintā). Vēl vairāk tas ietekmē literātus un teologus, kas senos tekstus tulkojuši pēdējos gadsimtos, īpaši 19. un 20. gs., kad aizvien būtiskāks kļuva Seno Tuvo austrumu pētnieku ieguldījums psalmos minēto kultūrvides reāliju un ar kultūrvidi saistīto priekšstatu izpētē. Turklāt psalmu poētiskajā tekstā, jādomā, atspoguļojas arī senāku priekšstatu ietekme vai pēdas. Ja pēc 19.–20. gs. lielajiem Seno Tuvo austrumu arhīvu atklājumiem, eksegēti orientējās uz psalmu kosmiskās ģeogrāfijas izpratni, pieskaņojot to Enūma eliš, Gilgameša un citu Tuvo Austrumu tekstos ietvertajiem mitoloģiskajiem priekšstatiem, tad mūsdienās aizvien aktuālāks kļūst jautājums par šo priekšstatu transformāciju psalmu tapšanas laikā, kā arī recepciju senajos psalmu tulkojumos grieķu valodā. Senākie latviešu psalmu tulkojumi ir tapuši, balstoties laikmeta zināšanām atbilstošā izpratnē par Vecās Derības laikmeta ebreju kultūrvidi un terminoloģiju. Savukārt modernajos psalmu tulkojumos dažādās valodās mēdz ņemt vērā arī senākos valodas un Tuvo Austrumu mitoloģisko priekšstatu slāņus, bieži vien tos visai nepastarpināti attiecinot uz psalmu tekstiem. Apzinoties lingvistiski arheoloģiskā redukcionisma subjektīvo raksturu, nākas atzīt nepieciešamību izpētīt attiecības starp psalmos netieši ietverto hipotētisko senāko priekšstatu slāni un psalmu autoru apzināti poētisko izteiksmes veidu. Jau paši psalmu autori neuzskatīja par vajadzīgu sekot kultūrvides mitoloģiskajiem priekšstatiem, bet tos izmantoja, lai paustu savai reliģiskajai identitātei atbilstošos priekšstatus un idejas. Referātā ielūkosimies atsevišķos piemēros, lai redzētu, kā Seno Tuvo austrumu kosmiskā ģeogrāfija un reālijas ir izmantotas reliģisko ideju poētiskajos formulējumos psalmos un to tulkojumos latviešu valodā.

TIBETIEŠU *BON* MĀCĪBAS ILGMŪŽĪBAS PRAKSES LATVIJĀ

Agita Baltgalve

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Vissenākā tibetiešu reliģiskā prakse un mācība ir *bon*, kuras pirmsākumi datējami vismaz ar mūsu ēras sākumu, tomēr daudzus gadsimtus budisma iespaidā tā tika apspiesta un izskausta. Tādēļ Rietumos par *bon* ir ļoti maz informācijas. 20. un 21. gs. vairāki *bon* klosteri (gan Ķīnā, gan Indijā) tika atjaunoti, piemēram, Indijas ziemeļos Dolandži ciemā atrodas Menri klosteris, kurā darbojas arī *bon* klostera universitāte. Līdzīgi kā budistiem, arī *bon* ir apjomīgi svētie raksti un reliģiski traktāti. Tomēr Latvijā un Baltijā zinātnisku pētījumu par šo ticības veidu tikpat kā nav, nav arī pieejami tieši no tibetiešu valodas tulkoti oriģinālteksti. Latviešu auditorija tuvāk ar *bon* mācības idejām un praksi sāka iepazīties 2011. gadā, kad Latvijā viesojās Menri skolotājs Thogme Šeraps Rinpoče. Viņš apmeklēja Latviju vēl vairākas reizes (2014., 2018., 2024. un 2025. gadā), kā arī Latvijā pēdējos gadus bieži viesojās *bon* ārsts Jungdzungs Osers. Jungdzung ir ne tikai cilvēka vārds, bet arī *bon* skolas nosaukums un mācības galvenais simbols. To iespējams pielīdzināt svastikai, kas šajā tradīcijā norāda uz ilgmūžību un nesagraujamību. Daudzi *bon* skolotāji vienlaicīgi darbojas arī kā ārsti, un viena no svarīgām praksēm saistās veselības profilaksi, lai novērstu slimību cēloņus, paildzinātu dzīvi un atjaunotu jaunību. 2025. gada augustā Jungdzungs Osers, viesojoties Latvijā, sniedza mācības par dzīvības eliksīru čulen, kura izgatavošana un lietošana smalki aprakstīta klasiskajā *bon* medicīnas traktātā “Melnais tekstu krājums par slimībām” (91. nod. “Vecuma novēršana un veselības uzturēšana”). Prezentācijā autore dalīsies ar personīgo pieredzi, tulkojot šīs mācības, kā arī analizēs kanonisko tekstu.

ALEKSANDRA VINTERA APRAKSTS “KĀDS VĀRDS PAR DZĪVI UN ĻAUDĪM KOREJĀ” (1899 UN 2025): TULKOJUMU UN PARATEKSTA NOZĪMĪGUMS

Ildze Šķestere

Latvijas Universitāte

Aleksandra Vintera apraksts “Kāds vārds par dzīvi un ļaudīm Korejā”, kas oriģināli tika izdots 1899. gadā, bija viens no pirmajiem populārzinātniskajiem darbiem, kas iepazīstināja latviešus ar Koreju. 2025. gada oktobrī tas tika izdots jaunā izdevumā, kur līdz ar paralēliem tulkojumiem angļu un korejiešu valodā, tika pielāgots arī oriģinālais teksts latviski, lai tas būtu saprotamāks mūsdienu lasītājiem. Jaunais izdevums izceļas arī ar estētisko noformējumu un parateksti. Piemēram, vēsturnieku Ērika Jēkabsona un Nadīnas Rodes komentāriem un korejiešu tulkotājas Sojongas Čve piezīmēm. Vintera oriģinālais apraksts pats par sevi kalpo gan kā pārsteidzoši detalizēts ieskats tā laika Korejas dzīvē un tradīcijās, gan kā tā laika latviešu attieksmes un interešu loka atspoguļojums. Taču līdz jaunajam 2025. gada izdevumam ar šo tekstu bija pazīstams tikai retais. Ar šo Vintera teksts ir atdzimis un padarīts pieejamāks gan pētniekiem, gan citiem caur paralēlajiem tulkojumiem un parateksti. Šajā pētījumā tiks apkopotas galvenās pazīmes un piemēri, kas parāda, cik nozīmīgs šādiem izdevumiem var būt precīzs tulkojums un parateksti oriģinālavota izpratnei. Tiks apskatīts arī, kā šos jaunradītos tekstus varētu izmantot korejiešu valodas un kultūras lekcijās, kā arī turpmākajā pētniecībā LU Āzijas studiju nodaļā.

2.6. sekcija. **PAGĀTNES KRUSTPUNKTI:
VARA, IDENTITĀTE UN VĒSTURES
PĒTNIECĪBA /**

**CROSSROADS OF THE PAST:
POWER, IDENTITY, AND
THE RESEARCH OF HISTORY**

HUNTER-FISHER-GATHERERS IN NW LITHUANIA: RE-EVALUATION OF LEGACY DATA AND NEW FIELDWORK RESULTS

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Sporadic mentions of animal skeletal finds recorded during peat extraction in Lithuania as early as the end of the 19th century are evident in some historical records, however, the start of reclamation in the first half of the 20th century revealed a lot of organic artefacts dated to various periods of the Stone Age. Being characterized by an abundance of small overgrown lakes, the western part of Lithuania was one of the key areas where the records of such finds were known. One of such areas is now completely overgrown Lake Ertenis, located in northwestern Lithuania. A collection of stray osseous artefacts was found there between the 1940–1965, which recently was investigated in a greater detail. These finds led to the first excavation and the discovery of Šarnelė 1 site in 1973, and 1981–1982. The results of this excavation revealed a lot of information about the activities of prehistoric hunter-gatherers in the area, including various organic artefacts and preserved wooden structures. Recent re-evaluation of this data confirmed the presence of humans in the area since the c. 10 800 cal BC, whereas the last records of their activity was assigned to the Early Bronze Age, but the most intensive episodes belong to the Mesolithic and Subneolithic.

Between the 2023 and 2025 new archaeological excavation was conducted at Šarnelė 1 site, and around the former shores of Lake Ertenis. We selected this area for new fieldwork believing that it could potentially provide more information about the Final Palaeolithic and Mesolithic human societies and their ecosystems where they had to interact. Combining the recent studies of legacy data and new excavation results we now can contribute more and re-evaluate previous interpretations about the various dating of osseous artefacts discovered at the site, provide information about fishing and hunting, and the changes of the landscape. Moreover, new excavation revealed new Stone Age sites, which enables to discuss more about the Lake Ertenis as the area being favourable for prehistoric societies. With this paper, we aim to present the latest research results from the studies of prehistoric sites located next to the former Lake Ertenis.

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NEOLĪTA AUKLAS UN PINUMI – SĀRNATES APMETNES MATERIĀLA ANALĪZE

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Bagātīgā atradumu kolekcija no Sārnates purva apmetnes izrakumiem, kas glabājas Latvijas Nacionālajā vēstures muzejā, satur arī vērtīgas liecības par vidējā neolīta laika (4. g. t. pr. Kr.) auklām un pinumiem. Saglabājušies fragmenti no astoņām dažāda resnuma auklām, kas visas darinātas, cieši savijot divus lūku pavedienus. Lūku strēmeles visbiežāk vītas z jeb pulksteņrādītāja virzienā un tad kopā savītas S virzienā jeb pretēji pulksteņrādītāja virzienam, bet sastopams arī pretējais vījuma virziens. Par īpatnēju mezglošanas tehniku liecina Sārnates H mītnē atrastais smalkais bērza tāss sloksnišu pinums, kuram tiešas etnogrāfiskās paralēles pagaidām nav atrastas. Ar stereomikroskopu rūpīgi izpētīti arī Rietumlatvijas vidējā neolīta keramikai raksturīgie “pinumu” iespaidumi, to dokumentēšanai pielietojot t. s. reflectance transformation imaging tehniku. Kā salīdzināmo materiālu izgatavoja dažāda veida auklas un pinumus no lūkiem, meldriem un bērza tāss sloksnītēm, kurus atspieda mālā. Tomēr “pinumu” iespaidumi uz māla traukiem ir ļoti neskaidri, kas apgrūtina to analīzi. Konstatēts, ka tie ir daudzveidīgi un iegūti ar dažādās tehnikās izgatavotiem spiedogiem, bet nevienu no paņēmieniem līdz šim nav izdevies precīzi atdarināt.

NEW STUDIES ON R. ŠNORE'S COLLECTION FROM THE LAKE LIELAIS LUDZA AREA

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The work conducted by the archaeologist Rauls Šnore in the Lake Lielais Ludza area (southeastern Latvia) produced a large and unique body of material. Over a few years in the late 1950s, he carried out numerous surveys and small-scale excavations, with a particular focus on Stone Age. In addition, a substantial collection of stray finds was assembled by Šnore, several committed local collectors, and the then museum director. This collection comprises hundreds of artefacts ranging from the Mesolithic to the historical period; the artefacts are curated by the Ludza Museum of Regional Studies and the National History Museum of Latvia. Part of the collection is summarized in Šnore's hand-written and illustrated catalogues by, but the collection has never been published and its use has remained rather limited. Our present research concentrates on the Stone Age part of the assemblage, with an emphasis on osseous fishing and hunting equipment, as well as selected polished stone tools. Our initial aim was to determine the contents of the collection and to identify and localize the artefacts. Subsequently, we plotted the find locations on a map, which, together with known sites, facilitates the study of prehistoric land use in the region. A key component of our study is the analysis of fishing gear. In addition to re-evaluating the typological sequences, we are conducting other analyses (e.g., radiocarbon and ZooMS) to provide further insight into chronology, raw material procurement and manufacturing technologies. In this presentation, we offer an overview of this research and its current stage.

CHANGE OR CONTINUITY? DIACHRONIC STUDY OF POTTERY PRODUCTION AND PROVENANCE IN ASVA HILLFORT

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Asva hillfort is one of the key Bronze and Iron Age sites in the eastern Baltic region. Due to its location on the shore of Saaremaa Island, it likely functioned as both a regional centre and a maritime stopping point. Archaeological evidence indicates strong bronze-casting activities as well as apparent cultural influences from other regions.

The pottery assemblage from Asva is among the most refined and versatile in the eastern Baltic. Particularly notable is the clear coexistence of fine and coarse wares – an uncommon phenomenon in Bronze Age settlements of the eastern Baltic. The seemingly unique and continuous presence of fine ware at the site raises questions regarding its technological development and provenance – whether it reflects distinct cultural traditions?

This study aims to assess change, continuity, and provenance in pottery production at Asva hillfort from the Late Bronze Age to the Pre-Viking Age. To address these questions, ceramic petrography and X-ray fluorescence spectroscopy (XRF) were employed. A total of 55 thin sections of pottery sherds were prepared, of which 15 were additionally analysed using XRF. The mineralogical and chemical composition of the pottery was compared with technical ceramics (daub and casting mould) and raw clay materials collected at the hillfort.

NEW RADIOCARBON DATES FOR IRON NARROW-BLADED AXES FROM ASVEJA LAKE, LITHUANIA: REASSESSING WEDGE-AXE EMERGENCE AND CHRONOLOGY IN THE BALTIC REGION

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Klaipėda University; Lithuanian Institute of History; amateur diver (Lithuania)

Direct radiocarbon dating of archaeological artefacts is rarely available, let alone a possibility for a series of dates for Bayesian analysis. This approach was made possible by the discovery of five iron axes from Asveja Lake in East Lithuania, each retaining wood pieces from their shafts. One of them is a typical narrow-bladed axe and was radiocarbon dated to the 5th–6th century AD. The other four are far rarer wedge-axes, which are typical for the Pre-Roman Iron Age. Until now, no more than three dozen such axes had been found in the vast region of the Baltic and Finno-Ugric cultures of Lithuania, Latvia, Estonia, Finland, and Belarus, being, however, mostly stray finds and thereby lacking chronological reference. Traditionally, their primary area of use and origin was the Scythian culture in the steppe zone in Southeast Europe. The new radiocarbon dates fall within the 4th–1st century BC. They verify the hitherto unproven early dating of Baltic iron wedge-axes and inspire a new debate on their emergence in the East Baltic region. The co occurrence of multiple axes within a single lake further invites interpretation regarding site function, use, or economic behaviour. The assemblage offers a valuable dataset for future chronological modelling and regional synthesis.

INTEGRATIVE BIOMOLECULAR ARCHAEOLOGY IN ESTONIA: ARCHEMY LAB INFRASTRUCTURE AND BRONZE–IRON AGE CASE STUDIES

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University of Tartu, Estonia

The ARCHEMY laboratory at the University of Tartu is a transdisciplinary biomolecular archaeology platform dedicated to reconstructing past diet, mobility, cultural practices, and human–environment interactions through integrated molecular and isotopic approaches. Its research framework combines organic residue analysis (ORA), bulk and compound-specific stable isotope analysis (SIA and CSIA), zooarchaeology, microfossil analysis, ancient DNA (aDNA), and palaeoproteomics. Core instrumentation includes GC–MS, ATR–FT–IR, EA–IRMS, and GC–c–IRMS, enabling the identification of lipid biomarkers and bulk and compound-specific isotopic measurements of archaeological materials. Through the PaleoMIX and CoEER projects, and in collaboration with the Universities of York, Burgos, and Copenhagen, the laboratory also develops compound-specific $\delta^2\text{H}$ isotope analysis and ZooMS-based species identification. The laboratory further contributes to BBAD and ARHUT, two archaeological research databases that support future comparative and data-driven studies.

The analytical potential of ARCHEMY as an integrative biomolecular research facility in Estonia is demonstrated through Bronze and Iron Age case studies. Bronze Age multiproxy analyses from northern Estonia (1250–500 cal BCE) indicate predominantly C_3 plant-based subsistence, with terrestrial animal products contributing approximately one-third of dietary intake. Organic residue evidence identifies the processing of ruminant adipose and dairy products, alongside occasional exploitation of aquatic resources, while chronological patterning after ca. 800 cal BCE suggests intensified use of animal-derived foods without clear dietary differentiation between social groups. Late Iron Age analyses from the Pada community in the eastern Baltic (650–1300 CE) likewise identify C_3 plant foods, most likely cereal-based, as the principal dietary staple, with terrestrial and aquatic resources making smaller contributions to daily consumption. In contrast, burial-related ritual contexts show a preference for higher-trophic-level foods, especially terrestrial and aquatic animal-derived products. No dietary variation is evident between sex or age groups in either lifetime or funerary datasets, indicating relatively homogeneous local foodways without food-based stratification. Together, these case studies demonstrate how integrated biomolecular infrastructure enables more cohesive and context-

ARHEOLOĢISKIE PĒTĪJUMI ZASAS MUIŽĀ 2023.–2025. GADĀ: GALVENIE REZULTĀTI UN IZPĒTES PERSPEKTĪVAS

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Saskaņā ar rakstīto vēstures avotu ziņām, Zasas muižas pirmsākumi attiecināmi uz 16. gs. otro pusi, tomēr plašākie pārbūves darbi tajā norisinājušies 17. gs. nogalē. Zasas upes labā krasta kraujā izveidotā muiža savas pastāvēšanas laikā (līdz 1905. gada revolūcijai) izveidojās par plašu saimniecisku centru ar daudzveidīgiem darbības virzieniem, tomēr vēstures liecībās par to ir saglabājušās ļoti fragmentāras ziņas (piemēram, atsevišķi 19. gs. muižas apraksti un plāni). Tāpēc būtisku informāciju par muižas veidošanos, saimniecību un ikdienas dzīvi var sniegt materiālās kultūras liecības.

Arheoloģiskie izrakumi Zasas muižā norisinās kopš 2023. gada, to laikā izpētot lielāko daļu kungu mājas teritorijas vairāk kā 250 m² platībā un pilnībā vai daļēji atsedzot 11 telpas un rizalitū. Arheoloģiskās liecības apliecina apdzīvotības veidošanos muižas vietā 16. gs. vidū, kad šajā vietā aizsākusies apdzīvotība un nolists mežs, izveidojot lauksaimnieciski izmantojamas zemes. Muižas kungu mājas vēsturē izdalāmi vismaz trīs būvniecības periodi, savukārt izrakumu laikā iegūtās senlietas, tostarp ap 10 monētas un vairāk kā 1000 krāsns podiņu un to fragmenti, pārsvarā saistāmas ar 17.–19. gadsimta saimniecisko un ikdienas dzīvi. Telpu zemgrīdas slānī atrastās monētas datēja kungu mājas celtniecību ar 17. gs. otro pusi, kad muižā saimnieko Heinrihs fon Zass. Savukārt par telpu reprezentatīvo raksturu 19. gadsimtā liecināja atrastā vēlāko muižas īpašnieku Greigu dzimtas ievērojamā pārstāvja Krievijas impērijas admirāļa Alekseja Greiga (1775–1845) bronzas statuja, kas, iespējams, rotājusi muižas kungu mājas ieejas vestibulu.

Muižas kungu māja, domājams, bijusi vienkārša koka celtnē, kurai varētu būt bijis izbūvēts mansards vai vēl viens neliels stāvs. Ēka apsildīta ar vismaz trim podiņu krāsnīm, kas būvētas celtnes rietumu daļā, bet austrumu daļas telpas apsildītas ar siltumsienām. Divas pilnībā izpētītās ēkas ziemeļu daļas telpas saistāmas ar muižas saimnieku dzīvojamajām telpām. Šī celtnes daļas fasāde bijusi pavērsta pret muižas centra kompleksa t. s. balto pagalmu un kariatēs atbraukušo viesu uzņemšanas apli. Zasas muižas kungu māja, kas bijusi apmēram 34 × 15 m liela, gājusi bojā ugunsgrēkos 1905. gada revolūcijas laikā. Pēc tam tās vietā iesākti, bet nav pabeigti remonta vai pārbūves darbi, uz nodegušās būves pamatiem steidzīgi veidojot ķieģeļu cokolu, stiprinot pamatus un izlīdzinot reljefa virsmu. Un vēlākajās desmitgadēs muižas kungu mājas vieta pakāpeniski kļuva par būtisku parka daļu un tūrisma objektu.

DAUGAVAS PILSKALNU IZPĒTE 2022.–2024. GADĀ: GALVENĀS ATZIŅAS UN REZULTĀTI

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Laikā no 2022. līdz 2024. gadam starptautiskā zinātniski pētnieciskā projekta INHILLDAUGAR (*Interdisciplinary Hillfort Studies at the Daugava River: Merging and Decoding Archaeological, Environmental and Linguistic Data*) ietvaros 17 Daugavas krastos esošos pilskalnus un vairākos ar tiem saistītos objektos tika veikti arheoloģiskās un ģeoloģiskās izpētes darbi. Projekta mērķis ir apvienojot arheoloģijas, ģeoloģijas un valodniecības metodes pētīt gar Daugavas ūdensceļa krastiem izvietotos dažādu laikmetu pilskalnus kā plašāka nocietinājumu un apdzīvotu vietu tīklojuma sastāvdaļas, izprast to lomu konfliktu risināšanas stratēģijās un Daugavas ūdensceļa kā kontaktu koridora funkcionēšanā. Arheoloģiskās izpētes darbi lielākoties tika veikti jaunatklātos un iepriekš maz pētītos pilskalnus, tāpēc to metodoloģija bija izvēlēta tā, lai, veicot neliela apmēra, mazinvaizīvus darbus, īsā laikā iegūtu pēc iespējas vairāk informācijas par pilskalna nocietinājumu sistēmas uzbūvi, kultūrslāņa stratigrāfiju un datējumu. Pēc lauka darbu noslēguma veiktas padziļinātas iegūto ģeoloģisko paraugu laboratoriskās analīzes un vairāku simtu paraugu datēšana ar radioaktīvā oglekļa ^{14}C metodi. Izpētes rezultāti ne tikai devuši materiālu atsevišķu pilskalnu datēšanai un raksturošanai, bet arī iezīmējuši vairākas reģionālas un hronoloģiskas tendences, kas raksturo pilskalnu atšķirīgās funkcijas dažādos laika un Daugavas tecējuma posmos. Šī referāta mērķis ir dot kopsavilkumu par projekta norisi un galvenajiem arheoloģiskās izpētes rezultātiem balstoties lauka darbos iegūtajā materiālā. Īpaša uzmanība tiks pievērsta jautājumiem par pētīto pilskalnu datējumu, to nocietinājumu sistēmu attīstības tendencēm, interesantākajiem senlietu atradumiem un keramikas materiāla analīzei.

LARGE-SCALE EXCAVATIONS AT ROMAN PERIOD SETTLEMENT IN MIGŪČIONYS, EAST LITHUANIA

Rokas Vengalis, Gytis Piličiauskas, Ieva Vengalė, Karolis Minkevičius, Kęstutis Peseckas

Lithuanian Institute of History, Lithuania

Although research on prehistoric settlements in Lithuania has intensified significantly in recent decades, it is still dominated by very small-scale excavations, often limited to small trenches or, more frequently, test pits. Such excavations naturally provide limited information, primarily concerning the dating of settlements rather than their internal structure or the spatial distribution of activity zones. A particularly critical issue remains the lack of identified buildings within these settlements. In this context, the 2024 excavations at the Migūčionys settlement site in southeastern Lithuania stand out. Conducted during the construction of a large logistics center, the excavations covered a continuous area of 8.3 hectares within the settlement territory. Following the mechanized stripping of the topsoil, over 400 sunken archaeological features were uncovered. While these belong to various periods, the vast majority date back to the second half of the Roman Period. Most of the features are postholes that form distinct structures – buildings – of which as many as 32 have been identified. These buildings represent different types and likely served various functions. During the research, an extensive collection of archaeobotanical samples was gathered, with over 2,000 liters of soil processed, although archaeobotanical remains were found to be scarce. Additionally, 100 AMS radiocarbon dates were obtained, allowing for a detailed reconstruction of the settlement's structural evolution. This data enables the identification of contemporaneous buildings, their grouping into farmsteads, and the tracking of farmstead location shifts within the settlement territory.

COMBS IN LITHUANIA FROM THE 3RD TO THE 12TH CENTURY

Šarūnė Valotkienė

National Museum of Lithuania

The aim of this presentation is to review combs dating from the 3rd to the 12th centuries held in Lithuanian museum collections and found within the territory of present-day Lithuania, with particular focus on bone combs with copper-alloy cases discovered in the lower reaches of the Nemunas River. The paper also addresses issues related to the dating of these combs and discusses possible approaches to resolving them.

The study examines the distribution of specific comb types, identifies two types considered to be of local origin, and discusses their chronology and prevalence within the territory of Lithuania. Special attention is given to the lower reaches of the Nemunas River, which stand out in the context of comb finds: this region has yielded the largest number of combs identified to date, all of which have been recovered exclusively from graves.

Particular emphasis is placed on two bone combs with copper-alloy cases from graves No. 18 and 19 at Kreivėnai, which are usually dated to the 7th–8th centuries. However, the assemblages from these graves show strong similarities to finds from women's graves at other burial sites in the lower reaches of the Nemunas River, such as Linkūnai, Šereitlaukis, and Barzūnai. Although the dating of these graves varies in the historiography, they are most often attributed to the period from the late 5th to the 7th century. The presence of similar women's ornaments in these graves –including long-stemmed brooches, bracelets with hooked ends, pins with elongated diamond-shaped heads, and other artifacts – suggests that the chronology of the Kreivėnai combs should be reconsidered within a broader regional context.

LAGZDĪNAS PILSKALNA ARHEOLOĢISKĀS IZPĒTES REZULTĀTI 2024.–2025. GADĀ

Kaspars Molls, Armands Vijups

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Lagzdīnes pilskalns (arī Lagzdenes, Lagzdienas) atrodas Ventas labajā krastā, un ir pirmais pilskalns Ventas krastā, kuģojot no Baltijas jūras. Starp Kurzemes pilskalniem tas ir viens no nedaudzajiem, kuru vaļņi aplveidā ieslēdz no visām pusēm. Plakums un vaļņi daļēji noarti 19.–20. gadsimtā. Lai gan pirmās ziņas par pilskalnu attiecināmas jau uz 19. gs., pilskalns līdz 2024.–2025. gada izrakumiem bija nepētīts.

2024.–2025. gada izpētes mērķis bija precizēt apdzīvotības hronoloģiju un kultūrslāņa izplatību. 2024. gadā iemērīts 7×4 m liels 1. laukums pilskalna plakuma ziemeļaustrumu daļā, izpētot sešas kārtas līdz 1,2 m dziļumam. Izpētes gaitā atsedzās māla klājums un akmeņu rindas ar koka fragmentiem. 2025. gadā darbi tika turpināti 1. laukumā, kā arī iemērīts 2×4 m liels 2. laukums plakuma rietumu daļā un paplašinājums 1. laukumam, lai pilnā apjomā atsegtu iepriekšējā gadā konstatēto māla klājumu. Apmetnē pie pilskalna tika iemērīts 2×3 m liels 3. laukums. Kopumā izpētīti 50 m^2 .

laukums un paplašinājums izpētīti astoņās kārtās. Līdz 0,7–1 m dziļumam konstatēta aramzeme. Zem aramkārtas sekoja melns kultūrslānis ar akmeņu klājumiem un oglēm, 0,8 m dziļumā atsegta sabrukusi krāsns. Pamatzeme sasniegta ap 1,7 m dziļumā. 2. laukums tika atsegts 6. kārtās. Zem aramzemes kārtas kultūrslāni veidoja intensīvi melna zeme. Ziemeļu pusē kultūrslānis sasniedza 0,9 m dziļumu, savukārt dienvidu pusē – 1,6 m.

Apmetnē pie pilskalna 3. laukumā kultūrslāni veidoja tumši pelēkbrūna, viendabīga zeme, kas apstrādāta ar arklū. Pamatzemi veido gaiši brūna/tumši dzeltena smiltis, kas pārjaukta ar tumšākas zemes ieslēgumiem. Izpētot laukumu trīs kārtās pamatzeme tika sasniegta 0,6 m dziļumā.

Izpētes gaitā iegūtas 236 dzelzs, bronzas, stikla, krama un keramikas senlietas. Daļa atradumu (māla trijkāja trauku kājas, glazēta sarkanmāla keramika) datējama ar 19.–20. gadsimtu un visticamāk saistāma ar zemes mēslošanu laukapstrādei. No arheoloģiskajām senlietām izceļami sudraba stienīšu atcirtumi, krama atšķīlas, bronzas jostas apkalums, bronzas zvārgulis, dzelzs slīmestis, dzelzs bārdas nazis, stikla krellīte ar zelta foliju, dzelzs atslēga u. c. 2. laukumā atrasts Oto III denārs (983–1002), bronzas pakavsa kta ar magonpogaļu galiem u. c. Senlietas pamatā datējamās ar vēlo dzelzs laikmetu, 10.–12. gadsimtu. Šim datējumam atbilst arī pilskalna paraugu radioaktīvā oglekļa analīzes rezultāti, kas iekļaujas 9. gs. beigās – 11. gs. sākumā – vidus hronoloģiskajos ietvaros.

Atrastās 1552 keramikas lauskas pārstāv apmetās un agrās ripas keramiku. Starp atradumiem ir arī māla apmetuma fragmenti un dzelzs sārņi. Izpētē iegūti ļoti maz, slikti saglabājušies dzīvnieku kauli.

Secinājumi. Lagzdīnes pilskalnu 10.–12. gadsimtā apdzīvoja Ziemeļkurzemes Baltijas somu grupa, kas to pametusi īsi pirms krusta kariem. Par apdzīvotību vēlajā akmens laikmetā vai agro metālu periodā liecina krama atšķīlu atradumi. Iegūtās senlietas lielākoties ir sadzīves priekšmeti un darba rīki. Maiņas priekšmeti liecina par kontaktiem ar Daugavas lībiešiem un citām reģiona iedzīvotāju grupām. 2024. – 2025. gada izrakumi apliecināja arī apmetnes pie pilskalna pastāvēšanu.

Lagzdīnas pilskalna arheoloģiskā izpēte veikta ar Valsts Kultūrkapitāla fonda finansiālo atbalstu.

TYOLOGY VS. RADIOCARBON: AMS ¹⁴C DATING OF DIVERSE ORGANIC MATERIALS FROM LATVIAN LATE IRON AGE CEMETERIES

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As part of projects funded by the Alexander von Humboldt Foundation and the DFG, led by the corresponding author at ZBSA/LEIZA in cooperation with LNVN and the University of Latvia (2018–2023), a series of burials from several Latvian Late Iron Age cemeteries were radiocarbon (¹⁴C) dated: Raņķu Kapenieki (8 graves/10 samples), Salaspils Laukskola (4), Lejasdopeli (1), Dole Vampenieši (1), Alsungas Kalniņi (1), and Libagu Saraji (1). In total, 18 samples from 16 burials across six burial sites were analysed.

These sites were selected and dated for several reasons. Raņķu Kapenieki was chosen for a systematic chronological study using ¹⁴C statistics and GIS modelling, and for subsequent comparison with ¹⁴C dates from Curonian cemeteries in Lithuania (Palanga, Ramutten/Girkaliai). The inhumation burials from Laukskola, Lejasdopeli, and Dole Vampenieši were included to compare with graves containing similar or closely related archaeological assemblages from the Baltic migrant cemetery of Ostriv (Ukraine). Alsungas Kalniņi (Grave 8) and Libagu Sāraji (Grave 43) represent well-studied and published contexts that are nevertheless particularly informative for comparing typological and radiocarbon chronologies.

The following materials were dated: cremated human remains, uncremated human remains (teeth), horn (fragments of organic parts of drinking horns), and elements of clothing (leather and textiles). Since each material reflects a different chronological signal – corresponding to the decay of carbon isotopes and the “death” of an object or individual – multiple samples were in some cases taken from the same, typologically well-dated burial (e.g., Raņķu Kapenieki Grave 20: cremated bone and charcoal; Grave 26: cremated bone and a drinking horn fragment). This allows not only comparison of the resulting dates but also evaluation of the suitability of different organic materials for ¹⁴C dating.

For Raņķu Kapenieki, a chronological model was developed that correlates typological and ¹⁴C dates within a GIS framework using Bayesian statistics. Radiocarbon dates from the other mentioned sites are likewise critically compared with the possibilities and limits of their typological dating.

The study concludes with a comparative analysis including ¹⁴C-dated burials from other sites in the eastern Baltic region and from Ostriv (Ukraine) that contain analogous typological material.

MILITĀRĀ KULTŪRA 13.–17. GADSIMTA RĪGĀ: BRUŅOJUMA ATRADUMU KOMPLEKSA KALĒJU IELĀ 64/66 PIEMĒRS

Artūrs Tomsons

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Kalēju ielas 64/66 arheoloģiskā izpēte (2017–2020) šī ziņojuma autora vadībā atklāja plašu un daudzveidīgu bruņojuma atradumu kompleksu, kas aptver laika posmu no 13. līdz 17. gadsimta beigām. Materiāls iegūts kādreizējās Rīgas upes labā krasta aizbērums slāņos, sniedzot unikālu ieskatu Rīgā lietotā bruņojuma un militārās kultūras attīstībā. Kompleksā ietilpst arbaleta un loka bultu gali, šķēpu uzgaļi, kaujas cirvji, zobenu, tai skaitā sabļu un rapieru detaļas un to makstu uzgaļi, ķermeņa bruņu elementi, kā arī plašs rokas šaujamieroču un artilērijas munīcijas klāsts. Savukārt ugunsieroču kalibru analīze uzrāda daudzlīmeņu uguns nodrošinājuma sistēmu, kas atbilst 16.–17. gs. beigu Rīgas kā nocietinātas ostas pilsētas militārajai organizācijai. Referāts analizē arheoloģiskā viduslaiku un agro jauno laiku bruņojuma materiālu kā varas, identitātes un tā lietojuma sociālo aspektu indikatoru. Materiāls atspoguļo militārās kultūras transformāciju, kas saistīta ar urbanizāciju, starptautiskiem konfliktiem un Rīgas politiskās un ekonomiskās nozīmes pieaugumu jauno laiku sākumā. Kalēju ielas 64/66 izpētē iegūtais bruņojums demonstrē, ka arheoloģiskais materiāls ļauj rekonstruēt ne tikai bruņojuma tehnoloģisko attīstību, bet arī pilsētas varas reprezentācijas un militārās identitātes dinamiku vairāku gadsimtu garumā.

SENĀS RĪGAS UPES (RĪDZENES) KRASTU KOKA NOSTIPRINĀJUMU POSMU DENDROHRONOLOĢISKĀS DATĒŠANAS REZULTĀTI

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2005. gadā bija publicēts pazīstamā arheologa un vēsturnieka Andra Caunes zinātniskais raksts par līdz tam laikam arheoloģiski atklātajiem un pētītajiem bijušās Rīgas upes krasta koka nostiprinājumu posmiem. Līdz tam laikam tie atšķirīga izmēra platībā bija atsegti un pētīti senāk aizbērtās upes gultnes astoņās vietās.^[1] Arheoloģisko izrakumu materiāli ļāva secināt vai apstiprināt, ka, pakāpeniski sašaurinot upes gultni, tās krastmalu nostiprināšana veikta vairākkārt: 13. gs., 15.–16. gs. un 17. gs. otrajā pusē. 1730. gados par kādreizējo upi atgādināja vien šaurs, slēgts notekūdeņu koka izvadkanāls.^[2]

Lai Rīgas upes krastu koka nostiprinājumu posmu absolūto datējumu varētu noteikt precīzāk, kopš 1970. gada no to būvelementiem arheologi sāka sagatavot koksnes paraugus to dendrohronoloģiskajai datēšanai. Diemžēl lielākā daļa no sagatavotajiem koksnes paraugiem 1990. g. sākumā gāja bojā, līdz ar to vairumam no pagājušajā gadsimtā atsegtajiem Rīgas upes krasta koka nostiprinājumu posmiem precīzs datējums palika nenoskaidrots.

Kopš gadsimtu mijas Rīgas upes krastu stiprinājumu posmi arheoloģiskajos izrakumos ir bijuši atsegti kādreizējās upes gultnes vēl sešās vietās, un daļai no šo posmu koka būvelementiem ir noskaidrots precīzs absolūtais datējums. Datēšanas darbs tika veikts LU HZF Latvijas vēstures institūta Dendrohronoloģijas laboratorijā. Senās Rīgas upes krastu nostiprinājumu vairāku posmu datējumi ir ļāvuši ievērojami precizēt šo posmu būvniecības laiku un secību, noskaidrot vairākus nostiprinājumu posmu pārbūves vai labošanas gadus, kā arī konstatēt iepriekš kļūdaini par krasta nostiprinājumu posmiem uzskatītās citas nozīmes koka konstrukcijas.

Iegūto rezultātu novērtējums vienlaikus liecina, ka tās noteiktības un objektivitātes vērtējums būtu bijis vēl augstāks, ja seno krastu nostiprinājumu koka būvelementu dendrohronoloģisko datēšanu būtu bijis iespējams veikt lielākā apjomā un sistemātiskāk.

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Pētījums veikts un ziņojums sagatavots projekta "HZF snieguma finansējums, LU reģistrācijas Nr. AAP2024/B283" ietvaros.

DAŽI 16. GS. BRONZAS APKALUMI LATVIJĀ – GRĀMATU VAI JOSTU DETAĻAS?

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Referātā tiks pievērsta uzmanība arheoloģiski atrastiem 16. gs. bronzas apkalumiem un to funkcijas interpretācijai. Latvijas viduslaiku pils un pilsētās, veicot arheoloģiskos izrakumus, nereti atrod dažādas sīkas krāsaino metālu senlietas, kuras mēdz apzīmēt par apkalumiem. Diemžēl lielākoties tās ir bojātas, salauztas vai fragmentāras. Turklāt arī vesēlie atradumi parasti nav senatnē lietoti atsevišķi, bet gan bijuši kāda lielāka priekšmeta sastāvdaļa. Tā kā vairumā gadījumu izrakumos atrod tikai nelielo metāla apkalumu, bet no organiskā materiāla – koka vai ādas – gatavota lāde, josta, grāmata u. tml. zemē nav saglabājusies, tad noteikt nelielā priekšmeta sākotnējo funkciju ir grūti.

Referātam izvēlētos atradumus vairāki latviešu arheologi identificējuši gan kā grāmatu, gan jostu apkalumus. Piemēram, daži paraugi Turaidas pils un Rīgas vecpilsētas arheoloģiskajā materiālā interpretēti kā 16. gs. grāmatu ādas iesējumu slēdži, kas izmantoti sējuma nostiprināšanai aizvērtā stāvoklī. Šādu secinājumu arheologi droši vien izdarījuši pēc analogijas ar attāli līdzīgiem paraugiem. Tomēr jāatzīst, ka nav ņemts vērā plašāks konteksts, attiecīgā laika analogi seno grāmatu kolekcijās, kā arī attiecīgo senlietu funkcionālas izmantošanas iespējas. Tā kā ar katru gadu strauji pieaug internetā pieejamo attēlu un publikāciju skaits, tad tagad var atrast daudz vairāk paraugu un var piedāvāt precīzāku citu skaidrojumu. Referātā tiks kritiski izvērtēti iepriekšējie interpretācijas modeļi un piedāvāts cits skatījums, kas vairāk balstīts uz funkciju, formas analīzi un kultūras kontekstu.

Pētījums veikts un ziņojums sagatavots projekta "HZF snieguma finansējums, LU reģistrācijas Nr. AAP2024/B283" ietvaros.

ARCHAEOLOGICAL RESEARCH ON LITHUANIAN MANOR SITES: RESEARCH DEVELOPMENT, METHODOLOGY, AND PRINCIPAL FINDINGS

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Research on manor estates in Lithuanian historiography is well established and has mainly focused on historical, economic, architectural, art historical, and heritage perspectives. However, the considerable body of archaeological material accumulated over the past three decades has not yet been fully evaluated in terms of its significance for understanding manor development. In 1994, 3342 surviving manor estates and their remains were recorded, while a 2004 database listed 579 estates registered as cultural heritage properties. These figures suggest that many Lithuanian manor estates have effectively become archaeological sites, with their heritage surviving primarily underground. Archaeological investigations began only in the 1970s and intensified in the 1990s. Over the past two decades, research has expanded significantly, largely due to the inclusion of manor estates in the state register of protected cultural heritage and related restoration processes. By 2023, archaeological investigations of varying scope had been conducted at 247 of the more than 600 registered manor sites, estates, folwarks, and their fragments – nearly 40% of all protected sites. Research has been concentrated around Vilnius, in Vilnius and Utena counties, and in central Lithuania. Most investigations remain exploratory in nature and limited in scale, typically focusing on assessing cultural layers and refining site chronology. Thus, as with other early modern (16th–18th century) sites investigated through archaeological methods, excavation data from manor estates should be correlated with historical information, surviving inventories, and other written and iconographic sources. Archaeological evidence can help fill existing gaps in the historical record. The aim of the presentation is therefore to approach the manor estate as an archaeological object, to compare the dynamics and methodologies of archaeological research on Lithuanian manor estates, and to summarize the most significant results.

THE BATTLE OF SALOČIAI (1703): RESEARCH IN THE VILLAGE OF ŠAKARNIAI

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The Institute of Baltic Region History and Archaeology at Klaipėda University, together with its partners, the Pasvalys branch of the Cultural Society “Žiemgala” and the Pasvalys Regional Museum, conducted archaeological surveys in the village of Šakarnių (Saločių parish, Pasvalys district) over four seasons (2022–2025). The total area surveyed is approximately 121.3 ha. The following presumed structures and finds have been recorded: 1) the site of an early Bronze Age bronze axe (~1500 BC); 2) the sites of the old roads Vilnius–Riga, Pasvalys–Bauska, and Joniškis–Biržai; 3) a medieval settlement (14th century) with the homesteads of a jeweler and a merchant; 4) a hoard of silver ingots (first half of the 14th century); 5) a cremation cemetery or sacrificial site (?) in a stream (second half of the 13th century – 14th century); 6) a place of sacrifice (?) in a stream valley (second half of the 13th century – first half of the 14th century); 7) the village of Šakarniai (16th–first half of the 20th century); 8) the sites of single-farmsteads in Šakarniai (16th–19th centuries); 9) Mažieji Saločiai manor (17th–18th centuries); 10) Site of the 1703 Battle of Saločiai, camp of the Lithuanian and Russian allies, battlefield (~500 m); 11) Relics of the Lithuanian and Latvian War of Independence (battle between the Saločiai unit of the Lithuanian separate (Joniškėlis) partisan battalion, the Bauska battalion of the Latvian army, and the 1st Guard Reserve Division of the German volunteer army against the Red Army (17 April – 23 May 1919); 12) Relics of the Second World War (30 July – 2 August 1944).

LATVIJAS SATVERSMES SAPULCES KOMISIJU LĒMUMU PIEŅEMŠANAS PROCESĀ (1920–1922)

Inta Krūmiņa

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Latvijas Satversmes sapulces – pirmās demokrātiski ievēlētās Latvijas tautas pārstāvības institūcijas – viens no galvenajiem uzdevumiem bija ne tikai Latvijas Republikas Satversmes, bet arī normatīvā regulējuma agrārās reformas īstenošanai izstrāde un pieņemšana. Plašākai sabiedrībai redzamākais likumdošanas procesa posms ir likumprojekta skatīšana plenārsēžu laikā. Tomēr ne mazāk atbildīgs ir darbs, kuru veic likumdevēja pastāvīgās komisijas, izskatot likumprojektus un sagatavojot tos nākamajiem lasījumiem. Viens no priekšnosacījumiem tam, lai komisijas varētu izstrādāt sabiedrības vajadzībām un valsts attīstības interesēm atbilstošus likumprojektus, ir kvalitatīvas informācijas, tostarp statistikas datu pieejamība lēmumu pieņemšanas procesā. Referāta mērķis ir raksturot veidus, kādos viena no nozīmīgākajām Latvijas Satversmes sapulces komisijām – Agrārlietu komisija – ieguvusi lēmumu pieņemšanai nepieciešamos statistikas datus, kā arī analizēt to izmantošanu komisijas darbā. Avotu bāzi veido Latvijas Nacionālā arhīva Latvijas Valsts vēstures arhīva Satversmes sapulces fondā pieejamās lietas – galvenokārt Agrārlietu komisijas un tās apakškomisiju protokoli –, Satversmes sapulces stenogrammas, likumdošanas akti, memuārliteratūra un raksti periodiskajos izdevumos. Konstatēts, ka Agrārlietu komisija bija viena no tām Latvijas Satversmes sapulces pastāvīgajām komisijām, kas savas specifikas dēļ salīdzinoši daudz izmantoja statistikas datus lēmumu pieņemšanā, par ko liecina arī speciālas apakškomisijas izveide. Statistikas dati tika iegūti dažādos veidos, citstarp no Valsts statistiskās pārvaldes un izpildvaras institūcijām. Agrārlietu komisija statistikas datus izmantoja ne tikai agrārās reformas regulējuma izstrādē, bet arī normatīvā regulējuma izstrādē virknē citu jomu, kas bija tās kompetencē. Tomēr ne vienmēr statistikas dati kalpoja faktos balstītai lēmumu pieņemšanai, dažkārt tie tika izmantoti politiskajā argumentācijā starp dažādu frakciju pārstāvjiem.

ONOMASTIKA KĀ POLITISKO PROCESU ATSPUGUĻOJUMS SENAJĀS ATĒNĀS V–IV GS. P. M. Ē.

Harijs Tumans

Latvijas Universitāte

Referāts veltīts poliskās onomastikas jautājumam senajās Atēnās. Senajiem atēniešiem, tāpat kā visiem grieķiem bija tradīcija dot bērniem saliktus un “runājošus” vārdus, kuri atspoguļoja vecākiem tuvas idejas vai jēdzienus. Starp šiem vārdiem ievērojamu grupu veido vārdi ar politisku saturu, proti vārdi ar saknēm dem- (“tauta”) un arist- (“vislabākais”, kas asociējas ar aristokrātiju). Šajā referātā tiek parādīts, kā Atēnu sabiedrībā V–IV gs. p. m. ē. mainās mode uz politiski nozīmīgiem vārdiem. Atēniešu personvārdu pētniecība ir iespējama, pateicoties kapu uzrakstiem un amatpersonu sarakstiem, kas ir saglabājušies līdz mūsdienām. Šādu uzrakstu ir ļoti daudz, un tas ļauj izveidot statistiku un izsekot tam, kā mainās vienas vai otras vārdu grupas popularitāte. Atēniešu personvārdu statistika parāda, ka V–IV gs. p.m.ē. ievērojami pieaug personvārdu skaits ar sakni dem- un samazinās personvārdu skaits ar sakni arist-, kas ļauj izsekot demokratizācijas procesa gaitai šajā laikā.

VELOMOBILITĀTE RĪGĀ 20. GADSIMTA 30. UN 21. GADSIMTA 20. GADOS: SALĪDZINOŠĀ ANALĪZE

Dita Zemīte

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Darba mērķis ir analizēt velomobilitāti kā ilgtspējīgas mobilitātes veidu, salīdzinot tās īpatsvaru pārvietošanās veidu modālajā dalījumā Rīgā 20. gs. 30. gados un 21. gs. 20. gados.

Pētījuma aktualitāti nosaka 2026. gadā plānotais Latvijas iedzīvotāju mobilitātes pētījums, ko trešo reizi veiks Centrālā statistikas pārvalde, ar uzsvaru uz urbāno mobilitāti Latvijā.

Ilgtspējīga mobilitāte ir nozīmīgs jautājums gan Latvijas un ES līmenī, gan arī globāli, jo transporta nozare rada aptuveni 24 % no kopējām emisijām; Latvija līdz šim nav sasniegusi emisiju samazināšanas mērķus.

Pētījumā izmantoti vēsturiskie dati no Statistiskās biroja 1938. gada publikācijas par 1937. gadā veikto pirmo satiksmes skaitīšanu Rīgā, analizējot datu vākšanas metodoloģiju un rezultātus.

Balstoties uz šiem datiem, tiks aprēķināts pielīdzināms modālais dalījums, izmantojot 2021. gada Latvijas iedzīvotāju mobilitātes datus Rīgā.

Īpaša uzmanība tiks pievērsta velomobilitātei, izvērtējot tās lomu dažādos laikposmos un iespējamās attīstības tendences.

Pētījums aplūko arī transporta nabadzības aspektu, uzsverot nepieciešamību nodrošināt pieejamu mobilitāti visiem sabiedrības locekļiem.

Vēsturiskā perspektīva ļauj izvērtēt velosipēda nozīmi kā pieejamu transporta līdzekli mazturīgajiem iedzīvotājiem un tā potenciālu mūsdienās mazināt nevienlīdzību transporta pieejamībā, īpaši urbānajā vidē.

Šobrīd labklājības, satiksmes un klimata politikas plānošanā ir svarīga arī transporta nabadzības mazināšana, nodrošinot, ka transports ir pieejams visiem sabiedrības locekļiem, tāpēc ir būtiski paraudzīties gandrīz gadsimtu atpakaļ, lai novērtētu, vai velosipēds, kas savulaik ticis izmantots kā transporta līdzeklis mazturīgo Rīgas iedzīvotāju vidū, būtu potenciāls risinājums, lai mazinātu nevienlīdzību gan transporta pieejamībā, gan transporta izdevumu slogā uz mājsaimniecības budžetu.

Darba rezultāti sniegs ieguldījumu ilgtspējīgas un iekļaujošas transporta politikas attīstībā Latvijā.

LATVIJAS PAREIZTICĪGO IEDZĪVOTĀJU SKAITLISKAIS, ETNISKAIS UN TERITORIĀLI TĒLPISKAIS SADALĪJUMS 20. GADSIMTA 20.–30. GADOS

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Referāta mērķis ir, izmantojot pieejamos statistikas datus, izpētīt Latvijas pareizticīgo iedzīvotāju skaitlisko, etnisko un teritoriāli telpisko sadalījumu starpkaru periodā. Lai to sasniegtu, svarīgi avoti ir 1920., 1925., 1930. un 1935. gadu tautas skaitīšanas dati. Pēc tiem var izsekot iedzīvotāju skaita un struktūras izmaiņas, palīdzot analizēt galvenās attīstības tendences. Tas savukārt ļauj konstatēt latviešu ticīgo un latviešu draudžu īpatsvaru baznīcas kopējā struktūrā, lai lauztu mītu par pareizticīgajiem iedzīvotājiem Latvijā kā tikai par krievu nacionalitātes pārstāvjiem.

Starpkaru perioda statistikas dati liecina, ka pareizticīgie veidoja ievērojamu daļu – tie bija aptuveni 9% no visiem valsts iedzīvotājiem. Tādā veidā pareizticīgā baznīca ticīgo skaita ziņā ieņēma trešo vietu Latvijā, sekojot evaņģēliski luteriskajai un Romas katoļu baznīcai, stabilas pozīcijas saglabājot līdz pat 30. gadu beigām. Lai gan pareizticība bija izplatīta krievu iedzīvotāju vidū, tomēr samērā lielu daļu no visiem pareizticīgajiem pārstāvēja latvieši, turklāt varēja konstatēt tendenci uz to skaita palielināšanos. Tā 1920. gadā no visiem pareizticīgajiem iedzīvotājiem latvieši bija 31%, savukārt 1935. gadā tie jau bija 33%. Salīdzinoši krievu tautības pareizticīgo skaitam bija tendence samazināties no 61% 1920. gadā uz 55,9% 1935. gadā. To varēja izskaidrot ar pārkrievoto latviešu pakāpenisku atgriešanos pie savas tautības, kā arī krievu tautības cilvēku pakāpenisku asimilēšanos latviskā vidē.

Draudžu nacionālais sadalījums bija noformējies vēl 19. gadsimtā – lauku draudzes pārsvarā bija latviešu draudzes, savukārt pilsētu draudzes, kā arī lielākā daļa no Latgales draudzēm, pārsvarā bija krievu. Taču kopējā Latvijas pareizticīgās baznīcas struktūrā latviešu un krievu draudzes procentuāli sadalījās vienādās daļās. Arī baznīcas dzīves organizācijā pilnvērtīgi un vienlīdz aktīvi darbojās gan latviešu, gan krievu draudzes, neizceļot, neizslēdzot vai kaut kā savādāk ierobežojot kādu no nacionālajām grupām ar lielākām vai mazākām pilnvarām.

Tāpēc var secināt, ka LPB bija pārsteidzīgi nodēvēta par krieviski orientētu institūciju un tai piederīgie ticīgie – kā tikai krievu nacionalitātes pārstāvji. Trešā daļa no visiem Latvijas pareizticīgajiem iedzīvotājiem bija latvieši, un latviešu draudzes veidoja nozīmīgu daļu LPB struktūrā.

MARĢERA SKUJENIEKA DEVUMS IEDZĪVOTĀJU STATISTIKAS ATTĪSTĪBĀ LATVIJĀ 20. GS. 20. UN 30. GADOS UN TĀS ATTĪSTĪBA MŪSDIENĀS

Pēteris Vēģis

Centrālā Statistikas pārvalde

Referātā tiks pētīts politiķa, profesionāla statistiķa un publicista Marģera Skujenieka ieguldījums statistikas pamatu veidošanā un attīstībā Latvijā 20. gs. 20. un 30. gados īpašu uzmanību pievēršot valsts tautas skaitīšanas un iedzīvotāju uzskaites organizācijai un iedzīvotāju datu publicēšanai. Tajā tiks sniegts Skujenieka laika iedzīvotāju statistikas metožu salīdzinājums ar padomju laiku un mūsdienu statistiku.

PSRS SOCIĀLI EKONOMISKO PROBLĒMU IETEKME UZ LATVIJAS CIVILĀS AVIĀCIJAS PĀRVALDES DARBĪBU 20. GS. 70.–80. GADOS

Jānis Ķeruss

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Darba mērķis ir izpētīt, kādas PSRS sociālekonomiskās problēmas bija redzamas Latvijas Civilās aviācijas pārvaldes darbībā 20. gs. 70. un 80. gados. Šī ekonomikas nozare tika izvēlēta, jo Padomju Savienībai saskaroties ar pieaugošām ekonomiskajām problēmām, aviācijas nozari, sakarā ar tās lielo degvielas patēriņu un nepieciešamajiem augstajiem drošības standartiem, šīs problēmas skāra jo īpaši jūtami. Referātā, balstoties uz pārvaldes pārvadāto pasažieru skaita apgrozījuma dinamiku no 70. gadu otrās puses līdz 1990. gadam, tiks aplūkots, kādas PSRS makroekonomikas problēmas un kā tās ietekmēja šī uzņēmuma darbību.

CHRISTIANITY RELATED TERMINOLOGY IN LIVONIAN: ORIGINS, LAYERS, AND WIDER INFLUENCE

Valts Ernštreits, Karl Pajusalu

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According to historical sources, the Livonians – the Indigenous people of Latvia – were the first in the region to encounter Western Christianity. The first Livonians were baptised in 1184, with the earliest recorded translations of Christian content into Livonian dating to 1205. These sustained contacts between Livonian communities and Christian missionaries can be expected to have left lasting traces in Livonian vocabulary, as well as in the languages of neighbouring peoples, including proto-Estonian and proto-Latvian tribes.

This presentation examines core Christian and church-related terminology preserved in Livonian, drawing on evidence from both attested varieties – Courland Livonian and Vidzeme (Salaca) Livonian. Through etymological analysis of key religious terms – including pāp ‘priest’, rōntōz ‘book’, lōt ‘church’, and rištīng ‘human being’, as well as rištō ‘to baptise’, pāstō ‘to save’, pastō ‘to fast’, and others – the study reveals a distinctly layered lexicon reflecting the complex contact history of the Livonian-speaking community.

The analysis demonstrates that Livonian religious vocabulary draws from multiple source languages and historical periods. Certain terms predate the arrival of the Western Church, with origins traceable to proto-Slavic or Old Russian – notably the words for priest and book. Others reflect the subsequent influence of Low German, the dominant language of the ecclesiastical and mercantile elite in the medieval Baltic region. Additional layers of contact with further neighbouring languages can also be identified.

Beyond Livonian itself, the presentation explores potential traces of Livonian religious terminology in the broader linguistic landscape of the region. A notable example is Latvian pestīt, bearing primarily religious connotations of salvation, which appears to derive from Livonian pāstō. Furthermore, certain features of early Estonian religious texts suggest possible reliance on now-lost Livonian source materials, raising the prospect that early Livonian translations may have served as a model for the first Estonian religious texts of the early sixteenth century.

The presentation thus situates Livonian not only as a recipient of Christian linguistic influence, but also as a potential transmitter of early religious vocabulary to neighbouring communities, offering new perspectives on Livonian’s role in the linguistic and religious history of the Baltic region.

PRESS CENSORSHIP UN INTERWAR LITHUANIA: FROM PROTECTION TO INSTITUTIONALIZED CONTROL

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In the First Republic of Lithuania, censorship remained a constant feature of public life. The primary justification for restricting freedom of speech was the pursuit of national security. During the Wars of Independence, the authorities sought to prevent the public dissemination of information that could harm the country's defense and state interests, as well as to shield society from propaganda spread by hostile forces. With the introduction of martial law and the establishment of military censorship, which was carried out by military commandants, particular importance was given to protecting state secrets and military information. The measures adopted in the course of establishing statehood were seen as reasonable and faced minimal criticism. However, the state of martial law persisted in the country, highlighting the ongoing threat of war with Poland, and censorship continued alongside it. As the situation in the country stabilized, the necessity of maintaining the state of emergency increasingly became a subject of debate in parliament. The issue of press censorship became highly sensitive with increasing complaints about its use for political purposes to supervise the content of opposition party publications. A brief relaxation of martial law and press control occurred during the rule of the Popular Peasants' Union and Social democrats. However, this respite was short-lived, as a military coup in December 1926 brought Antanas Smetona's regime to power, which reinstated censorship. This time, censorship was also used to consolidate the authoritarian form of government, with renewed emphasis on protecting military and state secrets, as well as on guarding against communist influences within the state. Following its initial objectives, the censorship system was gradually modified and refined during the authoritarian period. These changes attracted strong criticism from print media workers and political party representatives. Censorship began to extend into a broader range of social spheres while still maintaining its primary press-related functions. In the final years of the Republic, the outbreak of war and the weakening of presidential authority amid foreign policy failures further reinforced a return to the original objectives. During the years of authoritarianism, several institutional changes were implemented in the search for the most effective control mechanism. Moreover, during the years of authoritarianism, censorship was used to enforce a unified line of communication through public information channels, and editors were obliged to include government issued announcements in their press publications. The presentation aims to briefly discuss the objectives of censorship and their evolution during both the democratic and authoritarian periods, and to examine how different interest groups (the ruling authorities, opposition representatives, and print media workers) responded to these changes. The analysis examines how a measure that was initially intended to be temporary, justified by security concerns, became a long-term solution for controlling the public sphere. The experience of interwar Lithuania remains relevant today, as security arguments once again serve as an important basis for political decision-making, raising the question of whether democratic systems can prevent exceptional measures from becoming permanent mechanisms of control over the public sphere.

FROM NORTHERN TRANSYLVANIA TO SWEDEN: ROMANIAN JEWISH REFUGEES AND THE POLITICS OF RESCUE IN 1945

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The Romanian Association for Baltic and Nordic Studies

This study examines the arrival, reception, and post-war trajectories of Romanian Jewish refugees in Sweden at the end of the Second World War, with particular emphasis on the Swedish-led rescue mission known as the “White Buses.” Although Sweden is often portrayed as a humanitarian haven during the war, its refugee policy before and during the early war years was marked by ambivalence, restrictive attitudes toward foreigners, and concerns related to neutrality and national resources. The article explores how Swedish humanitarian engagement expanded after 1943 and how Romanian Jews became part of broader rescue efforts in the final months of the conflict. Most Romanian refugees who reached Sweden were Jews from Northern Transylvania, a region ceded to Hungary following the Second Vienna Award. After the German occupation of Hungary in 1944, Hungarian authorities deported approximately 90,000 Jews from this area to Nazi concentration camps. Survivors were evacuated in 1945 and transported via Denmark to southern Sweden as part of the White Buses operation, coordinated by the Swedish Red Cross under the leadership of Count Folke Bernadotte. Although initially intended to rescue Scandinavian prisoners, the operation ultimately saved over 15,000 inmates of more than twenty nationalities, including Romanian Jews. Drawing on archival sources from Swedish administrative authorities, particularly the State Commission for Immigration, this article reconstructs the refugees’ reception process, including registration, medical examination, quarantine, and placement in transitional and rehabilitation camps. The study analyses demographic data, places of origin, professions, and health conditions, highlighting the severe physical consequences of imprisonment. This study also traces the post-war outcomes of these refugees. While some settled permanently in Sweden and integrated into the labour market, others used Sweden as a transit country and emigrated elsewhere.

CAN ONE PERSON SLOW DOWN SOVIETIZATION? RELIGIOUS RESILIENCE AMONG LITHUANIAN LATVIANS AND THE LITHUANIAN LUTHERAN CHURCH (1944–1979)

Diāna Hristenko

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This paper examines how individual clerical authority can slow the Sovietization of minority religious communities. By using sources from Lithuanian and Latvian Lutheran parishes between 1944 and 1979 and Lithuanian Special archives, the author analyses the role of two prominent Lithuanian Lutheran Church figures – Pastor Gustavs Rauskiņš of Alkiškiai and Bishop Jonas Kalvanas of Tauragė – in sustaining religious life under Soviet anti-religious policy. The Lithuanian Lutheran Church was a marginal Church within the predominantly Catholic Lithuanian SSR, while Lithuanian Latvians represented both a national and confessional minority, mainly in Northern Lithuania. By using parish registers, metric data, and archival materials from the Lithuanian state and special archives, this paper examines whether a single authority could significantly influence patterns of religious continuity under Soviet rule. The case of Gustavs Rauskiņš in Eltiški parish is central, as he was deported to the GULAG in 1945 and returned in 1956; he was unanimously reinstated by his parish. A comparative perspective is provided by the example of Bishop Jonas Kalvanas in Tauragė, whose leadership operated at the institutional level of the Church, helping to preserve organisational continuity and international connections of the Lithuanian Lutheran Church. The paper proposes the concept of “personal authority as a brake mechanism”, which has also been the case in the Latvian and Estonian SSRs. Lutherans in specific borderland conditions show how clerical authority could slow, reshape, or mediate Soviet secularisation policies. While Sovietization was not reversed, its social impact proved uneven. The Lithuanian Latvian case highlights how agency and structure interacted in sustaining minority religious life under totalitarian pressure.

MUZIKĀLO ANSAMBLŪ TARIFIKĀCIJAS SKATES PADOMJU LATVIJĀ: MUTVĀRDU VĒSTURES PERSPEKTĪVA

Reinis Jaunais

Latvijas Universitāte

Muzikālo ansambļu tarifikācijas skates padomju Latvijā: mutvārdu vēstures perspektīva

Pētījuma mērķis ir izpētīt t. s. “pašdarbnieku” ansambļu tarifikācijas skates LPSR, balstoties uz laikmeta liecinieku atmiņām. Pētīta to ieviešana, norise, gaita, apskatot tās gan kā pašrealizācijas platformu, gan kā kontroles mehānismu. Pētījums iekļaujas plašākā LPSR rokmuзикas vēstures kontekstā topošās doktora disertācijas ietvaros.

Padomju kultūrpolitikas sistēmā tarifikācijas skates bija obligātas t. s. “pašdarbības” ansambļu līdz pusstundai garas uzstāšanās žūrijas priekšā atklātu koncertu veidā. Tajās tika uzraudzīta un standartizēta ansambļu darbība, vērtējot to ideoloģisko atbilstību, muzikālo kvalitāti, repertuāru, apģērbu, skatuves kultūru. Zonālajos arhīvos atrodams 1973. gada KM lēmums, kurā noteikts 1974. gadā rīkot skates, ansambļiem tajās piešķirot vienu no trim kategorijām (LNA DZVA, 116. f., 1. apr., 570. l., 51. lp.), turpmāk tām notiekot ik gadu (tiesa, atskaites koncerti, konkursi un mazāk formalizētas skates PSRS republikās regulāri notika arī iepriekš). Atkarībā no kategorijas, ansamblim ļauts uzstāties vai nu visā republikā, vai reģionāli (grupas pārstāvētajā rajonā) vai arī tikai ansambļa pārstāvētajā kultūras namā. Tarifikācijas skates tika rīkotas trīs posmos: I posms – rajonu (pilsētu) skates, II posms: zonālās skates, un III posms: republikas skates fināls. Kolektīviem, kuri bez attaisnojoša iemesla skatēs nepiedalījās, turpmāka koncertdarbība tika aizliegta (no 1978. gada tarifikācijas skašu nolikuma, LNA DZVA 859. f., 4. apr., 66. l. 4. lp.). Dokumentu izpēte par šo tematu tikai sākas, pilnīgas izpratnes veidošanai nepieciešams salīdzināt arhīvos atrasto ar laikmeta liecinieku pieredzi.

Pētījuma pamatmetode: mutvārdu vēsture, balstoties uz 49 manis veiktām intervijām ar laikmeta lieciniekiem (mūziķiem, faniem, koncertu rīkotājiem). Šī metode izvēlēta, lai salīdzinātu intervijās iegūtos datus ar arhīvu materiāliem un citiem dokumentiem. Turklāt arhīva materiālos LVA par skatēm atrodams maz liecību (kas varētu būt saistīts ar prasību cenzūras faktu dokumentāciju iznīcināt gada laikā, Strods 2008: 4; Strods 2011: 7). Tiesa, zonālajos arhīvos atrodamas liecības par tarifikācijas skatēm. Šos materiālus padziļināti pēta vēsturnieks Kaspars Zellis, laika gaitā pētījumu secinājumus plānots salīdzināt. Mutvārdu vēstures perspektīva ļauj pētīt tarifikācijas skates “no apakšas”, atklājot mūziķu subjektīvo pieredzi, kā arī izprast kā oficiālie normatīvi pielietoti reālajā praksē. Dažas pētījumā apskatītās tēmas: cenzūras apiešanas stratēģijas, mūziķu attieksme pret piedalīšanos, pašcenzūra u. c. Papildus intervijām, izmantota arī lauka darba metode – autora dalība kā žūrijas loceklim teatralizētā tarifikācijas skates norises rekonstrukcijā Sērenes tautas namā 2026. gada 11. novembrī.

Attiecībā uz mūziku akadēmiski ir pētīta kultūrpolitika (Kruks 2008, amatiermākslas kontekstā – Daugavietis 2015) un cenzūra (Raginskis 2024, Puzaks 2017), taču joprojām trūkst fokusēta un drošticama pētījuma par tarifikācijas skatēm, kaut intervijās tās bieži minētas kā izšķirošs faktors grupu panākumiem, īpaši 70. gados. Dokumentos un

mutvārdu vēsturē balstīts un ticams priekšstats par tarifikācijas skašu institūcijas izveidi, transformācijām un praksēm būtiski papildinātu kopējo izpratni par mūziķu darbības apstākļiem LPSR, jo tās vērtējamas kā kontrolpunkts starp mēģinājumu telpu un publisko skatuvi, līdz kurai daļa varēja netikt, neizpildot šajā pārejā paredzētos nosacījumus.

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TREŠĀ ATMODA UN LATVIJAS VĒSTURE: 1988–1991

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Trešās atmodas periodā Latvijas politiskā evolūcija ir cieši saistīta ar Latvijas vēstures problemātiku. No vienas puses, Latvijas vēstures jautājumi kļuva par mobilizējošu faktoru Trešās atmodas masu kustībā. Šeit jāmin gan 1987. gada “kalendāra nemieri”, gan 1988. gada 25. marta manifestācija par goru represiju upuriem, gan, protams “Baltijas ceļa” Molotova – Ribentropa pakta akcija. Vēsturei bija nozīme 1988.–1990. gada vēlēšanu kampaņās un 1991. gada tautas nobalsošanā. Daudzas atsauces uz vēsturiski notikumi tika minēti 1988.–1990. gada suverenitātes un Neatkarības deklarācijā. NO otras puses politiskā liberalizācija pavēra iespēju sagraut padomju oficiozās historiogrāfijas sastingušās nostādnes, paverot ceļu gan Latvijas neatkarības bojāejas ārpolitisko un iekšpolitisko apstākļu izpētei, gan “labo Latvijas laiku” atspoguļojumam, gan padomju režīma noziegumu izpētes sākumiem. Šī perioda historiogrāfija lika pamatus vēlākajai Latvijas vēstures zinātnes attīstībai līdz mūsu dienām, nosakot, piemēram, politiskās vēstures lielo nozīmi mūsdienu Latvijas historiogrāfijā.

VAI IR JĀPĀRVĒRTĒ LATVIEŠU LOMA KRIEVIJAS REVOLŪCIJĀ? PĀRDOMAS PAR ANDRIEVA EZERGAIĻA DARBU “THE LATVIAN IMPACT ON THE BOLSHEVIK REVOLUTION” (1983)

Jānis Šiliņš

Latvijas Nacionālais arhīvs

Viena no Andrieva Ezergaiļa mūža nozīmīgākajām pētniecības tēmām bija 1917. gads latviešu vēstures kontekstā. Viņš ir sarakstījis vairākus rakstus un grāmatas, aplūkojot šo tēmu no dažādiem rakursiem. Nozīmīgākais no tiem ir 1983. gadā izdots “The Latvian Impact on the Bolshevik Revolution”. Šajā grāmatā Ezergailis detalizēti aplūkoja latviešu lielinieku un it sevišķi latviešu strēlnieku darbību lielinieku apvērsuma kontekstā 1917. gada beigās.

“The Latvian Impact on the Bolshevik Revolution” ir nozīmīga ne vien ar to, ka plašāku Rietumu akadēmisko auditoriju iepazīstināja ar latviešu skatījumu uz lielinieku apvērsumu un latviešu lomu tajā, bet arī ar to, ka Ezergailis, izmantojot padomju publikācijas un laikabiedru atmiņas, spēja sintezēt visai pārliecinošu interpretāciju par 1917. gada beigu notikumiem, kura nav zaudējusi aktualitāti joprojām.

Kādas bija Ezergaiļa koncepcijas galvenās tēzes? Pirmkārt, latvieši nebija lielinieku apvērsuma un Ļeņina režīma autori, taču latviešu lielinieku un it sevišķi strēlnieku loma bija ārkārtīgi svarīga. Otrkārt, ignorējot latviešu faktoru, lielinieku apvērsumu, Ļeņina režīma noturēšanos pie varas, ir grūti izskaidrot. Treškārt, Latvijas neokupētā daļa (Vidzeme) 1917. gada vasarā un rudenī kļuva par vienīgo reālo lielinieku kontrolēto placdarmu visā agrākajā Krievijas impērijā, nosakot neproporcionāli lielo lomu apvērsumā.

Mūsdienu pētniekam izbrīnu rada tas, ka Ezergaiļa darbā “latviešu ietekme” aprobežojas tikai ar “sarkano” nometni. Mēs zinām, ka ļoti liels skaits latviešu, it sevišķi virsnieku, aktīvi darbojās arī pretējā – tā saukto “balto” pusē. Šo aspektu Ezergailis ignorē. Vēlākajās desmitgadēs ir parādījušies vairāki pētījumi, kas apšaubījuši strēlnieku “sarkanumu”, tāpat mūsdienu Krievijas historiogrāfijā neviena vien padomju historiogrāfijas klišeja, kuru Ezergailis avotu trūkuma dēļ (padomju arhīvi viņam bija liegti) pārņēma, ir atspēkota vai vismaz tiek apšaubīta.

Lai gan Ezergaiļa koncepciju šodien mēs varētu saukt par visai vienpusīgu, vienlaikus tā ir ļoti labi saprotamu. Latviešu lomas un strēlnieku “sarkanuma” uzsvēršana paradoksālā kārtā bija izdevīga ne tikai padomju Latvijas nomenklatūrai un akadēmiskajai videi, bet arī Rietumu vēsturniekam, kurš centās ielauzties ārkārtīgi pieblīvētajā Aukstā kara perioda sovjetoloģijas laukā. Latviešu kārts tajā bija trumpis – neviens līdz tam nebija pētījis lielinieku apvērsumu no kādas no impērijas “mazo” tautu (konkrētajā gadījumā – latviešu) prizmas.

HOLOKAUSTA PĒTNIECĪBAS PRAKTISKIE UN TEORĒTISKIE ASPEKTI: BALDONES GADĪJUMS

Mārtiņš Kazainis

Baldones muzejs

2021. gada rudenī novadpētnieki Baldones mežos atklāja 80 gadus slēpta nozieguma vietu – holokausta nogalināto Baldones ebreju masu kapu. Nākamā gada vasarā Baldones muzeja vadībā notika tā ekshumācija, pētniekiem veicot detalizētu atradumu izpēti un godpilni pārapbedot upurus Baldones kapos. Notikums mudināja pētnieku grupu turpināt iesākto darbu 1941. gada vasaras notikumu izziņāšanā, praktiskā veidā iegūto informāciju papildinot ar dažāda veida arhīvu materiāliem un zinātniskajā literatūrā publicētajiem pētījumiem, tai skaitā Andrieva Ezergaiļa fundamentālajiem darbiem par holokausta norisi Latvijā.

Pētījums par holokaustu Baldonē turpina A. Ezergaiļa uzsākto Latvijas holokausta vēstures pētniecību, ar unikālas vēstures avotu bāzes palīdzību rekonstruējot gan nozieguma gaitu, gan daļēji apzinot upuru un vainīgo identitātes.

Papildus tam, sadarbojoties dažādu valsts, pašvaldību un nevaldības organizāciju pētniekiem un darbiniekiem, tika iegūta unikāla praktiskā pieredze holokausta pētniecībā, radot precedentu un iespējas nākotnē veikt līdzīgus pētījumus arī citos Latvijas reģionos, kur līdzvērtīgu noziegumu vietas ir apzinātas, taču pieredzes un/vai līdzekļu trūkuma, kā arī sabiedrības spiediena iespaidā tās nav adekvāti izpētītas, neļaujot veidot godīgu un faktos balstītu izpratni par Latvijas vēsturi okupācijas varas apstākļos, kā arī nonivelējot totalitārisma upurus līdz bezpersoniskai statistikai. Baldones holokausta pētniecības gadījums vieš cerības, ka, pārņemot iegūto pieredzi un mācoties no iespējamām kļūdām, sabiedrībā un akadēmiskajā vidē vairošies interese par holokausta praktisko pētniecību un līdzīgi pētījumi varētu tikt veikti arī citos Latvijas reģionos.

Kopumā, apkopojot dažāda veida lietišķos, audiālos un rakstiskos avotus, kā arī plašu zinātniskās un atmiņu literatūras klāstu, ir izveidots viens no detalizētākajiem pētījumiem par holokausta norisi Latvijas provincē.

VĒSTURES PĒTNIECĪBA DAŽĀDU VARU IETEKMĒ: IZAICINĀJUMI LIEPĀJAS 21. BATALJONA TIESAS PRĀVAS (1972–1973) IZPĒTĒ

Ilma Elsberga

Biedrības "Atvērtās krātuves" valdes priekšsēdētāja

Referāta uzmanības centrā ir Liepājas 21. kārtības dienesta bataljona tiesas prāvas izpētes anatomija, ko 20. gadsimta 90. gados uzsāka vēsturnieka Andrieva Ezergaiļa atklājumi Latvijas Nacionālajā arhīvā. 1972./73. gadā Rīgā notikušajā Liepājas 21. bataljona tiesas prāvā, kurā viens no tiesnešiem bija jurists, LPSR Augstākās tiesas tiesnesis (vēlāk – LU Juridiskās fakultātes profesors) Uldis Krastiņš, tika notiesāti Trešā reiha pakļautībā izveidotā Liepājas 21. policijas bataljona 24 karavīri (8 no tiem uz nāvi) par dalību ebreju iznīcināšanas akcijās Liepājā, Šķēdes kāpās 1941./42. gadā.

1990. gados A. Ezergaiļa raksti presē par 1972./73. gada tiesas prāvas nelikumību pievērsa sabiedrības uzmanību. Uz Liepāju intervēt vēl dzīvos sodītos karavīrus vai arī sodīto radniekus devās laikraksta "Diena" žurnālists. Savukārt LR Ģenerālprokurors uzdeva tiesas dokumentu pārskatīšanu prokurorei Astrai Leičenko, kura pēc skrupulozas lietu caurskates un izvērtēšanas un pēc intervijām ar sodītajiem un viņu radniekiem sniedza savu slēdzienu, ka tiesā nav pierādīta sodīto vaina, viņi attaisnojami un lieta ir jāizmeklē no jauna. Diemžēl prokurores slēdziens nogūla ģenerālprokurora atvilktnē, lieta noklusa un LR Augstākās tiesas Reabilitācijas daļa pieņēma lēmumu, ka šajā tiesas prāvā sodītie nav reabilitējami.

Referātā, veicot LNA pieejamo prāvas dokumentu analīzi un atsaucoties uz pētījuma autores sarunām ar vēl dzīvajiem tālaika lieciniekiem, ir mēģināts rast atbildi uz A. Ezergaiļa jautājumu – kāpēc šāda prāva vispār tika rīkota, ja tā noritēja gandrīz pilnīgā slepenībā, turklāt nedz tiesā, nedz pirmstiesas izmeklēšanā nespējot rast pierādījumus notiesāto vainai.

Referāta mērķis, atklājot prāvas detaļas, gaitu un veidu, kā noritēja izmeklēšana, ir uzskatāmi parādīt cilvēka kā indivīda bezvērtību autoritāras sistēmas mašīnērijā, kuras inerces nebeidzas līdz ar pašas autoritāras valsts krišanu, bet vēl gadu desmitiem atstāj ietekmi gan uz konkrēto indivīdu tiesību ievērošanu, gan uz notikuma izpēti un atspoguļojumu sabiedrībā.

HERBERTA CUKURA PRETRUNĪGAIS MANTOJUMS: PAGĀTNES UN ATMIŅAS IZAICINĀJUMI

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Herberts Cukurs ir viena no visvairāk apspriestajām personībām Latvijas Otrā pasaules kara akadēmiskās un publiskās vēstures telpā kopš Aukstā kara beigām un Latvijas neatkarības atjaunošanas 1990./1991. gadā. Ja 20. gadsimta 30. gados Cukurs kļuva par slavenu lidotāju, tad vēlāk dienēja “Arāja komandā”, kas bija atbildīga par desmitiem tūkstošu civiliedzīvotāju, galvenokārt ebreju, iznīcināšanu nacistu okupētajā Latvijā. Līdz mūsdienām ir apzināta virkne strīdīgu liecību, kurās Cukurs raksturots gan kā ebreju slepkava, gan glābējs, tomēr vairumam pētnieku nav šaubu, ka Cukura dienests “Arāja komandā” veicināja genocīdu pret ebrejiem.

Nozīmīga vieta Cukuram ir arī vēsturnieka Andrieva Ezergaiļa pētījumos par holokaustu, demonstrējot zināmu uzskatu evolūciju, no Cukura dienesta “Arāja komandā” nosodījuma Ezergaiļa agrīnajos darbos līdz pat viņa attaisnošanai Ezergaiļa mūža noslēgumā.

Kopš Izraēlas izlūkdienesta “Mossad” veiktās Cukura noslepkavošanas Urugvajā 1965. gadā, Cukurs ir kļuvis par polarizējošu figūru, ilgu laiku attēlots gan kā Rīgas geto “miesnieks”, gan netaisnīgi nogalināta nacionālās aviācijas ikona. Sabiedrībā neviennozīmīgi ir vērtēti priekšlikumi par Cukura kā Latvijas Neatkarības kara dalībnieka pārapbedīšanu Rīgas Brāļu kapos vai ierosinājumi viņa vārdā nosaukt Rīgas starptautisko lidostu. Cukuram ir veltītas pretrunīgas izstādes, teātra izrādes, dokumentālās filmas un literāri darbi, kas saņēmuši konfliktējušus novērtējumus un sekmējuši kaislīgas debates.

Situācijā, kad Cukura dalību holokaustā ļoti atšķirīgi vērtējuši viņa ģimenes locekļi un Latvijas Ebreju kopiena, kriminālprocesu pret viņu vairākkārtīgi uzsākusi Latvijas Ģenerālprokuratūra, tā arī nespējot nonākt pie galīgā verdikta.

Balstoties dažādas izcelsmes vēstures avotos un publiskās diskusijās, referātā iespēju robežās tiks izvērtēta par Cukuru izteikto pretrunīgo liecību ticamība. Vienlaikus tas pievērsīsies jautājumiem, kas saistīti ar spriedzi starp ģimenes atmiņu un plašākiem sabiedrības naratīviem, individuālās un kolektīvās atbildības dilemu, kā arī atšķirīgo vēsturisko pieredzi un sašķelto kolektīvo atmiņu mūsdienu Eiropā un pasaulē. Iezīmējot plašākus izaicinājumus sarežģītas pagātnes pētniecībā un izpratnē publiskajā telpā, pētījumā mēģināts noskaidrot, kāpēc Cukura lieta joprojām ir neatrisināts pagātnes mantojums un nacionālās un transnacionālās atmiņas sadursmes objekts.

EZERGAILIS PRET NACIONĀLPOLĪTISKO TRIMDU – KĀDS PIEMIRSTS KONFLIKTS

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Vēsturnieku Andrievu Ezergaili aptuveni desmit līdz piecpadsmit gadus trimdas posmā varētu pieskaitīt pie tā sauktajiem “kultūras sakarniekiem”. Viņš atbalstīja domu, ka jābūt pragmatiskiem. Lai latviešu tautai būtu iespēja izdzīvot, trimdai vajadzētu piemēroties okupētās Latvijas vadošajai politikai. Būtu jāatsakās no prasībām par neatkarīgu Latviju un jākoncentrējas uz latviešu kultūras uzturēšanu un veicināšanu.

1976. gada novembrī trimdas lielākajā laikrakstā “Laiks” tika publicēts Ezergaiļa raksts divos turpinājumos, kurā viņš ieteica emigrācijas latviešiem atteikties no “neatkarīgās Latvijas atjaunošanas” kā vienīgā iespējamā nākotnes Latvijas modeļa un apsvērt iespēju Latviju iekļaut “kāda nākotnes Austrumeiropas federatīvā struktūrā”. Šo domu viņš papildināja savā runā IV Vispasaules Latviešu jaunatnes kongresā Viljamstaunā, ASV 1978. gada 6. jūlijā, sīkāk izklāstot savus motīvus un secinājumus.

Ezergaiļa ieteiktā doma trimdai atnest cīņu par “neatkarīgās Latvijas atjaunošanu” iespējams nebūtu izraisījusi tik lielu sašutumu, ja nebūtu sakrituši vairāki apstākļi. 1978. gada oktobrī viņš pavadīja divas nedēļas Rīgā pēc Latvijas Komitejas kultūras sakariem ar tautiešiem ārzemēs Zinātņu sekcijas aicinājuma. 1979. gada sākumā “Jaunajā Gaitā” (Nr. 122) tika publicēta viņa Viljamstaunas runa ar virsrakstu “Vai ir vajadzīga jauna trimdas nacionālpolitika?” Raksta beigās Ezergailis pieļāva, ka trimdai “būtu jārēķinās ar varbūtību, ka latvieši paši par sevi nevar valdīt. Aizbildniecības alternatīvas varbūt ir vienīgas, kas mums ir.”

Pret Ezergaiļa pausto nākotnes Latvijas vīziju asi izteicās četri Stokholmas latviešu vēsturnieki – Agnis Balodis, Uldis Ģermanis, Lidija Švābe un Jānis Zalcmanis (Laiks, 1979. g. 28. nov.).

Turpmākajos gados šķiet, ka Ezergailis gandrīz vai tīši meklēja veidus, kā provocēt trimdu. Piemēram, 1982. gadā “Jaunajā Gaitā” (Nr. 137) viņš pozitīvi izteicās par Kārli Marksu un marksismu.

Latvijas brīvībai tuvojoties, mainījās arī Ezergaiļa uzskati. Intervijā laikrakstā “Literatūra un Māksla” (1989. gada 15. jūlijā) viņš norādīja, ka vissvarīgākais Latvijas valsts nākotnes kontekstā ir vārds “demokrātija”. Viņa darbība viņa dzīves turpmākajos gados liecina, ka viņš pilnībā pārvērtējis savas agrāko gadu koncepcijas un atziņas.

3. Valsts tehnoloģiskā un digitālā attīstība /

- Technological and digital development of the state

3. plenārsēde. **A CRITICAL REVIEW OF CURRENT
THEORIES AND RESEARCH
ON CONSCIOUSNESS**

Cees van Leeuwen

Laboratory for Perceptual Dynamics, Katholieke Universiteit Leuven, Belgium

This keynote addresses one of the most fundamental and rapidly evolving questions in contemporary science: how conscious experience arises from brain activity. In recent years, the field has seen a proliferation of competing theoretical frameworks – ranging from global workspace and integrated information theories to dynamical and predictive processing approaches – accompanied by advances in brain imaging and computational modelling that promise increasingly precise investigation of the neural correlates of consciousness. At the same time, growing interactions with physics-inspired methods and computational neuroscience are reshaping how researchers conceptualize brain dynamics and information processing. This talk will provide a critical synthesis of these developments, evaluating the strengths and limitations of current theories, highlighting key empirical findings, and outlining promising directions for future research, with particular attention to the role of neural dynamics, large-scale brain networks, and interdisciplinary approaches bridging neuroscience, physics, and computation.

3.1. sekcija. **RECENT ADVANCES IN COMPUTER
SCIENCE, IT, AND THEIR
APPLICATIONS /**

JAUNĀKIE SASNIEGUMI
DATORZINĀTNĒS, IT, UN
TO PIELIETOJUMS

RECENT PROGRESS IN QUANTUM ALGORITHMS

Aleksandrs Belovs

University of Latvia

In this presentation, I will survey the major recent results in quantum algorithms and information theory, both worldwide and at the University of Latvia.

LANGUAGE TECHNOLOGY INITIATIVE: MAIN RESULTS AND PLANS FOR THE FUTURE

Inguna Skadiņa, Normunds Grūzītis

Faculty of Science and technology, UL

From being a niche technology with practical applications in translation and speech recognition, natural language technology (NLP) is now underpinning the AI era through LLMs, promising a universal economic impact in the future. Although transitioning to the AI era is hyped by BigTech companies, practical adoption of the LLM capabilities for economically impactful tasks and processes goes via education of specialists capable to apply it properly. In 2023, the Language Technology Initiative (LTI) project was launched to develop advanced digital competencies and significantly increase the number of language technology (LT) specialists by 2026. The project fosters strong synergy between the research and higher education sectors. It aims to develop a curriculum for cross-disciplinary LT teaching, advance Latvian language resources, and create platforms and tools for studying and experimentation, as well as for conducting research by young researchers. This presentation will provide an overview of the key outcomes of the LTI project in both teaching and research. It will highlight how close collaboration between research and higher education serves as a critical driver for building sustainable expertise and accelerating the practical adoption of language technologies.

CHALLENGES AND DISCOVERIES IN PERCEPTUAL AND COGNITIVE SYSTEMS: AN OVERVIEW ANALYSIS

Jurgis Šķilters

Lab for Perceptual and Cognitive Systems, University of Latvia

In my report, I will summarize the most significant findings in the research on perceptual and cognitive systems both on international and Latvian scale. Findings about the AI constraints on human perception will be examined, additionally discoveries about perspectivity of vision and emotion regulation will be discussed. In Latvian scale, research about impacts of midlevel perception and visuo-spatial processes on healthy, neurodegenerative, aging and other types of populations will be discussed. Additionally, some recent and unique findings about emotion regulation in large-scale populations will be also reported.

AI FOR ROBOTICS IN MANUFACTURING

Guntis V. Strazds, Laura Leja, Katrīna Viltrake, Arnis Priedītis, Diana Dupļevka,
Makss Meiers, Kārlis Freivalds

University of Latvia

We will overview recent trends in AI for robotics and present work being done at the Institute of Electronics and Computer Science (EDI) as part of the EU AIMS5.0 project (“Artificial Intelligence in Manufacturing leading to Sustainability and Industry 5.0”). This includes components for machine vision (3D pose estimation and object tracking) and real-time robot control, and a system for automatically translating natural language task descriptions into executable robot control policies using LLM-based code generation, to simplify the process of configuring a robotic system for new tasks.

A PREDICTIVE ANTHROPOMETRIC DATA INFRASTRUCTURE FOR 3D BODY MODELING

Andrejs Neimanis

SIA DIVI grupa

In this presentation I will address a persistent gap between measurement-based garment engineering and geometry-oriented 3D body modeling. While sizing surveys provide population statistics and parametric body models produce visual representations, neither guarantees that generated 3D geometry meets specific anthropometric measurements with defined accuracy. I will present AntrDB, a predictive anthropometric infrastructure combining hybrid manual-digital data collection, statistical completion of partial measurement vectors, and conditional 3D avatar generation under explicit measurement preservation conditions. In contrast to parametric body models, anthropometric measurements serve as primary conditioning variables and are geometrically verified after each generation step. The system is modular, supports incremental data growth, and targets garment engineering workflows – in particular virtual fitting. I will describe the system architecture, current implementation status, and remaining open challenges.

HOLOGRAPHIC-TO-BRIGHTFIELD CROSS-MODALITY TRANSFER WITH GANS FOR POLLEN CLASSIFICATION

Maksims Ivanovs, Blaž Cugmas

University of Latvia

Lens-less digital in-line holographic microscopy (DIHM) provides a compact and cost-effective alternative to conventional brightfield microscopy. However, raw holographic images differ substantially from brightfield images due to speckle noise and twin-image artefacts. This domain gap makes both human interpretation and automated analysis considerably more challenging. In our recent work, we investigated cross-modality transfer from holographic to brightfield imaging using generative adversarial networks (GANs). Our approach focuses on learning a mapping from unreconstructed holograms to visually interpretable, brightfield-like images. By leveraging paired optical and affinely aligned holographic data, we train GAN-based models to suppress artefacts and enhance structural features relevant for pollen morphology. Visual assessment of the results by expert veterinarians allows us to evaluate how effectively GAN-based reconstruction preserves diagnostically relevant features and whether holographic microscopy can approximate brightfield-level interpretability of microscopy images. This research contributes to the broader goal of enabling reliable, AI-supported workflows for low-cost microscopy systems. By narrowing the perceptual gap between holographic and optical modalities, GAN-based cross-modality transfer may facilitate more accessible imaging solutions in veterinary diagnostics, environmental monitoring, and resource-constrained settings.

SHIELDS AGAINST QUANTUM THREATS

Rihards Balodis, Edgars Celms, Elīna Kalniņa, Sergejs Kozlovičs, Ināra Opmane,
Krišjānis Petručeņa, Jevgenijs Pigožņa, Edgars Rencis, Juris Vīksna

Institute of Mathematics and Computer Science University of Latvia

Cryptographers believe that a quantum computer large enough to break widely used asymmetric cryptography could be built approximately within the next ten years. Our current communication systems are vulnerable to “harvest now, decrypt later” attacks. This presentation examines protection mechanisms to make communication quantum-safe. The solutions include Quantum Key Distribution (QKD) and Post-Quantum Cryptography (PQC). We highlight the importance of transitioning to quantum-resistant security solutions in advance of the practical implementation of quantum attacks.

CLUSTERING SINGLE CELL HI-C DATA USING GRAPH-BASED METHODOLOGIES

Gatis Melkus, Andrejs Sizovs, Pēteris Ručevskis, Edgars Celms, Juris Viksna

Institute of Mathematics and Computer Science, University of Latvia

The advent of widely available single cell chromatin conformation capture data has opened heretofore unseen opportunities to understand how chromatin architecture operates on a cell-to-cell level. These opportunities include both the pinpointing of highly specific structures within small cell sub-populations as well as larger organizational challenges such as organizing the entirety of a sampled cell population in pseudotime. In our work we apply our previous methods of graph-based chromatin conformation capture data analysis to the interpretation and refinement of one of the first single cell Hi-C datasets, comparing the quality of our clustering with other available tools and making some inroads toward systematic understanding of the structure of single cell Hi-C data and through it, the principles of spatial DNA organization in the cell.

PROGRAMMING THE DESKTOP QUANTUM COMPUTER

Alexander Rivosh, Maksim Dimitrijevič

University of Latvia

In this talk, we present our initial practical experience with the SpinQ Triangulum. To the best of our knowledge, it is the only on-site quantum computing device in the Baltic States. The presentation also examines the accompanying software environment and its suitability for teaching and exploratory use. We discuss the principal advantages and limitations of physical access to a three-qubit system and propose research directions in which such a system may still produce academically relevant results.

VPPSPORTS – PRECISION ENGINEERING AND ANALYTICS IN LUGE

Leo Seļāvo

University of Latvia

The VPPSports project integrates advanced sensor fusion and machine learning to quantify elite performance in the high-velocity discipline of luge. By deploying a specialized hardware suite – including tensor sensors for structural load analysis and high-frequency accelerometers – the system captures granular technical parameters that define sled dynamics. To overcome the challenges of signal attenuation within the ice track, we employ sensor fusion techniques, blending GNSS and IMU data for precise location determination. These data streams are processed via machine learning models to extract actionable Key Performance Indicators (KPIs), identifying subtle inefficiencies in steering and line choice. Finally, these insights are integrated into a virtual training environment, providing athletes with a digital twin of the track for risk-free technical refinement. This presentation highlights the intersection of embedded systems, predictive analytics, and sports science in the pursuit of millisecond gains.

AI TOOLS SEMINAR: STUDENT-SELECTED TOPICS VERSUS CURRENT EVENTS IN THE AI WORLD

Bojārs Uldis, Karnītis Ģirts, Rivošs Aleksandrs, Šostaka Dace

University of Latvia

This presentation is dedicated to the topics chosen by students in the 2025/2026 academic year in the seminar “Creative Applications of AI Tools”. The trends of students’ chosen presentation topics will be examined and compared with the AI news compiled by students. In conclusion, we will outline the current AI news and trends.

QUANTUM POSITION VERIFICATION AND INFORMATION-THEORETICALLY SECURE MESSAGE AUTHENTICATION FOR HIGH-ASSURANCE SYSTEMS

Wulf Harder, Dominique Unruh, Guntis Arnicans, Maris Alberts, Ralfs Abolins, Uwe Resas, Leo Selavo

QuBalt, University of Latvia

Modern distributed systems such as satellite networks, autonomous spacecraft, and unmanned aerial vehicles operate in adversarial physical environments where communication delay, limited intervention, and long operational lifetimes impose stringent security requirements. In such settings, relying exclusively on computational hardness assumptions may be problematic for long-term assurance. This talk presents two complementary cryptographic approaches addressing these challenges. The first concerns quantum position verification, a class of protocols that aims to authenticate the geographic location of a party using relativistic constraints and quantum information. Classical position claims can be forged by coordinated relays; quantum protocols attempt to limit such attacks by exploiting physical principles. We will outline the central idea, the fundamental limitations, and the potential relevance of location-based authentication for distributed systems operating in open physical environments. The second approach focuses on information-theoretically secure authentication. These schemes provide provable security independent of computational assumptions and therefore remain secure even against adversaries with unbounded computational power. Within ongoing work at QuBalt and in ESA-related projects, such authentication mechanisms are being investigated for long-term, high-assurance communication scenarios. The presentation provides a concise conceptual overview of both directions and explains why combining physically motivated position verification with assumption-free authentication may be strategically relevant for future high-assurance infrastructures.

LOW DEGREE REPRESENTING POLYNOMIALS OF HIGH SENSITIVITY BOOLEAN FUNCTIONS

Juris Smotrovs, Jurijs Zaicevs

University of Latvia, Faculty of Science and Technology

High sensitivity ensures that the Boolean function has high deterministic query complexity. Low degree of the representing polynomial, on the other hand, is necessary for the function to have low quantum exact query complexity which motivates study of such functions. Nisan, Szegedy (1994), Tal (2013), Wellens (2020) established square root of sensitivity with a constant factor as lower bounds on the degree. But how tight are these bounds? Using earlier and new approaches of converting the multivariate representing polynomial into a univariate polynomial and analyzing it, we offer numerical results for degrees up to 32 which improve the abovementioned general bounds for these degrees and allows to offer a finer conjecture on the lower bounds.

ENSEMBLE LEARNING AND COALITION-AWARE EXPLAINABILITY FOR IMBALANCED CREDIT DEFAULT

Anjali Shibu

Transport and Telecommunication Institute (TSI), Riga, Latvia

Credit default prediction remains a core application area of machine learning in finance, where modern ensemble models achieve high predictive accuracy but often lack transparency. Regulatory frameworks such as GDPR, the EU AI Act, and ECOA increasingly require explainability, stability of feature attributions, and consistency of automated credit decisions. Traditional post-hoc methods, especially SHAP, have been shown to become unstable under class imbalance, which is typical in real credit datasets. This work presents a novel comparative study of seven game-theoretic attribution methods, including Shapley (SHAP), Banzhaf, three Owen-value variants, Myerson values, and a newly proposed Redistributed Myerson (R-Myerson) method. A unified framework is introduced to quantify interpretability through stability of attribution magnitudes (coefficient of variation), directional coherence (cosine similarity), top-k feature consistency (Kuncheva index), and group-level quality for coalition-based explainers. These metrics are integrated with predictive performance (AUC-ROC) into a composite trade-off score ($S(\alpha)$), enabling systematic evaluation across models and imbalance strategies. Experiments were conducted on five real-world credit datasets with imbalance ratios ranging from 1% to 30%, using Random Forest, LightGBM, and XGBoost combined with no-resampling, cost-sensitive learning, SMOTE, and SMOTE-Tomek pipelines.

AI-DRIVEN PERSONALIZATION IN STEM EDUCATION: ENHANCING LEARNING MANAGEMENT SYSTEMS FOR DIGITAL TRANSFORMATION IN HIGHER EDUCATION

Agon Memeti, Ibrahim Neziri

University of Tetova

The rapid digital transformation of higher education has intensified the need for innovative, student-centered approaches in STEM education. This presentation explores the integration of artificial intelligence (AI) into Learning Management Systems (LMS) to enhance teaching and learning processes in STEM disciplines at university level. Drawing on a case study from the University of Tetova, the research examines how AI-driven personalization mechanisms – such as adaptive content delivery, intelligent quiz recommendations, and real-time learning analytics – can improve student engagement, learning outcomes, and instructional decision-making. The study is grounded in the practical implementation of an AI-enhanced LMS architecture developed using modern web technologies, including MVC Blazor components and service-oriented design principles. Empirical data collected from student usage patterns and feedback are analyzed to assess the impact of personalized learning paths on students' performance and motivation in computer science and related STEM courses. Beyond technical implementation, the presentation discusses broader implications for STEM pedagogy, assessment practices, and academic leadership. It highlights how digital and AI-supported tools can support instructors in monitoring learning progress, identifying at-risk students, and continuously refining teaching strategies. The findings contribute to current discussions on sustainable innovation in STEM education and demonstrate how universities can responsibly leverage AI to support inclusive, data-informed, and future-oriented learning environments.

3.2. sekcija. **STEM IZGLĪTĪBA VALSTS
TEHNOLOĢISKAJAI UN DIGITĀLAJAI
ATTĪSTĪBAI /**

STEM EDUCATION FOR
TEHNOLOGICAL AND DIGITAL
ADVANCEMENTS

PRACTICAL AI AUTOMATION FOR TEACHER FEEDBACK AND LEARNING

Ergi Bufasi¹

¹Department of Physics, Riga Stradiņš University, Riga, Latvia

Artificial Intelligence is increasingly entering educational environments, yet much of the discussion remains focused on student-facing applications. Less attention has been given to how AI automation can support teachers' professional practice and ongoing development. This presentation explores how AI-driven workflow systems can augment teacher capacity by automating structured feedback processes and facilitating professional learning from academic literature and pedagogical texts. The first application examines AI-assisted formative feedback generation. By integrating structured rubrics into automated systems, AI can generate consistent, criteria-aligned draft feedback that remains under teacher supervision. The second application focuses on professional learning, demonstrating how AI can process educational literature and transform it into actionable teaching strategies, summaries, and implementation plans. Rather than replacing teacher judgment, AI automation is conceptualized as cognitive augmentation by reducing repetitive workload while preserving pedagogical agency. The session presents conceptual models, implementation examples, and ethical considerations related to transparency, bias, and professional responsibility.

Keywords: AI Automation, Teacher Professional Development, Structured Rubrics

THE IMPACT OF ARTIFICIAL INTELLIGENCE ON EDUCATIONAL ASSESSMENT: EXAMPLES FROM LITERACY AND NUMERACY

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The nature of educational assessment today is very different from what it was just a few decades ago. It has evolved from discrete and standardized (focused on declarative memorization) to continuous and adaptive (primed by higher-order cognitive demands). Surges of interest in generative models and technical innovations in natural language processing and predictive analytics have changed the nature of assessment, advanced educational measurement, and redefined literacy and numeracy concepts. Specifically, these innovations could profoundly change literacy assessment by shifting the focus from static reading comprehension to continuous, automated writing evaluation that provides real-time diagnostic feedback and assesses students' critical interactions with AI-generated texts. Concurrently, numeracy assessment is poised to move away from routine manual calculations, instead utilizing computerized adaptive testing and authentic digital tools to diagnose conceptual misunderstandings and evaluate real-world problem-solving. Explorations of interactions between these domains have generated a new interest in authentic, process-oriented evaluation. This interest has produced a unique way of examining human-technology collaboration, and has provided the basis for a vastly different underlying knowledge and skills structure in the disciplines, prioritizing critical evaluation, AI literacy, and systems thinking. But the future still challenges and significant problems such as algorithmic bias, data privacy, and threats to academic integrity face educational measurement if it is to remain a viable and equitable practice in the new artificial intelligence society.

Keywords: Literacy Assessment, Numeracy Assessment, Predictive Analytics

Funding: "Individualized and personalized support system for students' reading, mathematical and scientific literacy development." VPP-IZM-Izglitiba-2023/1-0001

ALIGNING LESSON STUDY WITH SCHOOL AIMS: A CASE STUDY OF TWO SCHOOLS

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School aims often remain at the level of policy documents and do not translate into classroom practice. At the same time, lesson study is frequently implemented as an activity for individual teachers' professional growth without being explicitly connected to school priorities. This study explores an expert-supported lesson study model aligned with school aims and designed as a whole-school professional development approach. The model combined workshops on pedagogical practice relevant to school aim with expert-supported lesson study cycles, bringing together key features of effective professional development. The study aimed to examine both how such a model supports the attainment of school aims and how it influences changes in teachers' classroom practice. A case study design was used in two schools involving 52 teachers. In one school, the improvement aim focused on the quality of classroom discourse; in the other, it focused on creating greater opportunities for students' self-regulated learning. Data were collected through post-intervention teacher surveys, teacher focus group discussions, and 27 lesson observations with subsequent analysis. The findings indicate that the professional development model contributed to observable changes in teachers' practice in both schools. In School A, classroom discourse became more inclusive and less limited to traditional teacher-student interaction patterns. In School B, teachers paid more attention to the teaching and use of metacognitive strategies that support students' self-regulated learning. At the same time, the effects differed across the two schools. Possible explanations include differences in starting positions, particularly teachers' prior experience with lesson study, as well as the degree of focus in the school aim itself. Overall, the study suggests that aligning expert-supported lesson study with school aims is a promising whole-school approach to professional development and may help schools translate strategic goals into classroom-level change.

Keywords: Teacher Professional Development, Lesson Study, Classroom Discourse, Metacognitive Strategies

Funding: "Functional Model for Personalized and Automated Teacher Professional Development Solutions."
lzp-2023/1-0122

AI-SUPPORTED CONTENT LEARNING IN PRIMARY STEM TEACHER PROFESSIONAL DEVELOPMENT

Inese Dudareva¹, Kārlis Greitāns¹, Ergi Bufasi²

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²Department of Physics, Riga Stradiņš University, Riga, Latvia

As generative artificial intelligence becomes more common in teacher professional development (PD), an important question is whether it can support deep, topic-specific learning rather than simply providing general assistance. This study explores how a purposefully designed AI chatbot can support primary STEM teachers in strengthening their understanding of student spatial ability, which is an important factor in STEM achievement. Using a design-based research approach, a custom AI chatbot was developed to guide teachers through structured analysis of spatial reasoning situations. Teachers were asked to justify their answers and reflect on their thinking, while the system provided guided, formative feedback. Twenty experienced educators evaluated the tool through structured tasks and reflective comments. The findings suggest that structured, domain-specific AI interaction can promote active reasoning and gradual refinement of understanding, functioning as a small professional learning cycle. At the same time, the study highlights the need to balance structured guidance with teacher autonomy and adaptable feedback. The results suggest that generative AI can serve as a scalable support tool within broader, sustainable STEM teacher professional development systems.

Keywords: Teacher Professional Development, Generative AI, Spatial Ability

Funding: "Functional Model for Personalized and Automated Teacher Professional Development Solutions."
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TEACHING FOR UNDERSTANDING: CHANGING THE MATHEMATICS CLASSROOM CULTURE IN LATVIA

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In the context of Latvia's educational digital transformation, the fundamental challenge remains the qualitative evolution of mathematics classroom culture. Current performance metrics indicate a critical necessity for systemic change: 22,2% of Latvian students fail to achieve basic mathematical literacy, while only 6,4% demonstrate high proficiency in PISA assessments. Addressing these disparities requires a paradigm shift from teacher-centered, routine-oriented instruction toward a pedagogical culture that prioritizes deep conceptual understanding and mathematical reasoning. Empirical analysis of lessons shows that there are big gaps in helping students use metacognition and meaningful discussion, which are both necessary for students to take charge of their own learning. To enhance primary mathematics education, instruction must transcend the assumption that instructional materials alone facilitate learning. Instead, it must implement inclusive strategies that integrate mathematical concepts with real-world contexts and socio-technical processes. A primary methodological objective is the systematic integration of multiple representations – bridging physical, visual, verbal, contextual and symbolic to ensure that procedural “doing” translates into conceptual “understanding.” Furthermore, the instructional focus must transition from immediate performance outcomes to the intrinsic value of the learning process, maintaining high cognitive expectations for all learners. By balancing foundational skills with complex problem-solving and mathematical modelling, Latvian educators can cultivate a more analytically proficient society. This cultural transformation is imperative to equip students with the competencies required to interpret data and execute informed, responsible decision-making in a complex 21st-century landscape.

Keywords: Maths Teaching & Learning, Digital Transformation in Education, Cultural Transformation

Funding: “Operational framework to support capacity building of educational professionals for school improvement solution development in schools and municipalities” VPP-IZM-Izglītība-2024/1-0001

ADVANCING NEEDS-BASED TEACHER PROFESSIONAL DEVELOPMENT: DESIGN OF AN AI-BASED MODEL

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Teacher professional development (TPD) for in-service teachers is increasingly required to address continuously evolving curricular, technological, and organisational expectations. However, many professional development initiatives continue to face difficulties in identifying teachers' specific development needs, supporting the transfer of learning into classroom practice, and maintaining long-term improvement. This position paper contends that stronger personalisation can be achieved when teacher competencies are evaluated through a well-operationalised framework, resulting in a transparent competence profile that serves as a basis for planning focused development interventions. Drawing on conceptual perspectives that view learning transfer as a key unresolved mechanism in TPD effectiveness, the paper introduces an initial functional model for automated, AI-supported, and personalised in-service TPD from the standpoint of teacher educators. The proposed model follows a dynamic input–process–output logic and illustrates how artificial intelligence can be employed to (1) facilitate preparation and pre-learning activities, (2) support experimentation and reflective practice in authentic classroom settings, and (3) generate feedback and evaluation cycles that strengthen ongoing implementation and inform future professional development processes. To enhance structural clarity and practical applicability, the paper identifies the Structured Analysis and Design Technique (SADT) as an appropriate method for breaking down the TPD process into core functions, participant roles, and information flows. The paper's contribution lies in presenting a coherent, design-oriented rationale for competence-based personalisation and AI-enabled support for learning transfer, with the aim of informing future prototyping and empirical testing.

Keywords: Teacher Professional Development, Functional Model, Structured Analysis and Design Technique

Funding: "Functional Model for Personalized and Automated Teacher Professional Development Solutions."
lzp-2023/1-0122

DEFINING PROBLEM-SOLVING AND REASONING PROCESSES FOR LEARNING IN STEM EFFECTIVELY

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Training problem-solving in everyday class practice is crucial for students to develop in-depth scientific reasoning and to foster their understanding of science study content. Clear theoretical definitions and guidelines for practical implementation are relevant; therefore, we offer a view of problem-solving in STEM classes, integrating several perspectives. First, following the idea described in the “Brandon’s matrix”, there are four distinctive methods used in science, based on various types of problems in sciences. This means that teachers can offer students one of four types of how to approach a scientific problem (for example, with or without an aim to manipulate a variable). Second, once approaching any of the problems offered, the student goes through generally defined process or “steps” of problem-solving, starting from understanding the problem, planning and executing the solution and reflecting on it. Third, in each step of problem-solving, a specific reasoning activity (or combination of several activities) is activated in the mind (analysis, evaluation or synthesis) to produce an outcome – a conclusion, a comparison, a division of categories, a plan, a model or other. By following, combining and explicitly acknowledging the disciple-driven and cognitive processes during solving a task in sciences effective and deliberate problem-solving can be developed for students.

Keywords: STEM Problem Solving, Reasoning in STEM, Brandons Matrix

Funding: “Individualized and personalized support system for students’ reading, mathematical and scientific literacy development.” VPP-IZM-Izglītība-2023/1-0001

PHYSICS LESSONS WITH KHAN ACADEMY VIDEOS IN SECONDARY SCHOOL

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We present the results of integrating videos from the globally recognised digital learning platform Khan Academy into blended learning practices within the Latvian educational system. Hundreds of Khan Academy videos are freely available on YouTube; however, they are in English and do not align with the Latvian school curriculum, which complicates their direct use in formal education. To address this, we developed an iterative AI-assisted adaptation process involving curriculum mapping, subtitle translation, and teacher expert validation. The results are available on the open-access platform luka.lu.lv, which currently provides more than one hundred adapted videos, along with expert commentaries for students and teachers, and physics terminology with explanations in Latvian. Three in-service teachers involved in the project developed and tested different blended learning models, including the flipped classroom, flex model, and project-based learning, in real classroom settings throughout the school year with their Grade 12 students. Our initial results show that video-supported instruction can achieve learning outcomes comparable to those of traditional teaching in the advanced-level course Physics II. At the same time, blended learning required time investments into lesson redesign and rethinking the teacher's role, especially regarding classroom control and student motivation. With this presentation, we aim to inspire more teachers to experiment with blended learning, share our experience using AI tools to adapt international learning materials, and highlight the importance of STEM education in Latvia.

Keywords: Physics Teaching & Learning, Khan Academy, Video Supported Instruction

LITERACY AS A UNIVERSAL SKILL: A STEM PERSPECTIVE

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Aim of the Research The research aims to conceptualise literacy as a universal competence embedded across STEM subjects and to develop a structured trajectory model for its progressive development from Grade 1 onwards. The study examines how students decode, interpret, analyse, and apply disciplinary texts, symbols, and multimodal representations in STEM contexts. **Relevance of the Study** In STEM education, literacy extends beyond reading written text. It involves understanding graphs, formulas, diagrams, models, data tables, and problem situations. Literacy functions as the cognitive infrastructure of STEM learning. A major educational challenge is distinguishing between general reading difficulties and insufficient mastery of disciplinary language and symbolic systems. Without a clear framework, students' struggles in STEM may be misinterpreted as content gaps rather than literacy development issues. From a pluriliteracy perspective, subject learning and language development are inseparable. Therefore, literacy should be understood as a universal skill that underpins reasoning, modelling, explaining, and argumentation in STEM. **Results, conclusions and/or discussion** The findings demonstrate that literacy functions as a transversal competence shaping students' performance across all STEM subjects. Analysis of trajectory-based assessment tasks shows that students' difficulties often stem not from a lack of conceptual knowledge, but from challenges in decoding symbolic representations, interpreting problem situations, and articulating reasoning.

Keywords: Literacy in STEM, Pluriliteracy, Transversal Competences

Funding: "Individualized and personalized support system for students' reading, mathematical and scientific literacy development." VPP-IZM-Izglītība-2023/1-0001

AI-DRIVEN PERSONALIZATION IN STEM EDUCATION: ENHANCING LEARNING MANAGEMENT SYSTEMS FOR DIGITAL TRANSFORMATION IN HIGHER EDUCATION

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The rapid digital transformation of higher education has intensified the need for innovative, student-centered approaches in STEM education. This presentation explores the integration of artificial intelligence (AI) into Learning Management Systems (LMS) to enhance teaching and learning processes in STEM disciplines at university level. Drawing on a case study from the University of Tetova, the research examines how AI-driven personalization mechanisms – such as adaptive content delivery, intelligent quiz recommendations, and real-time learning analytics – can improve student engagement, learning outcomes, and instructional decision-making. The study is grounded in the practical implementation of an AI-enhanced LMS architecture developed using modern web technologies, including MVC Blazor components and service-oriented design principles. Empirical data collected from student usage patterns and feedback are analyzed to assess the impact of personalized learning paths on students' performance and motivation in computer science and related STEM courses. Beyond technical implementation, the presentation discusses broader implications for STEM pedagogy, assessment practices, and academic leadership. It highlights how digital and AI-supported tools can support instructors in monitoring learning progress, identifying at-risk students, and continuously refining teaching strategies. The findings contribute to current discussions on sustainable innovation in STEM education and demonstrate how universities can responsibly leverage AI to support inclusive, data-informed, and future-oriented learning environments.

Keywords: Digital Transformation in Education, Learning Management System, Learning Analytics

SYSTEMIC DIAGNOSTICS OF MATHEMATICAL LITERACY WITHIN A MULTI-TIERED SYSTEM OF SUPPORTS: A TWO-LEVEL ASSESSMENT MODEL

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Educational systems increasingly emphasise data-informed instructional decision-making. However, assessment in practice often functions as episodic measurement rather than as a structured diagnostic mechanism. The Multi-Tiered System of Supports highlights early identification of learning difficulties and graduated levels of support based on systematic monitoring data. In mathematics education, such systemic diagnostics remain insufficiently structured. The doctoral research project “Systemic Diagnostics of Mathematical Literacy in Lower Secondary Education” proposes a two-level assessment model that operationalises the principles of the Multi-Tiered System of Supports in mathematics. Tier 1 consists of comprehensive class-level assessments administered across grade levels. These assessments cover the full range of curriculum content and provide an overview of students’ mathematical literacy. This level functions as universal screening. Tier 2 includes thematically focused diagnostic assessments targeting specific content domains. These instruments enable more precise identification of conceptual and procedural difficulties and inform targeted instructional planning. The model supports structured data use at student, classroom, and school levels, strengthening data-based decision-making processes. Assessment is conceptualised not as isolated testing, but as a systemic mechanism for diagnosing and supporting mathematical literacy development.

Keywords: Mathematical Literacy, Multi-Tiered Support System, Instructional Planning

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COACHING SCHOOL LEADERS FOR SUSTAINABLE PEDAGOGICAL AND DIGITAL CHANGE IN EDUCATION

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Sustainable pedagogical and digital change in schools is frequently addressed through discrete initiatives or the introduction of technological solutions. However, such changes increasingly emerge in response to demands generated by multi-level educational governance systems. Within a capability-oriented framework, change is understood as the development of organisational capacity – that is, a school's ability to systematically plan, implement, and sustain improvement processes over time in response to these governance requirements. The purpose of this study is to examine how capability development supports sustainable change in schools and how the same underlying principle applies to the implementation of digital initiatives. The study was conducted as a design-based research project employing qualitative data analysis. It investigates an ongoing and iteratively refined professional support programme involving 11 trained coaches and 18 school leaders organised into two cohorts ($n = 10$; $n = 8$). Coaches work individually with school leaders over an extended period. In parallel with individual coaching sessions, targeted and interconnected professional development activities are provided to strengthen coaching competences. Monthly group sessions are organised for case analysis, reflective dialogue, and collaborative problem-solving in complex situations. In addition, four face-to-face training days and eight online sessions have been implemented. The programme is continuously improved based on interim analysis and participant feedback. Data collection includes semi-structured interviews with both coaches and school leaders, as well as analysis of schools' progress towards strategic goals. Particular attention is paid to coaching interventions, professional competences, and factors that enable or constrain sustainable change. The findings suggest that the combination of leadership coaching and structured professional learning contributes not only to the acquisition of knowledge but also to shifts in leadership practices and decision-making processes, thereby strengthening schools' capacity to initiate and sustain pedagogical and digital change. The study advances a capability-based approach to school development by demonstrating that digital transformation should not be treated as a separate domain of reform but rather as an expression of a school's broader capacity for managing change within a multi-level governance system. The results indicate that systematically designed and complementary forms of professional support enhance sustainable pedagogical and digital development and reinforce schools' ability to function coherently within governance-driven reform environments.

Keywords: Instructional Coaching, Digital Transformation in Education

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IMPLEMENTING INNOVATIONS IN STEM EDUCATION AT THE SYSTEM LEVEL

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The implementation of innovations and reforms in STEM education at the system level can be conceptualised as a multi-stage implementation process, in which outcomes are shaped both by the sequencing of implementation and governance mechanisms, and by contextual factors that enable or constrain implementation. Within the study, an integrated implementation perspective was developed that combines several theoretical approaches and viewpoints: a policy-cycle approach to implementing innovations (clarity of goals, coherence of instruments, the specificity of regulation, resources and support mechanisms), a theory of change (how implementation activities are expected to generate intermediate outcomes and impact), an implementation science perspective (interactions among stakeholders and system levels, leadership and management practices, communication, professional development, learning and support), and an outcomes-oriented approach (implementation outcomes and their distinction from policy impacts, including stability over time and the depth of changes in practice). The effectiveness of a system-wide STEM reform increases when policy design, stakeholder participation, institutional conditions and targeted implementation strategies are mutually consistent and cascaded down to the school and classroom levels. Governance effectiveness in STEM reforms is increasingly explained as a shift from “implementation fidelity” to adaptive governance, since reform success cannot be reduced to simple compliance with the original reform design. The adaptive approach emphasises mutual adaptation between the reform and local – municipal and school – contexts, where implementers’ sense-making and shared understanding, capacity strengthening, and sustained support are essential. At the system level, this requires coordinated action across all levels, clear goals, strategic use of data, an appropriate distribution of accountability, and a balance between external oversight and support, while also ensuring political sustainability. Governance outcomes are shaped by context, coherence-building, agency and motivation, as well as co-creation and two-way flows between governance levels – national, municipal and school.

Keywords: Governance Chain, Implementation of Innovations, STEM Education Reforms

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DEVELOPING AN ADDITIONAL MATHEMATICS PROGRAMME FOR GRADE 7 STEM EDUCATION

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Strengthening pupils' motivation and confidence in mathematics at lower secondary level is important for their continued engagement in STEM education. An additional mathematics programme for Grade 7 pupils has been developed within the Erasmus+ Cooperation Partnerships in School Education project "Diversifying the STEM Ecosystem". The programme was created through international collaboration between the University of Eastern Finland Teacher Training School and academic staff from the Latvia University of Life Sciences and Technologies. Its aim is to help pupils strengthen their basic mathematical knowledge and skills, while also increasing their interest and motivation to continue learning STEM subjects. The methodology consists of 64 academic hours organised into 8 flexible modules, combining focused conceptual work with practical, problem-based and interdisciplinary activities. Mathematical topics are linked to real-life situations, project work and exploratory tasks that encourage problem-solving, critical thinking and collaboration. The programme can be adapted to different school contexts and learner needs and can be used with both printed and digital materials. The presented results focus on the structure and pedagogical principles of the programme and share initial observations from its piloting phase. These observations suggest that the programme has the potential to support pupils' confidence in mathematics and their engagement in STEM learning. The finalised materials will be made freely available for use by schools and teachers.

Keywords: Mathematics Teaching & Learning, Problem-based Learning, Confidence in Mathematics

METHODOLOGY FOR ADDITIONAL LESSONS IN “MODERN TECHNOLOGY STUDIO” FOR OZOLNIEKI SECONDARY SCHOOL

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This methodology has been developed within the Erasmus+ Programme Cooperation Partnerships in School Education project “Diversifying the STEM Ecosystem” (No. 2024-1-LV01-KA220-SCH-000250755). The program was created in cooperation between Ozolnieki Secondary School and academic staff from the Latvia University of Life Sciences and Technologies (LBTU). The methodology “Modern Technology Studio” aims to support students’ digital creativity and technical literacy through modern browser-based tools for image editing, 3D modelling, and multimedia creation. The program combines practical, hands-on activities with digital design thinking to help learners build competence in visual communication, programming logic, and innovation. In addition, the methodology introduces students to the basics of robotics, programming, and control systems.

Keywords: Digital Creativity, STEM Teaching & Learning, Technical Literacy

Funding: the Erasmus+ Programme Cooperation Partnerships in School Education project “Diversifying the STEM Ecosystem” (No. 2024-1-LV01-KA220-SCH-000250755)

3.3. sekcija. **MATEMĀTIKA, STATISTIKA UN DATU
ZINĀTNE UN TO STARPNOZARU
PIELIETOJUMI /**

**MATHEMATICS, STATISTICS,
AND DATA SCIENCE AND THEIR
INTERDISCIPLINARY APPLICATIONS**

EMPIRICAL LIKELIHOOD QUANTILE INFERENCE WITH APPLICATIONS IN INSURANCE

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In insurance, it is often necessary to employ statistical methods that target quantiles rather than the mean, since the data are typically characterized by asymmetric or heavy-tailed distributions and extreme outliers. However, there remain relatively few methodological frameworks that enable quantile inference. Empirical likelihood provides a flexible, nonparametric framework for quantile inference that is well suited for insurance data. It supports both one-sample and two-sample settings – enabling inference for a single portfolio's quantiles as well as comparisons of quantiles across portfolios or time periods – without imposing restrictive parametric assumptions. Moreover, the approach can be extended via smoothed empirical likelihood to improve method's accuracy. Empirical likelihood procedures for one- and two-sample quantile inference are explored. Alongside case applications, the theoretical aspects of the method and refinements such as smoothed empirical likelihood for improved coverage accuracy is discussed.

CLOSED-FORM BARTLETT CORRECTION FOR BLOCKWISE EMPIRICAL LIKELIHOOD UNDER AR(1) DEPENDENCE

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Bartlett correction provides a systematic way to improve the finite-sample accuracy of likelihood ratio tests. In the parametric Gaussian AR(1) model, van Giersbergen (2009) derived an explicit Bartlett correction factor for inference on the autoregressive parameter. This closed-form representation provides analytical insight into the finite-sample behavior of the likelihood ratio test, showing how the correction depends on the persistence parameter and how it grows as the model approaches the unit-root boundary. In the nonparametric framework, DiCiccio, Hall and Romano (1991) established that empirical likelihood (EL) is Bartlett-correctable under the smooth function model, and Kitamura (1997) extended this result to blockwise empirical likelihood for weakly dependent processes. However, closed-form Bartlett correction factors for blockwise empirical likelihood in autoregressive models have not been derived, and the dependence of the correction on the persistence parameter and block length remains unexplored. In this paper, we study Bartlett correction for blockwise empirical likelihood in the problem of inference on the mean of a stationary AR(1) process. We derive an explicit expression for the Bartlett correction factor as a function of the autoregressive parameter and the block length. This representation enables a detailed investigation of how serial dependence and block size jointly determine the higher-order behavior of the EL ratio statistic. In particular, it allows us to analyze how the magnitude of the correction varies with persistence and how it changes with the choice of block length. The theoretical results are complemented by extensive simulation analyses, which confirm the analytical findings and demonstrate improved finite-sample size accuracy after Bartlett correction.

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EXISTENCE OF A NONNEGATIVE SOLUTION FOR A HIGHER-ORDER (P,Q)-LAPLACIAN SYSTEM WITH NONLOCAL BOUNDARY CONDITIONS

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We present a result on the existence of a nonnegative solution for a system of two higher-order differential equations endowed with three-point boundary conditions. The highest-order derivative appears in equations nonlinearly due to the p -Laplacian homeomorphism. We obtain the existence of a nonnegative solution and localisation in a suitable conical shell by applying classical results of the fixed point index theory in cones. To illustrate the obtained result an example is considered.

MATHEMATICAL MODEL OF THE MARTINDALE ABRASION TEST

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There is a wide variety of tests that are being used to determine the durability of textile materials. One of such test standards is the Martindale test that requires the subject textile to be fixed and mechanically rubbed against the abrasive cloth for a predetermined amount of cycles. After that the quality and durability of the textile can be evaluated based on the extent of hole formation, their size, frequency and overall quality. The objective of this work is to propose a mathematical model that describes the resulting wear which is primarily based on the Reye-Archard-Khrushchov wear law but adapted for this specific purpose by introducing modifications to it. Both the subject textile and abrasive cloth are modelled as spatially periodic surfaces with their height evolving over time depending on the wear rate at the contact regions. For this testing standard the movement of the subject cloth is described by a Lissajous trajectory given as a function of time. The resulting system of partial differential equations is solved numerically, and after which the simulation results are compared to experimental data. It can be observed that certain qualitative properties prominently in the form of wear patterns are present both in the simulations and tests. Under certain conditions the simulations reveal an emergence of parallel stripes which correspond with real test results and show that using appropriate parameters it is possible to obtain outcomes that resemble the expected outcomes. Finally, the limitations of the model and possible directions for future development are discussed in this work, with an emphasis on finding of exact parameters for recreating test results more accurately.

CHAOTIC SIMPLE NEURON MODEL WITH PERIODIC COEFFICIENTS

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We investigate the piecewise linear difference equation that is a prototype of one neuron model with the internal decay rate and the given signal function. We study the periodic solutions of a discrete neuron model for period two or period three of the parameter (internal decay rate) ([1-3]). The existence of periodic points is different for parameter sequences with period two (even number) and three (odd number). In [5], the authors consider the situation when the parameter sequence is periodic with period 2 and show that at certain values of the parameter coefficients a chaotic attractor is formed. For certain values of the parameter coefficients with period 3 there exists an attracting interval for which the model is chaotic ([4]). On the other hand, if the initial value is chosen outside the mentioned attracting interval, then the solution of the difference equation either increases to positive infinity or decreases to negative infinity. The properties of chaos (sensitivity to initial conditions) can be used in random number generation as well as in cryptography. The investigation can be useful in the design of chaos-based neural networks architecture.

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SOME PROBLEMS ON OPTIMAL DOMINO ARRANGEMENTS

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The topic of shape exclusion (blocking) is one of the sources of extreme problems in discrete mathematics. Typical problems in this field are: what is the minimum number of shapes F that must be placed in square $n \times n$ to no more be able to fit a shape G . Depending on the choice of n and shapes, the variety and complexity of problems can vary widely: including mathematics Olympiads, research tasks and unsolved mathematical problems. Non-trivial results and surprises are already contained in the problem of using the simplest shapes, namely $F = G = 1 \times 2$ (domino), see [1]. An additional impulse for our research on domino arrangement problems was a paper [2] with the captivating title, as well as a paper by the same authors [3], containing some unanswered questions. We use a different approach to find explicit formulas and so-called base patterns, which give the answer for the maximum or minimum number of dominoes in the corresponding problems for optimal domino arrangements in squares.

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QUANTILE INFERENCE IN ANOVA USING EMPIRICAL LIKELIHOOD

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Traditional analysis of variance (ANOVA) is the standard tool for comparing multiple groups. However, this method is based on the assumption that the data are free of outliers and follow a normal distribution. In many practical applications, such as biomedicine and economics, the median or other quantiles may provide a more meaningful and robust representation of the population than the mean. This research explores the use of empirical likelihood (EL) as a nonparametric alternative to standard ANOVA. Unlike rank-based tests (e.g., the Kruskal–Wallis test), the EL approach enables the construction of likelihood-ratio-based confidence intervals and hypothesis tests without the need to specify a distribution for the error terms.

DATA-DRIVEN KOOPMAN ANALYSIS OF THE FREE RIGID BODY DYNAMICS

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In 1931, Koopman operator was introduced for the first time to describe the evolution of observable functions along Hamiltonian system solutions, laying the foundations of Koopman theory which was later generalized for dynamical systems with continuous spectrum [1, 2]. Koopman operator is linear, and, therefore, if appropriate observables are found, Koopman theory allows to obtain global linear representations of strongly nonlinear dynamical systems. The recent increase of available computational powers has led to development of methods for performing data-driven Koopman analysis [3]. Using these methods, a finite-dimensional linear operator approximately describing the evolution of observables along solutions of an arbitrary dynamical system can be obtained based on numerical simulation data. In this work, deep learning-based Koopman analysis techniques are applied to find linear representations of the free rigid body dynamical system described by Euler equations [4]. The observable functions are approximated using an autoencoder, and the sought finite-dimensional linear operator is parametrized using an auxiliary feed-forward neural network [5]. Different parametrization approaches are applied which preserve structure and respect qualitative properties of the considered dynamical system. The obtained representations are used to predict dynamical system solutions. Relative prediction errors as well as overall quality of the representations are analyzed taking into account the free rigid body dynamical system properties.

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FUZZY APPROACH BASED MODEL FOR ASSESSMENT OF RISKS OF ENERGY PRICE DYNAMICS

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Energy price dynamics have important impact on daily costs of living. While generally the energy prices depend on global geopolitical developments and underlying risks, they can be also impacted by specific local circumstances like weather conditions. We propose construction of fuzzy based model reflecting both global and local impacts on energy prices. This model is based on application of fuzzy inference systems and aggregation operators which are widely used in various risk assessments.

EMPIRICAL LIKELIHOOD RESIDUAL BOOTSTRAP METHOD

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Empirical likelihood (EL) is a nonparametric method of statistical inference proposed by A. B. Owen. It allows researchers to use likelihood-based methods without assuming that the data come from a known family of distributions. EL is applicable to linear models. B. W. Brown and W. K. Newey proposed an EL-based bootstrap approach, broadening its applications. An alternative bootstrap method, residual bootstrap, was introduced by D. A. Freedman in a regression setting.

Consider the following one-factor linear fixed effects model with two treatments: $Y_{ij} = \mu + \tau_i + \varepsilon_{ij}$, where Y_{ij} is the response corresponding to the j -th subject under the i -th treatment, $i = 1, 2$ and $j = 1, \dots, n_i$; n_i is the size of the i -th treatment group, and $n = n_1 + n_2$ is the total number of subjects; μ is the overall mean, and τ_i is the effect of the i -th treatment. Further assume that $\{\varepsilon_{ij} : i, j\}$ are i.i.d. with $E(\varepsilon_{ij}) = 0$ and $\text{Var}(\varepsilon_{ij}) = (\sigma_i)^2$. For identifiability and interpretability, assume that $\tau_1 + \tau_2 = 0$. Consequently, τ_i can be interpreted as $\tau_i = \mu_i - \mu$, where $\mu_i = E(Y_{ij})$. Assume that we collect a set of observations $\{X_{ij} : i, j\}$ on a covariate variable X . In this work, we perform a simulation study exploring the performance and limitations of the empirical likelihood residual bootstrap (ELRB) and its extension using auxiliary information (ELRB-aux). Their performance is compared against the pair bootstrap, residual bootstrap, and t -test methods. We also apply and compare the above methods in a data analysis case.

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APPLYING SNP MARKERS ASSOCIATED WITH FEED CONVERSION RATIO TO DEVELOP MACHINE LEARNING ALGORITHMS FOR GENOMIC SELECTION IN LATVIAN SHEEP BREEDS

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Feed efficiency in sheep meat production represents a complex quantitative trait influenced by multiple genetic factors and is well suited for data-driven modelling approaches. This study presents an interdisciplinary data science framework that integrates high-dimensional genomic data, statistical association analysis, and machine learning methods to predict feed conversion ratio (FCR) in sheep populations of Latvia. Genotype data from the GeneSeek® Genomic Profiler™ Ovine 50K array and phenotypic measurements from 261 controlled fattening lambs across eight breeds were analysed, including 135 (51.72%) animals from the Latvian Dark-head (LT) breed. Genome-wide association study (GWAS) methods were applied to detect statistically significant SNP markers associated with FCR. Across all breeds, one SNP reached genome-wide significance ($p = 3.46 \times 10^{-8}$), with 1665 markers at $p < 0.01$ and 3549 at $p < 0.05$; breed-specific analysis for LT identified 478 and 1994 markers at the same thresholds, respectively. To address the high dimensionality of genomic predictors, statistically significant loci were used as a feature selection step prior to predictive modelling. Machine learning algorithms were then applied to construct predictive models of FCR using selected SNP features and early-life performance indicators. Model performance demonstrates that combining statistical marker selection with machine learning improves predictive accuracy and supports early-stage genomic prediction. The results highlight the effectiveness of integrating statistical genetics, feature selection strategies, and machine learning for predictive modelling in biological systems. This work illustrates how mathematical and data science methodologies can be applied to high-dimensional genomic datasets to support decision-making and optimisation in applied breeding programs.

MAXIMAL POLYIAMONDS – HEPTAGONS

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An important place in discrete geometry is occupied by isoperimetric problems, in which a figure with maximum area is sought for a fixed perimeter, or, conversely, a figure with a minimum perimeter is sought for a fixed area. Such problems in various discrete structures, for example, in lattices, are difficult. One such discrete structure is a lattice of equilateral triangles, in which the constructed figures are called polyiamonds. The properties of maximal polyiamonds with a fixed perimeter have been studied, however, less is known about maximal polyiamonds with a fixed number of sides. In this work, heptagonal polyiamonds were studied. The results obtained showed that several maximal heptagonal polyiamonds exist for a fixed perimeter. An area formula was obtained for all heptagonal polyiamonds with a perimeter $P > 7$. Keywords: polyiamonds, maximal polyiamonds, heptagons.

ON THE SOLVABILITY OF A THIRD-ORDER DIFFERENTIAL SYSTEM WITH COUPLED INTEGRAL BOUNDARY CONDITIONS VIA THE LERAY-SCHAUDER CONTINUATION PRINCIPLE

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We investigate a priori estimate, existence, and uniqueness of solutions for a third-order differential system with coupled integral boundary conditions. The Leray-Schauder continuation principle forms the basis of our approach to establishing the existence result. To demonstrate the applicability of the obtained results, illustrative examples are provided.

DETECTING VOLATILITY CHANGE-POINTS USING EMPIRICAL LIKELIHOOD

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The detection of structural changes in volatility is a fundamental topic of research in the analysis of financial time series. The classical CUSUM algorithm, which was originally developed for testing changes in the mean, can also be adapted to detect changes in volatility. Inclán and Tiao (1994) first established this connection when they proposed a cumulative sum of squares procedure for identifying variance shifts. Subsequently, Pooter and van Dijk (2004) extended this framework to include dependent and heteroscedastic time series data. In this research, we present an alternative non-parametric approach based on the empirical likelihood (EL) method. Instead of relying on cumulative sum statistics, we construct test statistics based on the likelihood ratio for change-point inference within the EL framework. Aniskevich et al. (2025) developed a two-sample empirical likelihood procedure for testing differences in means in dependent time series. We apply similar ideas to the problem of volatility change-point detection. The proposed method provides a flexible, distribution-free way of identifying structural breaks in variance and has the potential to offer advantages in financial time series, where dependence and non-normality are common.

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DATA-DRIVEN METHODS FOR DETECTING STRUCTURAL CHANGES IN DYNAMICAL SYSTEMS

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Many complex systems, ranging from ecosystems to industrial processes and financial markets, often exhibit sudden, potentially irreversible shifts in the system's behavior or structure. Traditionally, structural change detection methods rely on model-based statistical methods, typically assuming full knowledge of the underlying process and its governing equations. However, in most real-world problems, the models are often only partially known, and observations may be noisy or sparse. As a result, the demand for data-driven techniques has grown significantly in recent years. This work aims to explore, explain, evaluate and systemize a wide variety of data-driven change point detection paradigms and algorithms. When doing so, the strengths, and limitations of the existing approaches are identified and scenarios for which the changes are to be detected (e.g., sudden change in system parameters, switching between regimes, bifurcation-like behavior) should be formally specified.

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EMPIRICAL LIKELIHOOD IN STRUCTURAL EQUATION MODELING

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Structural equation modeling (SEM) is a set of statistical methods used to depict relations among observed and latent variables in various models, and to provide quantitative tests of hypotheses. It is widely used in the social and behavioural sciences. Most estimators used in SEM assume multivariate normality, which is often not observed in real-world data. Empirical likelihood is a method for statistical inference, which was introduced by A. B. Owen in 1988. It is a nonparametric method that retains the advantages of likelihood-based inference. Although an empirical likelihood estimator for SEM was proposed in 2007, literature on empirical likelihood in SEM is limited, and no implementation of this estimator can be found in commonly used software. This work reviews the currently available literature on the application of empirical likelihood in SEM and presents the authors' contributions, including the application of the empirical likelihood estimator to several simple structural equation models.

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ERGODICITY OF THERMOSTATED LINEAR CHARGE DYNAMICS IN A SEMI-CLASSICAL HAMILTONIAN LATTICE MODEL

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Thermostat methods are molecular-dynamical tools that allow for stochastically perturbing a Hamiltonian system in a way that the resulting system of stochastic differential equations (SDEs) samples the canonical Gibbs distribution at a fixed temperature. A crucial condition for a thermostat method to give meaningful results is ergodicity of the resulting system. It is well known that the sufficient condition for the system with Gibbs equilibrium distribution to be ergodic is Hörmander's condition, which requires a certain set of vector fields to span the tangent space of the phase space at every point [1].

Articles [2; 3] describe a semi-classical Hamiltonian system modelling the dynamics of a periodic crystal lattice with an extra charge. After constructing and applying a thermostat method to the Hamiltonian system, a system of Itô SDEs is obtained. For the analysis, we first consider the subsystem that describes only the dynamics of the charge when the lattice particles are frozen. The phase-space variables of the system are the real and imaginary parts of the charge-probability amplitudes, together with the thermostat's auxiliary variables. Moreover, the Hamiltonian part of the system is linear in the charge variables with a symmetric tridiagonal matrix with periodic boundary conditions. Since the total charge probability is conserved along the trajectories of the thermostated system, the phase space for the charge variables is considered a hypersphere. We prove that Hörmander's condition holds for the thermostated system in the suitable phase space, ensuring the ergodicity of the charge dynamics when the lattice particles are frozen. In conclusion, we provide a theoretical justification for why Hörmander's condition can be viewed separately for the charge and lattice dynamics.

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PĒTĪJUMI /**

**GEODYNAMICS AND
GEOSPATIAL RESEARCH**

ON THE ERROR SOURCES IN GNSS AND DIGITAL ZENITH CAMERA MEASUREMENTS FOR QUASI-GEOID MODEL

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GNSS Positioning, [Navigation and Timing (PNT) methods are widely used in all the branches of National economies. However, in many areas, the GNSS height component determined by GNSS methods in relation to the reference ellipsoid is not satisfactory for many tasks of economy. The height determined in this way does not reflect the flow of water, which does not obey simple geometric laws but occurs under the influence of Earth's gravitational forces.

In order to convert the so-called ellipsoidal height to component of normal height, it is necessary to know the difference between the ellipsoidal height and the geoid, i.e. heterogeneous Earth's gravitational field reduced to sea level at this geographical location. The geodesists of the State Geospatial Information Agency (LGIA) have done a very great job, obtaining thousands of gravimetric measurements of the Earth's gravitational force across the entire territory of Latvia, and they have performed the geometric levelling of Latvia's national normal height network as well. The normal height values are fixed for the big stones beneath the ground, that are called benchmarks. The benchmark location and height values are publicly available at the database stored in LGIA. At the Institute of Geodesy and Geoinformatics (GGI) of the University of Latvia, the currently most precise quasi-geoid model has been developed. To accomplish this, GGI researchers in two projects carried out extensive computational work and also very large-scale GNSS at the benchmarks of GNSS/levelling points and Digital Zenith Camera (DZC) measurements of Deflection of Vertical (DoV) at more than 400 locations in the territory of Latvia. Authors of this abstract participated in GNSS data reduction and analysis (J. Balodis) and in field data collection of both GNSS and DZC measurements (K. Balodis).

Similar research of quasi-geoid development takes place all over the world, and the implementation, accuracies, and sources of errors are still debated in many countries. Through the lens of a literature review, the work of field data collection and reduction itself is reassessed, but significant corrections are also found that could interest many. This will be discussed in the presentation.

Keywords: GNSS/levelling, DZC, PNT, data reduction.

DEVELOPMENT OF A POSITIONING ALGORITHM BASED ON MAGNETIC FIELD AND INERTIAL NAVIGATION MEASUREMENTS

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In this study, developed within a University of Latvia pilot-project with high impact “Development of precise geomagnetic field distribution maps for positioning applications”, a positioning algorithm independent of Global Navigation Satellite Systems (GNSS) was created and tested by combining magnetic-field measurements with Inertial Navigation System (INS) data. As part of the study, a new high-resolution near-surface magnetic-field map was produced in the Staicele area, covering 27 km². The magnetic-field map was used for the development, testing, and modelling of the positioning algorithm at different altitudes to evaluate the algorithm’s applicability to near-surface and aircraft navigation.

The positioning algorithm uses absolute magnetic-field measurements together with speed and azimuth data, calculating the most likely position from probability distributions at each movement step, thereby enabling the estimation of deviation from the true location. Experiment results indicate that incorporating magnetic field information significantly improves positioning accuracy: the INS error at the end of the test profile is improved from 1003 to 162 meters. At the same time, it was concluded that the scalar magnetic field alone was not sufficient for stable navigation, as values can coincide in different areas of the map; the best performance was achieved by using all available information (magnetic field, speed, direction). The robustness of the method is influenced by the error characteristics of the input data; appropriate selection of these parameters and the measurement instrument accuracy substantially affect the positioning quality.

Algorithm tests at different altitudes indicated an increase in positioning error, reaching 256 m. Nevertheless, a substantial 400% improvement over INS-only systems is still observed. The study results are significant for defence technology developers as a practical, modelling-based approach to GNSS-independent positioning, where accuracy is achieved through multi-source data fusion and measurement-error parametrization.

Keywords: magnetic navigation, inertial navigation, data fusion, magnetic-field modelling, GNSS-independent positioning

PERFORMANCE CHARACTERIZATION OF THE GGI OPTICAL TRACKING SYSTEM FOR SPACE OBJECT SURVEILLANCE

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This study evaluates performance of the optical tracking system (OTS) of the Institute of Geodesy and Geoinformatics (GGI) for routine positional astrometric observations of faint near-Earth objects (NEOs) and space debris. The assessment focuses on limiting magnitude, tracking capabilities, and recent software enhancements enabling detection of fast-moving and low-brightness targets.

The optimal exposure time for NEO searches with the OTS was determined to be 5 seconds. Under these conditions, the faintest detected asteroid reached a visual magnitude of 18.7 (1997 WU22, observed on 15 November 2025). As it was captured in relatively hazy environment, the limiting magnitude can be improved by performing observations during periods of better seeing conditions.

The GGI software has been upgraded with image stacking and shifting techniques that enable detection of fast-moving NEOs using predicted angular speed. Using this approach, asteroid 1999 VF22 (visual magnitude 17.1, observed on 20 February 2025) was successfully identified in a stack of six frames, despite being practically invisible in individual exposures.

A similar stacking-shifting method, based on the known speed of Earth's rotation, has been implemented for detecting faint geostationary objects (GEOs). Observations were conducted in the geostationary belt region (typically containing 2–3 visible satellites) from the OTS site (57° N, 24° E) within the azimuth range 171.0°–173.5° and elevation range 24.5°–25.0°.

The OTS can track low-Earth-orbit (LEO) satellites with apparent angular speeds below 0.1–0.2°/s, corresponding to orbital altitudes above ~1000 km (e.g., LARES, Ajisai, Jason). Tracking objects at lower altitudes (e.g., Stella, SARAL) is limited; for these cases, the system can operate in static or star-tracking mode, producing satellite images as elongated streaks.

Satellites GLONASS-1 and Etalon-2 were observed simultaneously with both OTS CCD cameras, and the resulting frames were successfully stacked. This demonstrated that processing in equatorial coordinates enables the combination of frames with different CCD orientations, scales, and distortions. The ability to stack images from multiple sensors enhances the detectability of faint streaks produced by small debris fragments in LEO. Such multi-sensor fusion is increasingly important given the growing density of orbital debris and the associated collision risks.

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ASSESSING ATMOSPHERIC ANOMALOUS REFRACTION EFFECT ON ASTROGEODETTIC DEFLECTION OF VERTICAL MEASUREMENTS

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Since the initial testing phase of the Digital Zenith Camera (DZC) VESTA (VERTical by STArs) at the University of Latvia, persistent temporal variations in deflections of the vertical (DoV) have been observed during measurement sessions. These fluctuations, present in all subsequent campaigns, are assumed to be largely influenced by atmospheric anomalous refraction (AR), which introduces irregular angular displacements of star images and can significantly affect DoV accuracy within a typical 40–60 minutes observation window. To investigate this effect in a systematic manner, the project “Investigation of Anomalous Refraction Effect by Using Automated Digital Zenith Camera VESTA”, funded by Latvian Council of Science Fundamental and Applied Research projects (No lzp-2024/1-0095), was initiated in 2025. The research focuses on practical assessment of AR magnitude, temporal behaviour, and spatial characteristics under real observation conditions. Extended overnight measurement campaigns are being carried out in contrasting environments: hilly terrain (Lode), open flat fields (Tīnūži), and coastal areas (Tūja). Observations are conducted throughout different seasons and under varying meteorological conditions to capture a broad spectrum of AR phenomenon. Parallel measurements with two adjacent DZCs are planned and partly implemented to distinguish instrument-related effects from true atmospheric influences and to evaluate spatial correlation of AR. A dedicated meteorological sensor network has been deployed around observation sites to record temperature, humidity, and pressure gradients during measurements. These data support analysis of the structure of the atmosphere at the observation site and its relationship to observed DoV variability. In parallel, a simplified model describing AR influence on DZC measurements has been developed.

Keywords: digital zenith camera, deflection of the vertical, anomalous refraction, gravity field

Acknowledgement: “Investigation of Anomalous Refraction Effect by Using Automated Digital Zenith Camera VESTA”, funded by Latvian Council of Science Fundamental and Applied Research projects (No lzp-2024/1-0095)

REAL-TIME SEGMENTATION FOR PRECISE NAVIGATION IN OUTDOOR ENVIRONMENTS

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This topic addresses the development of technologies for autonomous navigation systems for unmanned ground vehicles (UGVs) operating in outdoor environments. Autonomous vehicles rely on remote sensing technologies such as radar, GPS, IMU, cameras, and LiDAR to perceive their surroundings and to build an environmental representation for navigation. One of the core tasks of an autonomous navigation system is reliable perception and localization. Through machine learning, vehicles are trained to interpret complex sensor data to improve navigation algorithms and enhance their ability to operate in real-world conditions. In this work, the environment primarily consists of roads and path infrastructure; however, the focus is on designing and adapting visual machine learning systems that remain robust in outdoor, low-visibility, and harsh operating conditions, as well as in scenarios where cartographic data is incomplete or inaccurate. Our specialization lies in visual machine learning for environments where perception is inherently difficult and where public datasets or standard benchmarks are insufficient. This includes outdoor and night-time operation, low-visibility scenarios, and infrared or multi-spectral vision, where environmental variability, motion, and sensor limitations significantly affect system behaviour. The acquired video data is processed using SegFormer-based semantic segmentation, implemented with deterministic, low-latency processing on edge hardware powered by NVIDIA Holoscan. A dedicated image database is created for both training and testing the models. For example, winter scenes are explicitly included in the training data to ensure reliable performance under snow-covered and low-contrast conditions. Machine learning-based classification distinguishes between different road states, such as snowy roads, road surface types, and travelled versus untravelled paths. The developed technology is applicable to a wide range of use cases, including critical infrastructure monitoring, forest and natural resource management, road quality assessment, and other dual-purpose civilian and industrial applications.

Keywords: unmanned ground vehicles, autonomous navigation system, sensor data, real-time segmentation

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HOURLY IONOSPHERIC RISK CLASSIFICATION FOR RTK SURVEYING USING CORS NETWORK INDICATORS

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Ionospheric variability remains one of the principal limiting factors affecting the reliability of real-time kinematic (RTK) positioning. While many studies focus on modelling total electron content (TEC) and monitoring space weather, fewer approaches translate ionospheric behaviour into operational indicators useful for surveying practice. This study proposes an hourly ionospheric risk classification framework derived from observations of a regional continuously operating reference station (CORS) network. High-resolution dual-frequency GNSS observations are used to compute variability indicators including the rate of TEC index (ROTI), temporal dispersion of ionospheric delay, and spatial TEC gradients between stations. These indicators are aggregated into hourly metrics and integrated into a three-level classification scheme representing low, medium, and high ionospheric risk conditions for RTK positioning. The behaviour of the proposed classification is analysed under both quiet and disturbed ionospheric conditions, considering diurnal and seasonal variability. Results show that hourly aggregation provides a stable yet responsive representation of ionospheric dynamics while preserving periods of enhanced variability that may affect ambiguity resolution. The framework offers a practical method for translating GNSS-derived ionospheric variability into operationally interpretable information suitable for surveying workflows and quality assessment in RTK applications.

Keywords: ionosphere; RTK positioning; CORS network; GNSS; ROTI; TEC variability; risk classification; surveying

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Acknowledgements: This research used LatPos GNSS CORS network observations.

ANALYSIS OF THE METEOROLOGICAL DATA RECORDED AT SATELLITE LASER RANGING STATION RIGA IN 1998–2004

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The accuracy of satellite laser ranging measurements is affected by local weather conditions, with atmospheric pressure being the most significant factor. We compared the meteorological data collected during the observations with the published records from the nearest weather station. The selected period, 1998-2004, includes the time when the SLR station in Riga still used manual meteorological instruments, while the nearby station had installed new, modern equipment. This work is part of an effort to assess the quality of older laser-ranging data.

Keywords: space geodesy, satellite laser ranging, SLR, systematic errors

RIGA SATELLITE LASER RANGING STATION: 2025 OVERVIEW

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This paper outlines the main activities and results of the Satellite Laser Ranging Station Riga in 2025, including observation statistics and performance metrics. Station upgrades involve monitoring and recording temperature and humidity in the time and frequency room, along with purchasing a specialized GNSS receiver to support time-transfer experiments. We have demonstrated the ability to perform simultaneous satellite laser ranging and photometry measurements with Topex/Poseidon and Ajisai as test targets.

Keywords: SLR, Satellite laser ranging

HYBRID REGIONAL GRAVITY FIELD DETERMINATION USING GRAVIMETRIC AND VERTICAL DEFLECTION OBSERVATIONS BASED ON ADJUSTED SPHERICAL CAP HARMONIC (ASCH) MODELING

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This study presents a Gauss–Markov modelling framework for regional gravity field determination using integrated gravimetric and astrogeodetic vertical directions (Φ , Λ) observations. The gravitational potential V as the part of the gravity potential is parameterized by Adjusted Spherical Cap Harmonics (ASCH), enabling an efficient regional representation of the gravity field in a local spherical coordinate system. Compared to global spherical harmonic approaches, the ASCH formulation provides comparable spatial resolution with a substantially reduced number of model parameters, which is particularly suitable for regional gravity field modelling.

The proposed GMM based on ASCH parametrization is implemented in the DFHRS v5.x (Digital Finite-element Height Reference Surface) software developed at the Laboratory for GNSS and Navigation, Karlsruhe University of Applied Sciences. Terrestrial gravity observations are already implemented into the adjustment, while the astronomical vertical directions (Φ , Λ) related to the gravity field W are currently under implementation within the Gauss–Markov framework. Astrogeodetic vertical directions (Φ , Λ) are obtained by a digital zenith camera, as developed at the Institute of Geodesy and Geoinformatics, University of Latvia in 2016. In the adjustment, astronomical vertical directions (Φ , Λ) are used as observations. This formulation means – in opposite to the use of vertical deflection observations – in gravity field determination V a physically consistent and strict approach in the Gauss–Markov framework. In addition, a priori information on the spherical harmonic coefficients is introduced from global gravity field models to stabilize the parameter estimation and to account for long-wavelength gravity field components.

The study demonstrates that the combination of ASCH modelling and hybrid observation integration provides a robust framework for precise regional gravity field determination. This approach is particularly advantageous in regions with limited gravimetric coverage and highlights the scientific potential of high-precision vertical deflection observations for next-generation regional gravity field modelling.

Keywords: gravity field, gravity, quasi-geoid, vertical-direction, zenith-camera

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ON IMPACT OF ATMOSPHERIC ANOMALOUS REFRACTION AND INSTRUMENT ASSEMBLY DEFORMATIONS ON ASTROGEODETIC VERTICAL DEFLECTION MEASUREMENTS

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Proposed a simple model of impact of anomalous refraction and deformations of instrument assembly on astrogeodetic measurements of vertical deflection by a digital zenith camera. A calculation algorithm has been developed, allowing for estimation of magnitude and direction of the impact. Results of application of the algorithm are presented.

Keywords: astrogeodesy, vertical deflection, zenith camera, anomalous refraction

Acknowledgement: "Investigation of Anomalous Refraction Effect by Using Automated Digital Zenith Camera VESTA", funded by Latvian Council of Science Fundamental and Applied Research projects (No lzp-2024/1-0095)

GNSS ANALYTICAL RESEARCH AT THE INSTITUTE OF THE GEODESY AND GEOINFORMATICS

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Global navigation satellite systems (GNSS) have become a part of our daily life whether it is geodesy, sports, precise agriculture or just navigating from one point to another. GNSS (particularly GPS, GLONASS, BeiDou and Galileo) provide positioning, navigation and timing to millions even billions of users worldwide. But is it only about position, logistics and timing? And what really means timing in our life. How are power grids synchronized, how financial operations are linked together, where terrestrial communications get the precise time which is so crucial for their operation? It is far more than only navigation or getting precise coordinates for civil engineering or surveying. It's not about how dependent we are on GNSS but how dependent we are on all other what depends on GNSS. Radio signal interference is present in radio systems for a very long time if not since the very first radio system. GNSS signals, transmitted from medium Earth orbit satellites, are extremely weak. They are vulnerable to unintentional interference, atmospheric disturbances, and intentional interference attacks such as jamming and spoofing. Low-cost jammers can disrupt positioning services over wide areas, while spoofing techniques can manipulate receivers into calculating false positions or times. Since the full-scale invasion of Russia to Ukraine on February 24th, 2022, the intentional interference, especially on GNSS has grown enormously all over the Europe and is present in other regions as well. Currently the main affected areas are air and sea traffic, as it is easiest to jam or spoof. There have been several cases when airplane or ship onboard navigation systems have been compromised which have led to different unwanted situations. What happens if an on-land infrastructure (Cell towers, financial transactions, continuously operating Reference Stations) starts to fail due to the man-made interference? Are we ready for that, do we know how to detect and mitigate that? To better understand how the interference affects all above mentioned and other things, the Institute of Geodesy and Geoinformatics of the faculty of Science and Technology at University of Latvia in July 2025 started a postdoctoral research project with the aim to develop GNSS analytical research competency Centre. The objective of this project is to increase knowledge, skills and competences to provide society, business and legal bodies with independent, trustful and science-based information about, but not limited to, interference and its impact on GNSS and our lives.

Keywords: GNSS, RFI, Interference, Jamming, Spoofing, Satellite navigation

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GNSS-DERIVED ZENITH TROPOSPHERIC DELAY FOR NUMERICAL WEATHER PREDICTION ASSIMILATION OVER NIGERIA

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Accurate representation of atmospheric moisture is critical for reliable Numerical Weather Prediction (NWP), particularly over data-sparse regions such as West Africa. Global Navigation Satellite System (GNSS)-derived Zenith Tropospheric Delay (ZTD) provides high temporal resolution, all-weather observations that can complement conventional meteorological measurements. ZTD estimates from GNSS data are important parameters for assimilation into Numerical weather Models (NWM) or as input parameters for estimation of Integrated Water Vapour (IWV) over GNSS antenna. This study investigates the estimation of GNSS-derived ZTD over Nigeria and evaluates its suitability for assimilation into NWP models. Continuous GNSS observations from selected Nigerian GNSS stations (NIGNET) for the year 2011 were processed using Bernese 5.2 software, adopting double differencing techniques to derive ZTD time series. The GNSS-derived ZTD was validated against International GNSS Service (IGS) tropospheric products for three selected IGS stations (RABT, NOT1 and ADIS). The ZPD estimation shows the least ZPD value of 2233.771m at station *CGGT* (*now CGGN*) in the northern part of Nigeria while, the highest value of 2583.285m at *ULAG* in the southern part of Nigeria. The validation results indicate strong agreement between GNSS-derived and the reference ZTD values, with correlation coefficient (R^2) of about 0.99 at all the three reference stations and root mean square errors typically below 1mm. The findings highlight the potential of GNSS meteorology as a cost-effective solution for enhancing weather prediction capability over Nigeria and similar regions.

Keywords: Zenith Total Delay (ZTD), Integrated Water Vapour (IWV), Numerical Weather Prediction (NWP) model, Double-Differencing, Data Assimilation (DA).

PRELIMINARY ASSESSMENT OF THE STRESS-STRAIN STATE OF GEOLOGICAL ENVIRONMENT IN THE RADON FIELD AREA IN SIGULDA, LATVIA

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To study the relationship between radon anomalies and the tectonic structure of the ancient East European Platform, modeling of the stress-strain state (SSS) of the geological environment conducted. The study aimed to elucidate the relationship between radon Rn^{222} anomalies in the soil and the SSS parameters of the geological environment. In Latvia, radon Rn^{222} concentrations studied several times to determine its impact on human health. Radon Rn^{222} is not only a naturally occurring, radioactive, heavy, and inert gas that impacts human health, but also an effective and sensitive indicator of modern geodynamic activity and an earthquake precursor (Diaz & Liza, 2025). Changes in the stress-strain state of rocks lead to anomalous variations in radon concentrations in soil air, groundwater, and the surface atmosphere. Radon sampling conducted in various settings: in residential and workspaces, basements, soil, and groundwater. A 2014–2015 study (Gilucis, 2015) examined the influence of geological conditions, specifically the lithological composition of Quaternary sediments, on radon concentrations in soil. Radon levels assessed at three sites (Gilucis, 2015). A site near Sigulda was selected for this study. This site is located near the Inčukalns underground gas storage facility. Here, elevated radon concentrations and increased risk risk ($Rn_{min}^{222} = 10247 \text{ Bq/m}^3$, $Rn_{max}^{222} = 138010 \text{ Bq/m}^3$, $Rn_{ave}^{222} = 45852 \text{ Bq/m}^3$) were detected at points located near the Olaine-Inčukalns fault. The Olaine-Inčukalns fault is the only fault that has a thrust mechanism of the southeastern limb over the northwestern limb. At the level of Ordovician deposits, the overlap reaches 150 m. All other tectonic faults in Latvia have a normal fault character (Brangulis & Kanevs, 2002). Thus, the Olaine-Inčukalns fault probably formed in a different tectonic setting in the earth's crust. The tectonic fault model based on a set of input predicted parameters for the Sigulda region created in the Coulomb program. Some parameters (S_{Hmax}) were partially estimated in previous studies (Ņikuļins & Malytskyy, 2024), while other parameters were estimated using additional data, including InSAR remote sensing data. The results of the vertical surface displacement assessment are generally consistent with the type of tectonic structures (uplifts) previously identified in the study area. The most informative parameter assessed in this study is dilation. Dilation is the change in volume per unit of material. In other words, it is a measure of volumetric deformation, indicating how much a material expands or contracts. As the volume of material increases, increased fracturing of the geological environment and more favorable conditions for radon penetration from the depths to the surface are expected. Studies have shown that of the 21-radon monitoring sites in the Sigulda area, the highest concentrations found at sites 21S and 7S, which are located closest to the Olaine-Inčukalns fault. Radon

measurement site 21S is located near a small positive dilation anomaly indicating a tendency for the geological environment to expand. Map of tectonic faults, radon measurement sites, and dilation forecast in the Sigulda area.

Conclusions

1. Numerical stress modelling indicates that the orientation of the present-day stress field in the Eastern Baltic region ($S_{Hmax} \approx 115-125^\circ$) [3] is favourable for the reactivation of NE–SW striking faults.
2. OIF produces local perturbations in the stress field, resulting in zones of positive volumetric strain (dilatation).
3. Positive dilatation increases rock permeability and facilitates upward migration of radon.
4. The strongest radon anomaly observed near Sigulda (138 kBq/m^3) spatially coincides with a calculated zone of positive dilatation.
5. This spatial correspondence suggests that radon anomalies in the study area are controlled by the stress-strain state of geological environment associated with the fault system.
6. The results of the SSS modeling can be used to predict the location of radon anomalies.

Keywords: Stress-strain state, radon anomalies, East-Baltic region, Olaine-Inčukalns fault, thrust faulting, dilatation

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NETWORK RTK DEVELOPMENTS IN ESTONIA

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In Estonia, the use of network RTK have been in progress already more as 15 years. Initially, only GPS+GLONASS corrections were transferred. Later on, GALILEO and BEIDOU satellite systems have been added as well. The last enhancement increased survey efficiency on forest so much, that more as 95% cadastral jobs are made by GNSS devices only. The use of the own RTK base stations almost ended. There are 4 public real-time RTK networks in addition to Land and Spatial Development Board (previously State Land Board). Different networks are based to different devices. Company called as Geonovus uses Trimble equipment on about 20 base stations. Network called as MYNET uses CHCNAV GNSS devices and server from same provider. State Land Board has RTK reference stations based to Leica receivers, HADNET uses Topcon devices and software. The fifth RTN called THEK is founded due to ROAD construction jobs but covers whole country as well, correction stream is based to Septentrio receivers and SNIP software. All RTN has slightly different capabilities and there is a problem to achieve same results. This is a serious challenge how to guarantee direct connection to state geodetic network. Clearly can be seen that accuracy is dependent from the distance to base station, even in case of virtual reference point is used.

Keywords: real time GNSS networks

TIME-FREQUENCY ANALYSIS OF ATOMIC CLOCKS USING PPP

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This study presents an assessment of the stability and performance of atomic clocks within Global Navigation Satellite Systems (GNSS), focusing on the GPS, GLONASS, and Galileo constellations. The objective is to examine how differences in system architecture and signal processing affect the precision of time and frequency transfer in a combined multi-GNSS framework.

The analysis is based on the Precise Point Positioning with Ambiguity Resolution (PPP-AR) technique, implemented using PRIDE PPP-AR software (version 3.2). Data were processed in static mode using observations from two IGS reference stations equipped with high-stability atomic clocks. A continuous 108-day dataset from 2025 was analysed, supported by precise products from the Center for Orbit Determination in Europe (CODE), including satellite ephemerides, clock corrections, and signal biases.

A key methodological improvement involved modifying the stochastic model of the receiver clock. Instead of the standard white noise assumption, a random walk model was applied to better reflect the physical behaviour of atomic oscillators. Clock stability was evaluated using Modified Allan Deviation (MDEV) and Time Deviation (TDEV), while time–frequency analysis using Fourier band-pass filtering enabled identification of periodic components.

The results show that GPS and Galileo provide the highest consistency and long-term stability, while GLONASS exhibits greater variability and periodic fluctuations. Strong correlation between results from distant stations indicates that observed instabilities are mainly driven by global factors rather than local effects.

These findings confirm that all GNSS constellations can support high-precision timing applications, with GPS and Galileo offering the most stable reference for long-term frequency transfer.

Keywords: GNSS, TIME TRANSFER

SATELLITE-DERIVED CLIMATE HAZARD CHARACTERIZATION FOR VULNERABLE POPULATIONS: LINKING EARTH OBSERVATION SYSTEMS TO HEALTH OUTCOMES IN SUB-SAHARAN AFRICA

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Climate extremes represent a critical intersection of Earth system dynamics and human vulnerability. As atmospheric processes intensify under global change, satellite observation systems have become indispensable for characterizing environmental hazards at scales relevant to human exposure. This study demonstrates the application of Earth observation infrastructure, designed for monitoring planetary processes, to assess climate-related health risks among pregnant populations across Sub-Saharan Africa.

We leverage multiple satellite derived and reanalysis products to characterize the spatiotemporal dynamics of thermal and atmospheric hazards. The ECMWF Atmospheric Composition Reanalysis captures diurnal variations in near-surface temperature, particulate matter, nitrogen dioxide, and aerosol optical properties (Inness, A., et al. 2019). ERA5-Land reanalysis provides derived thermal stress indices integrating temperature, humidity and precipitation. Static geospatial layers characterize terrain morphology, soil geochemistry, climatic zones, and urbanization gradients (Hersbach et al., 2020).

By georeferencing individual health records to precise coordinates, we construct continuous exposure profiles spanning pre-conception, gestational, and postpartum periods, capturing each participant's unique spatiotemporal trajectory through the environmental hazard landscape. This longitudinal exposure characterization enables investigation of critical windows of vulnerability: How do first-trimester heat exposures relate to preterm birth? Do cumulative thermal stress patterns across gestation influence birthweight? Can spatial variation in atmospheric composition explain geographic disparities in adverse outcomes?

This framework transforms planetary scale satellite observations into individual-level exposure assessments across 57,000 pregnancies. By bridging Earth observation science and environmental epidemiology, we demonstrate how geospatial monitoring infrastructure can directly inform climate adaptation strategies for vulnerable populations, a critical frontier as climate hazards intensifies across the Global South.

Keywords: Earth observation, spatiotemporal analysis, climate hazards, exposure characterization, satellite monitoring, thermal stress, Sub-Saharan Africa

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IMPLEMENTATION AND EVALUATION OF THE REDESIGNED AMBIGUITY FUNCTION (RAF) AND THE NEW SAPOS. GEPOS STATE SPACE REPRESENTATION MESSAGES SSRZ FOR A HIGH POTENTIAL REALTIME PPP

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Precise Point Positioning (PPP) means a new era in GNSS positioning. PPP uses state space representative messages (SSR), derived from reference station data, but requiring a much lower density than for classical DGNSS OSR messages. The SSR messages comprise precise satellite orbits, different bias terms, satellite clock corrections, and further parameters for modelling atmospheric delays. A remaining problem for PPP standard algorithms is however the so-called convergence time of up to tens of minutes, needed for fixing the carrier-phase ambiguities requiring the estimation of improved atmospheric parameters (troposphere, ionosphere). This phase delays the time before getting precise coordinates. Another problem is the affection of classical PPP algorithms by cycle slips.

The work deals with the developed so-called redesigned ambiguity function (RAF). In opposite to the classical ambiguity function (AF), the RAF uses by the Euler-theorem the right side of the AF for the observation part, and respective cosine and sine terms. This leads to a Gauss-Helmert model (GHM) and further to a Gauss-Markov model (GMM) of a classical nonlinear adjustment.

As concerns the above SSR messages, the new SSRZ messages (State Space Representation Zipped) as new generation of open data, have been developed by the German company Geo++ in cooperation with the German Bundesamt für Kartographie und Geodäsie (BKG). The GNSS service titled SAPOS.GEPOS (<https://gepos.sapos.de/>) will start on 1-April-2026, by broadcasting free SSRZ messages.

The above RAF observation equations are integrated as first component, the new SSRZ messages as second component, and a general state prediction for all kind of parameters in PPP as third component of a Gauß-Markov-Model into the OS software RTKLIB. The classical ambiguity resolution method is improved and kept as alternative for the RAF in the first component of the new approach. The new algorithms and SSRZ messages are evaluated using different sets of real data.

Keywords: Precise Point Positioning (PPP), SAPOS.GEPOS GNSS Service, SSRZ Messages, Redesigned Ambiguity Function (RAF), Algorithm Implementation into the RTKLIB, Real Data Tests.

ANALYSIS OF THE CONDITIONS FOR DIGITAL REPRESENTATION OF HISTORICAL TOPOGRAPHY USING MODERN GEODETIC AND GEOMATIC METHODS. THE CASE OF TARNOWSKIE GÓRY

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This study presents an analysis of the conditions affecting the digital reconstruction of historical topography using modern geodetic and geomatic methods, based on the case of Tarnowskie Góry (southern Poland). The research focuses on the application of contemporary geoinformation technologies for the reconstruction of a modern spatial representation of terrain transformed by mining activity.

The aim of the study is to identify the factors influencing the process of digital representation of historical topography and to indicate the limitations and challenges arising from the specific nature of archival source materials. Historical maps, photogrammetric materials, and available archival documentation were analysed as the basis for further reconstruction work.

The paper discusses issues related to the digitization and georeferencing of historical maps, their transformation into contemporary spatial reference systems, and accuracy constraints resulting from scale differences and the lack of cartographic and photogrammetric uniformity. Differences between historical and modern methods of spatial data acquisition and processing are also examined.

The study presents the results of an attempt to collect and utilize archival cartographic and photogrammetric data for the digital documentation of areas of historical and post-industrial significance. At the same time, it highlights the role of modern geodetic and geomatic tools in research on historical and industrial heritage.

Keywords: historical topography, geodesy, cartography visualization, geomatic methods, georeferencing, GIS

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ASSESSMENT OF GEODETIC AND SMARTPHONE GNSS RECEIVERS FOR GNSS-IR MONITORING IN A PARKING GARAGE ENVIRONMENT

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GNSS Interferometric Reflectometry (GNSS-IR) utilizes multipath effects observed in signal-to-noise ratio (SNR) data to characterize nearby reflecting surfaces [1]. While geodetic receivers are commonly used for stable and repeatable GNSS-IR applications, e.g., [2], [3]. The growing availability of smartphones motivates the evaluation of low-cost devices for multipath-based environmental sensing, such as measuring the sea level using a tablet [4].

This study compares three geodetic receivers and two smartphones installed inside a parking garage in Kraków, Poland. The geodetic receivers were mounted on tripods at an antenna height of approximately 3.45–3.48 m above the garage floor, with a spacing of about 1.20 m between setups to ensure similar observation geometry while maintaining independent multipath footprints. Phone A was co-located with Receiver 1 and Phone B with Receiver 3. To isolate reflections from the garage structure, the analysis was restricted to low-elevation satellites (2° – 10°) within an azimuth sector of 120° – 240° , corresponding to the main reflecting area. The observation was conducted using the geodetic receivers for approximately 4 to 5 hours, while smartphones were used for about 2 to 3 hours. This took place over two consecutive days, Day of Year (DOY) 60 and DOY 61. On DOY 60, the garage area was relatively busy, whereas on Sunday, DOY 61, it was semi-empty.

SNR observations were detrended using a third-order polynomial with respect to elevation, and Lomb–Scargle spectral analysis was performed as a function of $\sin(\text{elevation})$ to estimate dominant interference frequencies and spectral coherence through peak-to-noise ratio (PNR). The geodetic receivers consistently exhibited sharp, stable spectral peaks with high PNR values and good repeatability between days. In contrast, the smartphones produced broader and more variable spectra, larger day-to-day shifts in dominant frequency, and lower PNR stability. Although both phones detected multipath oscillations within the garage environment, their GNSS-IR performance was less robust and repeatable compared to the geodetic systems.

Keywords: GNSS-IR; Reflections; Multipath; SNR

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DYNAMIC DISPLACEMENT MONITORING WITH CENTIMETER-LEVEL ACCURACY USING SINGLE-FREQUENCY SMARTPHONE GNSS

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The use of smartphone Global Navigation Satellite System (GNSS) observations for structural health monitoring and geodynamic applications has gained increasing attention since the introduction of raw measurement access in Android 7.0. However, the low quality of built-in linearly polarized antennas characterized by frequent cycle slips, strong multipath effects, and unknown phase center remains a major limitation for high-accuracy dynamic displacement monitoring. This study proposes a low-cost solution to enhance smartphone GNSS performance through the integration of an external antenna and a custom-developed \$10 multi-frequency GNSS repeater. The repeater wirelessly retransmits signals received by a low-cost external antenna to the smartphone's internal receiver without requiring any physical modification of the device. To validate the proposed approach, smartphones were tested under open-sky conditions through (1) a static zero-baseline experiment, (2) a comparative antenna assessment, and (3) controlled dynamic displacement experiments. Static results demonstrated significant improvements in signal quality, including reduced cycle slips and a stronger correlation between signal-to-noise ratio and satellite elevation. Using relative positioning techniques, root mean square errors (RMSE) of 3 mm, 8 mm, and 14 mm were achieved in the east, north, and up components, respectively, with a fix rate exceeding 90%. Furthermore, frequency-domain analysis of a dynamic experiment (± 13 mm oscillations at 0.2–0.5 Hz) confirmed that single-frequency smartphone observations reliably detect dominant oscillation frequencies below 0.5 Hz. Finally, the performance of the variometric approach for detecting low-frequency oscillations was evaluated. Despite cumulative drift effects requiring high-pass filtering, smartphone GNSS achieved an RMSE of 6 mm even without the external antenna. The results demonstrate that smartphones can achieve centimeter-level positioning accuracy while reliably detecting low-frequency dynamic displacements, highlighting their potential for low-cost structural health monitoring and geodynamic applications.

Keywords: Smartphone GNSS, variometric approach, Infrastructure monitoring, Geodynamics

HYBRID REMOTE SENSING AND GIS–MCDA FOR MUNICIPAL SOLID WASTE MANAGEMENT: A SPATIAL SUITABILITY ANALYSIS

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Landfilling remains one of the most widely used waste disposal methods in many low- and middle-income countries due to its relatively low cost, despite its significant environmental impacts. Therefore, the problem now turns to the selection of acceptable landfill areas while considering socio-economic factors. In our case study, waste management faces mounting challenges, as both the rising volume and complexity of solid waste driven by rapid economic growth and urbanization and inadequate landfill infrastructure, now nearing environmental limits, put increasing pressure on the system. In this context, selecting new landfill areas is not just necessary but crucial to ensuring sustainable urban development and protecting public health. This study introduces a hybrid remote sensing and GIS-MCDA (Geographic Information Science – Multi-criteria Decision Analysis) approach to enhance landfill site suitability assessments. Within this framework, a municipal solid waste landfill Index (MSWI) was developed and applied to combine multiple criteria into a single suitability measure, allowing for adaptation to different regional contexts and data conditions. This approach enables a more comprehensive evaluation of economic, environmental, topographical, and social criteria, thereby highly supporting the decision-making process. The results reveal a highly uneven spatial distribution of suitability across the study area, with only limited zones meeting the combined requirements for landfill development. Environmental criteria and distance-based buffer criteria play a dominant role in shaping the spatial pattern of suitability. The methodology demonstrated in this study is highly transferable and can be applied to other low- and middle-income countries that face similar waste management challenges. The proposed framework provides a widely applicable tool to support the selection of suitable sites for landfill construction in areas facing similar waste management challenges.

Keywords: Municipal, Solid waste landfills, GIS-MCDA, Remote sensing.

GEOSPATIAL MODELLING OF RISK SITUATIONS IN WASTEWATER TREATMENT PLANTS

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In the context of modern climate change and increasing urbanization, wastewater management systems face growing challenges. One of the most pressing issues is the occurrence of heavy rainfall – induced flooding, which significantly impacts the operation of wastewater treatment plants, threatening both infrastructure safety and environmental as well as public health [1]. This issue is increasingly relevant on a global scale including in Latvia where climate change has led to more frequent and intense precipitation events. According to the current situation, there is a lack of research in Latvia on geospatial modelling of floods caused by heavy precipitation and analysis of risk situations in wastewater treatment plants. In current research, geospatial data are mainly used to determine the flood zones of major rivers during spring flood periods, however, under the influence of rapid climate change, heavy precipitation can also reach strategically important infrastructure objects [2]. This study serves as an example of what geospatial data and tools can be used in risk modelling and planning of preventive measures. Geographic information systems (GIS) provide a powerful framework to analyse terrain data, water flow paths, infrastructure location, and other parameters crucial for flood prediction [3]. By integrating meteorological data, digital elevation models, and the physical characteristics of wastewater treatment plants, scenario – based flood risk simulations can be constructed. The modelling approach allows municipalities and emergency services to plan and implement timely mitigation of strategies [4]. The aim of the study is to assess the potential impact on the infrastructure of wastewater treatment plants and develop a geospatial model to analyse flood scenarios caused by heavy rainfall and develop preventive measures to reduce the risk. The tasks of the study include the development of a simplified hydrological model of the wastewater treatment plant “Daugavgrīva” and the generation of 3D simulations with four precipitation scenarios – 50 mm/m2, 100 mm/m2, 150mm/m2 and 200 mm/m2. LiDAR laser scanning data and orthophotos prepared by LGIA were used to complete the tasks.

Keywords: climate change, GIS, geospatial analysis, flood modelling

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LEVERAGING RADAR AND GNSS SATELLITES FOR LAND MOTION SURVEILLANCE IN TAIWAN

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A systematic monitoring framework grounded in advanced remote sensing is indispensable for robustly quantifying land-surface deformation. Sentinel-1, operating in the C-band Synthetic Aperture Radar (SAR) domain, delivers wide swath coverage and high temporal sampling, facilitating the routine generation of Persistent Scatterer Interferometric SAR (PSInSAR) products for quasi-continuous deformation monitoring. The resulting deformation-rate fields provide spatially explicit diagnostics of structural stability, thereby supporting condition-based inspection, lifecycle maintenance planning, and geohazard risk mitigation to strengthen infrastructure resilience. This study characterizes ground deformation across Taiwan over a five-year interval. A standardized PSInSAR processing workflow is implemented to derive an island-wide mean velocity map and delineate principal subsidence hotspots. To enhance geodetic rigor and physical interpretability, GNSS-based calibration and three-dimensional vector decomposition are incorporated to separate vertical and horizontal motion components. Identified hotspots are further analysed at the building scale to resolve seasonal displacement signals of individual scatterers. Independent validation with continuous GNSS stations demonstrates centimetre-level concordance. By enabling the timely identification of anomalous deformation trajectories, this PSInSAR-based framework establishes an operational basis for early warning, particularly when displacement rates exceed predefined engineering thresholds indicative of heightened structural vulnerability.

Keywords: remote sensing, Synthetic aperture radar, PSInSAR, structural stability assessment, Sentinel-1

COMPARATIVE ANALYSIS OF CORS GNSS NETWORKS FOR PRECISION AGRICULTURE IN UKRAINE, POLAND, AND HUNGARY

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Today, Global Navigation Satellite Systems (GNSS) play a crucial role across various sectors of the economy, ranging from transportation navigation to the monitoring of structural deformations in engineering projects. This paper examines continuous operating reference stations (CORS) GNSS networks in Ukraine, Poland, and Hungary, which are vital for providing automated and precise positioning of agricultural machinery. Advanced GNSS equipment can be integrated with real-time kinematic (RTK) correction services, achieving positioning accuracy within 2 centimeters for precise tractor navigation. The importance of GNSS equipment installed on machinery extends beyond the device itself; it also depends on the quality of the correction signals received, primarily via the NTRIP protocol, as well as the stability of the CORS networks. In Poland, the primary network for precision farming is the ASG-EUPOS network, and starting from 2022, all services offered by the ASG-EUPOS system are available free of charge. In Hungary, the active [GNSSnet.hu](#) network and the GNSS LTK KGO Service Centre provide network RTK corrections for satellite positioning, ensuring uniform accuracy and availability throughout the country. At the same time, this GNSS service is an official, announced by the Decree of the Minister of Land Affairs in 2013 for land cadastre works with legal force. Unlike Poland, this centre provides paid services. In Ukraine, there are multiple private and state GNSS networks, such as GeoTerrace, SystemNet, ZakPos, among others. Some agricultural enterprises also independently install their own CORS GNSS stations. While efforts are made to monitor network stability through geodynamic and other assessments, the frequent instability of GNSS equipment installations – especially in private networks – can lead to decreased accuracy in the movement and positioning of agricultural machinery. Another obstacle faced by farmers in Ukraine has been the wartime issues of signal jamming and spoofing, prompting them to enhance their navigation equipment to function effectively under such conditions. The effectiveness of GNSS technology in Ukraine, Poland, and Hungary relies heavily on the stability and quality of their respective CORS networks and correction services, which are essential for achieving precise positioning in agriculture.

Keywords: GNSS, CORS network, Precise agriculture, RTK

GLOBAL ANALYSIS OF ANNUAL AND SEMI-ANNUAL CHANGES IN GNSS REFERENCE STATION COORDINATES

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The presentation shows a global analysis of annual and semi-annual changes in the coordinates of permanent GNSS reference stations. The aim of the study is to identify the scale of the largest amplitudes for each component and to describe them quantitatively on a world map. The analysis uses long-term, daily solutions from reference network stations spanning different climate zones and geographic locations. The coordinate data underwent preliminary quality control, accounting for missing data, jumps, and offsets. Seasonal components with annual and semi-annual frequencies were separated from the long-term trends. The results are presented globally, regionally, and broken down into N, E, and U components. The amplitude distribution reveals clear spatial variation; no major correlations were found between changes unrelated to tectonic plate movement, only individual behaviour at specific stations.

Keywords: GNSS, annual and semi-annual coordinate variations, tectonic plate movement, GNSS time series

IONOSPHERE OBSERVATION USING RADIO TELESCOPES

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The ionosphere is a highly dynamic and variable region of near-Earth space, extending from approximately 50 to 1,000 kilometres above Earth's surface. It forms when solar ultraviolet and X-ray radiation ionize the upper atmosphere, creating a partially ionized plasma that strongly influences radio communication, satellite navigation, and astronomical observations. Due to its complex and rapidly changing nature, the ionosphere presents significant challenges both for scientific research and for technological systems that depend on reliable radio wave propagation. Ionospheric variability occurs across a wide range of spatial and temporal scales. Fluctuations can develop within seconds to minutes and range from small-scale irregularities to large plasma structures. These disturbances cause effects such as scintillation, phase delays, and signal distortion, which degrade radio signals and reduce the accuracy of communication and navigation systems. Traditional diagnostic instruments – including ionosondes, incoherent scatter radars, and satellites – provide essential measurements of ionospheric conditions. However, they often lack the spatial or temporal resolution required to fully capture small-scale irregularities and short-lived phenomena. In recent years, radio telescopes have emerged as powerful complementary tools for ionospheric sensing. In particular, the Low Frequency Array (LOFAR) offers unique capabilities for monitoring ionospheric dynamics. By observing fluctuations in celestial radio signals caused by ionospheric irregularities – such as scintillation and Faraday rotation – LOFAR enables detailed characterization of turbulent plasma density fluctuations and larger plasma structures that affect radio wave propagation. The Latvian LOFAR station, located at high latitude within the northern hemisphere trough region, provides a strategically important vantage point for studying ionospheric phenomena under diverse space weather conditions. Its broadband frequency coverage, high sensitivity, and flexible observing modes allow for comprehensive investigations of both small-scale turbulence and large-scale plasma dynamics, many of which are difficult to detect with conventional instruments. Recent advances in instrumentation, signal processing, and calibration techniques have significantly improved the precision with which ionospheric parameters – such as Total Electron Content (TEC), plasma drift velocities, and wave activity – can be extracted from radio observations. These developments enhance our understanding of the physical mechanisms driving ionospheric irregularities and turbulence. Improved characterization, modelling, and forecasting of ionospheric behaviour are essential for mitigating the impacts of space weather on communication systems, satellite navigation, and radio astronomy. Leveraging radio telescopes such as LOFAR as ionospheric sensors represents a promising and innovative approach to advancing both fundamental scientific knowledge and the protection of critical technological infrastructure in the near-Earth space environment.

Keywords: Ionosphere, Radio telescopes, LOFAR, Total electron count, space weather

3.5. sekcija. **DIGITĀLIE DVĪŅI UN SKAITLISKĀ
MODELĒŠANA TEHNOLOĢIJĀM UN
VIDEI /**

**DIGITAL TWINS AND NUMERICAL
MODELLING FOR TECHNOLOGY
AND ENVIRONMENT**

SIMULTANEOUS 2D PHASE & VELOCITY FIELD MEASUREMENTS FOR HELE-SHAW BUBBLE FLOW IN LIQUID METAL

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Bubble flow in liquid metal is ubiquitous in modern industry, and is crucial in processes like continuous casting, liquid metal alloy stirring and purification, liquid metal-based chemical reactors, and more [1,2]. Magnetic control of bubble flow in liquid metal enables tailoring the process dynamics, but currently the unresolved practical problem is how exactly to apply magnetic field for bubble flow control to achieve desired outcomes, i.e., purer produced metal, greater reactor efficiency [1,2]. The underlying issue is that fundamental properties and physics of magnetohydrodynamic (MHD) bubble flow are not yet sufficiently understood, especially how magnetic field magnitude and orientation affect collective dynamics of bubbles [1,2]. One of the reasons is the lack of experimental methods enabling more direct comparisons between downscaled model systems with bubble chain flow typically used in the field against numerical models [2]. Phase imaging, i.e., bubble/metal phase segmentation, has been accomplished using X-ray [3], neutron [4] and more recently optical imaging [5]. Ultrasound Doppler velocimetry (UDV) is widely used for velocity field measurements in liquid metal [6,7]. However, concurrent phase and velocity field measurements for bubble flow in liquid metal have not yet been used for full reconstruction of both phase and velocity field in an experimental setup – critical for a more in-depth physical characterization and understanding of MHD bubble flow, as well as for direct validation of numerical models used for industrial process design and optimization. With this contribution, a method for simultaneous two-dimensional phase and velocity field measurements for Hele-Shaw MHD bubble flow in liquid metal is presented. Bubbles are visualized and detected using an optical imaging system combining backlight and sideways illumination, which exploits reflections off the metal meniscus formed at bubble boundaries for bubble shape reconstruction. The developed image analysis solution enables tracking bubbles and resolving their collective dynamics. The UDV setup augments the optical imaging system and delivers sparse measurements of the velocity field. Divergence-free interpolation, incorporating boundary conditions for metal vessel walls and bubble/metal phase boundaries, acts as a physics-based super-resolution technique that recovers the full two-dimensional velocity field. We present the current state of development for the proposed methodology, including numerical models used for design of experiments, and outline future work, and potential extensions beyond Hele-Shaw bubble flow.

Keywords: liquid metal, magnetohydrodynamics, bubble flow

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SHAPE & COLLECTIVE DYNAMICS IN GEOMETRICALLY CONFINED MHD BUBBLE FLOW

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Bubble flow in liquid metal has several applications, e.g. in metallurgical processes, such as metal stirring, purification and homogenization, in liquid metal-based chemical reactors, etc. [1]. However, bubble flow exhibits complex collective dynamics, and therefore appropriate experimental methods are necessary to study the underlying physics in hopes of ultimately optimizing industrial processes. One usually experiments with downscaled (via similarity criteria) systems of interest and using low melting point model liquids and inert gases [1]. One of the prospective contactless methods for bubble flow analysis is the high frame rate dynamic X-ray radiography (XR), which has been successfully validated both experimentally [2] and in silico [3]. XR allows direct observations of gas/liquid phase boundaries, enabling in-detail analysis of bubble shape dynamics and collective behavior. Bubble breakup [4], coalescence [5] and agglomeration are of special interest, but thus far XR studies have been limited to qualitative analysis due to challenges related to image processing [4, 5, 6]. Here, we present our bubble detection, tracking, shape analysis and deformation rate measurement methods. Bubbles are detected from X-ray images via background, dark current and artifacts corrections, followed by a segmentation algorithm combining global detection and local shape estimation refinement, which help resolve thin metal films between bubbles and accurately determine bubble interaction timings. Bubbles are then tracked using our MHT-X code, enabling reconstruction of collective dynamics. Shape analysis based on camber line and principal chord reconstruction allows quantifying bubble shape dynamics and to study breakup events. Further, combining MHT-X with principal component analysis (PCA) and our newly developed 2-way consistent Farneback with Singular Value Decomposition (2WCF-SVD) code for optical flow velocimetry, we measure bubble boundary deformation rates. Applicable to most types of bubble shapes, these tools are employed to study the effects of flow confinement, gas flow rate, and applied magnetic field on bubble collective dynamics in liquid metal. We express these dependencies in terms of relevant dimensionless numbers and provide a practical demonstration of the concept of magnetic control of bubble flow in liquid metal.

Keywords: X-ray radiography, bubble tracking, optical flow velocimetry

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2WCF-SVD: 2-WAY CONSISTENT FARNEBACK WITH SVD-BASED ARTIFACT FILTERING FOR MULTIPHASE OPTICAL FLOW VELOCIMETRY

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Multiphase flow is omnipresent in natural and industrial physical processes and includes flow classes like particle-laden fluid flow, bubble and droplet flow, as well as flow of miscible phases [1]. Examples in industry include particle- and bubble-laden liquid metal flow in metal alloy stirring, purification, continuous casting, and more [2]. When assessing multiphase flow, including in model systems for research purposes, a common problem/objective is to reconstruct the flow field given some experimentally measured observable or flow tracing objects [3]. To this end, there are three most employed classes of methods – optical flow velocimetry (OFV) [3], particle image velocimetry (PIV) [4], and particle tracking velocimetry (PTV) [5]. In many cases, however, tracers that PIV and PTV rely on are either not contrast enough, or simply not present in the system, in which case OFV is the only viable option of the three. While there are plenty of OFV types and implementations [3,6-8], many if not most are difficult or infeasible to apply to cases with low and/or strongly variable signal-/contrast-to-noise ratio (SNR/CNR), experiments with systems exhibiting generally fast motion and a broad spectrum of fluid and object velocity. In papers introducing the methods, they are often tested on sequences of high quality, clear images. Here, we present the current state of development of our optical flow pipeline designed to handle low SNR/CNR cases with (dynamic) artifacts, where the images may further be affected heavily by prior image filtering or enhancement. Our approach is based on the parallelized implementation of the Gunnar-Farneback method [9], which uses polynomial expansion of the image luminance and image pyramids for robust multiscale motion estimation. We augment it with a flow field filtering routine based on two-way optical flow consistency estimation, which produces a weight-averaged velocity field based on derived confidence and applicability scores. We further assist the optical flow algorithm by pre-filtering images for static/dynamics artifacts using vectorized 3D SVD (singular value decomposition) for the spatiotemporal 3D image (stacked image sequence), identifying and eliminating artifact-containing 3D basis images from the SVD reconstruction via Fourier analysis. We demonstrate the performance of our code (open-source) on several cases of varying difficulty: neutron imaging of droplet/liquid impact and mixing; solutal convection in X-ray imaged binary alloy solidification [10]; red blood cell flow [11]; neutron imaging of particle flow in liquid metal [4]; magnetohydrodynamic bubble flow in liquid metal [12], and more, showcasing the enabled physical analysis and validating our approach.

Keywords: optical flow velocimetry, multiphase flow, SVD filtering

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DC PLASMA–CHEMICAL ENHANCEMENT OF METHANE COMBUSTION IN A GTE CHAMBER

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This work presents a parametric CFD study of plasma–chemical activation influence on methane combustion in a swirl-stabilized GTE combustion chamber, where the effect of a DC arc discharge plasma–chemical element is modeled via empirical reduction of the activation energy of oxidation reactions for five volume fractions of plasma–chemical products ($\beta = 0 - 0.02$). The simulations confirm progressive CO emission reduction and expansion of the stable combustion zone with increasing β , while NO_x levels remain virtually unchanged. The obtained CFD dataset is used to train a multilayer-perceptron neural-network surrogate that reproduces these dependencies with high accuracy, enabling rapid construction of stability maps and power–efficiency trade-off curves for engineering optimization.

Keywords: plasma-assisted combustion, methane combustion, CFD

PHYSICS-INFORMED GRAPH NEURAL NETWORK FOR FAST THERMAL PREDICTION IN INDUCTION HEATING

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Induction heating needs fast EM–thermal simulations for control and optimisation. The Finite Element Method is accurate but costly. In this paper, we propose a physics-informed GNN for transient heat modelling on unstructured meshes and a physics-informed EM surrogate that predicts A and Φ in the frequency domain. Each model is validated against FEM on representative geometries. The thermal model predicts multi-step rollouts. We target robust physics-informed graph learning for transient thermal fields and a pathway to coupled EM–thermal prediction suitable for industrial induction heating.

Keywords: graph neural network, induction heating, surrogate modeling

MODELLING OF AN EM PUMP AND LOOP COUPLING FOR CAVITATION ONSET PREDICTION

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Neutron sources are crucial devices for material science, neutronography, medical applications, and other important studies. One way to generate neutrons is to bombard a target material with high-energy protons. One such material is ${}^7\text{Li}$, which melts at 180 °C and can be used as a target in the liquid phase. Liquid metal targets have major thermophysical advantages due to their very low Prandtl number. This property also makes them excellent coolants for high heat fluxes when circulated in a loop with organized heat removal. However, several hydrodynamic problems arise in such designs, for example, the stability of a free-surface flow and low pressure at the pumps inlet, which can lead to cavitation, malfunction, and damage to the entire device if neglected. In this work, we present a numerical model of an electromagnetic (EM) pump coupled with an external loop to estimate the pressure distribution and predict cavitation onset in order to characterize the safe operating conditions of such a system.

Keywords: electromagnetic pump, cavitation onset, liquid metal loop

TOWARDS A DIGITAL TWIN IN CRYSTAL GROWTH: CORRECTING OPTICAL RADIUS MEASUREMENT BIASES

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Accurate real-time radius determination is critical for controlling the crystal growth process. In the specific setup utilized for this study, an optical camera is used to capture the illuminated meniscus. As explained by Bergfelds et al. [1], the image is then post-processed to obtain the radius value in pixels, and a linear calibration function is used for the pixel to millimeter transition. The measurement error for this setup is estimated to be approximately 0.2 mm [1], but the methodology used to calculate this figure is omitted. Consequently, the true measurement bias caused by unaccounted meniscus height changes and melt level drops remains unknown. To address this gap, this study replicates the experimental conditions to perform an in-depth radius calibration and evaluate the measurement error. The research focuses on obtaining the calibration function and optimizing radius detection parameters. To achieve this, 3D crystal models with varying radii were printed and attached to the crystal puller to allow the system to detect the radius. Orthogonal Distance Regression (ODR) was performed on the extracted data points to formulate an accurate linear calibration equation and account for observational errors. Furthermore, an automated sweep algorithm was developed to determine the optimal input parameters required by the system's built-in radius detection script. The radius measurements obtained using these optimized parameters are being compared against an in-development Machine Learning (ML) model, which aims to provide faster data processing and better accuracy than the existing framework. Ultimately, the study establishes a new calibration and provides a rigorous assessment of the actual measurement error within the experimental setup. By determining the true baseline error of the linear calibration through ODR, automated constant derivation, and preliminary ML model evaluation, the results yield a newly quantified error evaluation that supersedes the previously estimated 0.2 mm threshold.

Keywords: digital twin, crystal growth, radius calibration

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CALIBRATION OF THE MATERIAL PROPERTIES OF BBO AND NATRIUM OXIDE MIXTURE

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BBO crystals are used in laser technology due to their nonlinear optical properties and electro-optical properties, e.g., frequency doubling or frequency tuning. Their possible applications, among others, are space-based Lidar systems, high-precision space debris laser ranging and point-to-point communication systems. For strategic reasons (independence from non-European manufacturers), the production of BBO crystals has been initiated in Vilnius, Lithuania. The numerical modelling is useful to support high-purity crystal growth. BBO crystals are grown from liquid BBO-Na₂O solution. A part of the process model is convective heat and mass transfer in the crucible. However, the literature data on material properties of this mixture, such as heat conductivity, viscosity, thermal expansion coefficient and Marangoni coefficient is scarce and uncertain [1]. In addition, when these values were used, the solution flow simulations for a simplified crucible geometry did not correspond the experiments – temperature distribution on the free surface and inside the crucible. Therefore, the inverse problem has been posed – to find the BBO-Na₂O solution properties for a given BBO mass percentage by running multiple simulations sets. To accelerate the process of simulation preparation and parameter search, an LLM has been used. After multiple manual and AI-assisted optimization runs, a parameter set has been obtained that describes the experimental results reasonably well.

Keywords: BBO crystal growth, inverse problem, numerical modelling

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LOCAL TRANSIENT SIMULATIONS OF FEED ROD MELTING DURING FLOATING ZONE SILICON CRYSTAL GROWTH

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High purity silicon single crystals can be obtained using the floating zone (FZ) crystal growth method, which consists of high-frequency electromagnetic induction heating of a polycrystalline silicon feed rod and the subsequent pulling of the monocrystalline material from the obtained melt. The molten silicon creates a thin melt layer on the surface of the feed rod and flows downwards to create the bulk melt. However, the melting process is not uniform, and irregular structures can appear on the surface of the feed rod, influencing the flow inside the thin melt layer. These local effects of the feed rod melting have an impact on the large-scale FZ process simulations, which are necessary for process optimization. The present study showcases results of a time-dependent multiphase flow model, which is based on the Volume-of-Fluid method within OpenFOAM software. Melt flow inside the thin layer is coupled with electromagnetic field simulations. The main goals of the presented research are to investigate the process of the breaking of the thin fluid film, to describe its evolution in time, and to evaluate the stability of the system under different conditions. The developed model uses previously published quasi-stationary simulation results as the initial conditions. Simulation results show sensitivity to boundary conditions and highlight the requirement for additional stabilization techniques, such as artificial viscosity increase near the melt-gas interface. However, a qualitative agreement with the previously used analytical model of melt layer thickness is reached in a system parameter range that represents the typical FZ crystal growth process. Simulations with realistic interface geometry show that a stable solution is reached and melt flow is re-established even in case of melt layer breaking.

Keywords: floating zone crystal growth, OpenFOAM, Volume-of-Fluid method

REAL-TIME MODELING OF COMET DUST TAILS IN THE BROWSER WITH WEBGPU

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The shape of a comet dust tail contains information about the particle size distribution, the history of particle ejection, and the influence of solar radiation pressure. In this work, an interactive comet dust tail simulation was developed that runs in a web browser and uses *WebGPU* to model several million particles in real time. The simulation is available at: https://dot361.github.io/comet_tail_simulation/

The calculations are based on the *Finson–Probstein* model, using the parameter β to construct synchrones and syndynes, which allows direct comparison of the simulated tail geometry with observations. The system architecture separates three main stages: (1) dust emission, (2) propagation of particle trajectories, and (3) visualization on the GPU side, thereby ensuring high performance and parametric interactivity.

Validation was carried out on several levels: (i) by comparing the generated synchrones and syndynes with the model implemented in the *sbpy.dynamics* library, (ii) by comparing tail position angles with *COBS* data, and (iii) by comparing the simulation overlay with telescope images from the *IRSA MOST* archive. The results show that the browser-based simulation is consistent with the observed geometry of comet dust tails and can serve as a useful tool for research.

Keywords: comet dust tail, WebGPU, real-time simulation

3.6. sekcija. **KOGNITĪVĀS SISTĒMAS UN
TEHNOLOĢIJAS /**
**COGNITIVE SYSTEMS AND
TECHNOLOGIES**

VISUAL-SPATIAL SKILLS IN CHILDREN WITH AND WITHOUT FUNCTIONAL IMPAIRMENTS

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Our study investigates visual-spatial abilities in children and adolescents with and without functional limitations, focusing on participants enrolled in special education programs (education code 58) and a typically developing control group. A total of 93 participants from cities across Latvia were divided into two age groups (12–14 and 15–18 years). The study combined standardized visual-spatial tests assessing mental rotation, mental transformation, and perspective-taking (reflecting allocentric and egocentric spatial processes) with eye-tracking measures of stimulus-driven visual attention. Across both age groups, the special education group demonstrated significantly lower performance in mental rotation and perspective-taking tasks compared to controls. Strong associations between rotation and perspective-taking were observed, particularly in the special education group. Eye-tracking results revealed shorter and more frequent fixations, more heterogeneous scanning patterns, and weaker sensitivity to visual accent among participants in the special education group, suggesting differences in stimulus-driven attention. No consistent gender effects were found, and age was not a significant predictor of performance within groups. Engagement in active hobbies (e.g., sports, dance) was positively associated with visual-spatial performance. The findings highlight systematic differences in visual-spatial processing and stimulus-driven scan strategies, emphasizing the importance of integrating spatial training and active engagement into educational and training contexts.

Keywords: visual-spatial abilities, eye-tracking, functional impairments, special education

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THE GENEVA EMOTION WHEEL IN LATVIAN LANGUAGE: THE RELATIONSHIP BETWEEN THE INTENSITY, DURATION AND OTHER FACTORS OF EXPERIENCED EMOTIONS AFTER THE SHORT MINI GRID

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The Geneva Emotion Wheel (GEW) is a widely used theoretically and empirically valid self-report instrument for assessing emotional reactions, featuring 20 discrete emotion families arranged in a bidimensional circular structure based on valence and control dimensions (Scherer et al., 2013). The digital Geneva Emotion Wheel enables a flexible and user-friendly real-time data collection across different contexts. Within the framework of this study, the Latvian language adaptation process included the translation of emotion words and the short Mini GRID questionnaire (16 questions for assessing emotions) from Latvian to English and backwards, so that the resulting translations could be used in the subsequent The Geneva Emotion Wheel validation process. The current study (N = 241) investigated associations between self-reported emotion intensity, duration, and ratings on other scales of the Mini GRID questionnaire for four randomly assigned emotions. Results indicate that higher intensity is strongly correlated with several scales of the Mini Grid questionnaire, whereas self-assessment of emotion duration is strongly linked to intensity, suggesting intensity as a core driver of emotional experience duration.

Keywords: emotions, emotion assessment, Geneva Emotion Wheel, valence, intensity

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AI-BASED COGNITIVE-AFFECTIVE AND NEUROMUSCULAR MONITORING FOR STRESS RECOVERY IN ATHLETES: A PILOT STUDY

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This pilot study examined the application of artificial intelligence-based facial emotion recognition, alongside neuromuscular performance assessment, to monitor stress recovery in athletes. Ten Taekwondo athletes (Cryosauna: $n = 5$; Control: $n = 5$) completed a 2-week intervention. Cognitive-affective responses were assessed using FaceReader analysis, while neuromuscular performance was evaluated via countermovement jump (OptoJump), isokinetic knee flexion and extension, and Determination test of Vienna test system. Change scores (post-pre) were compared between groups using Welch's independent samples t-tests. The Cryosauna group demonstrated significantly greater increases in happiness, $t(6.60) = 2.95$, $p = 0.02$, $d = 1.87$, and valence, $t(6.31) = 2.46$, $p = 0.04$, $d = 1.55$, compared to the Control group. No significant between-group differences were observed for countermovement jump performance, $t(6.87) = 0.62$, $p = 0.55$, isokinetic knee extension, $t(7.35) = 0.09$, $p = 0.92$, knee flexion, $t(7.80) = 1.13$, $p = 0.29$, or Determination Test, $t(5.67) = 1.33$, $p = 0.23$. These findings suggest that artificial intelligence-based cognitive-affective monitoring may be more sensitive to short-term modulation of stress recovery than neuromuscular performance measures. Larger-scale studies are warranted to confirm these preliminary observations.

Keywords: AI, stress, recovery, emotion, athletes

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COGNITIVE TUNNELING IN HUMAN-MACHINE SYSTEMS: A CRITICAL REVIEW OF DETECTION METHODS, THEORETICAL FRAMEWORKS, AND EMERGING CHALLENGES

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Cognitive tunneling, defined as the maladaptive allocation of attention to a single information channel or task goal for longer than optimal (Wickens & Alexander, 2009), remains a critical threat to human performance in safety-critical domains, from aviation to emergency medicine and unmanned aerial vehicle operations. This paper presents a critical review of the current literature on cognitive tunneling, examining theoretical foundations, detection methods, and unresolved challenges. The review contrasts classical models of attentional narrowing with contemporary accounts grounded in predictive processing (Clark, 2013), analyzing how hierarchical prediction mechanisms create vulnerability to tunneling. We examine recent evidence that post-decisional confidence modulates the neural accumulation of evidence, selectively gating disconfirmatory information and thereby sustaining the tunneling loop (Rollwage et al., 2020), bridging the gap between perceptual and decisional accounts of the phenomenon. Current detection approaches relying on eye-tracking metrics, physiological measures, and machine learning classification are critically evaluated, including formal detection methods combining oculomotor and cardiac indicators (Régis et al., 2014), while recent replication attempts reveal accuracy rates near chance level for tunneling-specific classification (Rankova, 2023). Three key gaps are identified: the lack of reliable methods to distinguish pathological tunneling from adaptive attention focusing; the neglected role of procedural memory in tunneling susceptibility; and the near-complete absence of research on tunneling in unmanned aerial vehicle operations, despite high operator cognitive workload in this rapidly expanding domain. We conclude by discussing the limits of current linear classification models for capturing the dynamic nature of tunneling transitions, and propose that nonlinear modelling approaches deserve investigation, informed by an ongoing qualitative study of drone operator experience.

Keywords: Cognitive tunneling, drone operations, predictive processing, multimodal detection, procedural memory

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EXPLORING THE INFLUENCE OF SOCIAL PROOF IN THE ADOPTION OF ALIPAY TRANSPORT CODE IN CHINA

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Mobile public transport services in China have rapidly evolved alongside smartphone adoption, exemplified by the Alipay Transport Code launched by Alipay under Alibaba in 2017. Despite reaching over 200 million users across more than 320 cities by 2019, limited research has examined the determinants of its adoption. To address this gap, the study investigates the factors influencing Chinese commuters' attitudes and behavioral intentions toward using Alipay Transport Code. The research applies the Technology Acceptance Model (TAM) developed by Fred Davis and extends it by incorporating the principle of Social Proof to better explain user behavior in a collectivistic cultural context. Using purposive sampling, data were collected through an online survey targeting Chinese commuters with prior experience using the service. Structural Equation Modeling results confirm the validity of TAM in explaining mobile ticketing adoption and demonstrate that perceived ease of use, perceived usefulness, and social proof significantly influence users' attitudes and behavioral intentions. Perceived ease of use positively affects both perceived usefulness and attitude, while perceived usefulness exerts a stronger direct influence on behavioral intention than attitude itself. Notably, social proof significantly and positively impacts both attitude and intention, suggesting that collective behavior strongly shapes technology adoption in China. Overall, the findings contribute to technology acceptance research and provide practical insights for mobile ticketing development in the Chinese context.

Keywords: User Acceptance, Alipay Transport Code, Technology Acceptance Model, Social Proof

BEYOND THE FACE: THE ROLE OF AESTHETIC “ADD-ONS” IN ACTIVATING GENDER AND COMPETENCE STEREOTYPES

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Social categorization heavily relies on immediate visual cues, which can form the basis of pervasive biases such as the Gender-Science Stereotype (GSS). This study investigates how modifiable facial features, termed “Gender Enhancers” (GE), such as makeup and facial hair, alongside hair color, length, and glasses, modulate perceived competence and modulate GSS. In this experiment, 90 participants evaluated 144 systematically modified face photographs of male and female targets. Participants rated the likelihood on a 10-point scale of each depicted individual authoring either a scientific abstract or a novel plot. A significant gender gap emerged, with male targets rated as highly probable authors for scientific texts compared to literature, while female targets showed no such advantage in either domain. Increasing the intensity of GE amplified these gender biases: heavier makeup linearly decreased perceived competence scores in women, whereas thicker beards increased competence scores in men. Additionally, a distinct effect emerged for blonde stimuli, which resulted in the lowest overall competence, for women depicted with long blonde hair combined with heavy makeup. This blonde bias has been found in men as well, which was previously overlooked in the literature. These findings demonstrate that low-level visual features and their contrast heavily modulate high-level social judgments. GSS remains present and is significantly reinforced by gendered aesthetic “add-ons”.

Keywords: Gender-Science Stereotype, Visual Perception, Makeup, Blonde Bias

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THE ROLE OF TIME ORIENTATION AND SUPERSTITION IN ATTITUDES TOWARDS SUSTAINABLE ECONOMY IN LATVIA

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This study examines how time orientation and superstition shape attitudes toward sustainable economy models (Green growth (GG), Degrowth (DG), and Circular economy (CE)) among economically active individuals in Latvia. Using a quantitative survey (N = 423) and structural equation modeling, the research evaluates both direct and moderated effects of cognitive time focus and superstitious beliefs on support for GG, DG, and CE. Time orientation has limited explanatory power in predicting attitudes toward GG, DG, and CE. Superstition displays a consistent and statistically significant negative relationship with attitudes toward CE, particularly among respondents with pre-tertiary education. Across all models, altruistic and biospheric value orientations, younger age, higher income, and openness to experience emerge as the most robust predictors of positive attitudes toward sustainable economy concepts.

Keywords: Green Growth, Degrowth, Circular Economy, time orientation, superstition, structural equation modelling

SPATIAL CORRESPONDENCE BETWEEN HUMAN FIXATION PATTERNS AND DEEP SALIENCY PREDICTIONS ACROSS VISUAL SCENE CATEGORIES

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Understanding the extent to which computational saliency models reproduce the spatial organization of human visual attention remains a central question in vision science and computational modeling. The present study investigates how perceptual grouping mechanisms influence the alignment between human visual attention and deep saliency predictions across selected categories of the CAT2000 dataset. To address this question, human eye-tracking data were analyzed and compared with saliency maps generated by the DeepGazeII model. The analysis examined whether dominant grouping cues – ranging from low-level feature-based organization (Pattern, Fractal), to object-centered grouping (Object), and high-level semantic and interaction-based grouping (Action, Social) – are similarly reflected in computational attention mechanisms. Area Under the ROC Curve (AUC) and Pearson correlation coefficients were used as quantitative measures of similarity between human fixation patterns and model predictions. The results reveal systematic, category-dependent differences. Higher AUC values in the Action, Object, and social categories indicate that DeepGazeII effectively predicts fixation locations in semantically rich scenes containing meaningful entities and interactions. In contrast, the Pattern and Fractal categories show lower and more variable AUC scores, suggesting weaker predictive performance for abstract or highly regular visual structures. Pearson correlation coefficients remain consistently low across categories, highlighting a discrepancy between fixation-level agreement and the global spatial organization of attention. Overall, these findings contribute to a clearer understanding of the relationship between human gaze behavior and deep computational models of visual saliency, emphasizing the role of perceptual grouping and semantic structure in shaping spatial attention.

Keywords: Visual Attention, Perceptual Grouping, Computational Saliency.

NEURODEGENERATIVE CONSTRAINTS ON DIFFERENT LEVELS OF COGNITIVE PROCESSING

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Neurodegenerative impairments impact perceptual and cognitive processing on different levels. However, the neurodegenerative constraints are not equally strong on each of the levels. Our study considers the demographic profiles and matches patients of Parkinson disease $n = 25$ with control $n = 21$; Huntington disease ($n = 14$) with control ($n = 13$), and links the results from visuo-spatial tests, language processing, and midlevel vision with the MRI scans. Our results indicate that higher level cognitive processing (e.g., language and categorization) is relatively intact in an early-stage neurodegeneration, while visuo-spatial processes are moderately and perceptual (midlevel vision) processes are significantly impaired. Differences between Huntington and Parkinson patients will be discussed.

Keywords: Neurodegenerative impairments, Perception, Visuospatial Abilities, Parkinson Disease, Huntington Disease

Funding: Fundamental and Applied Research project “Development of an integrative approach to the assessment of cognitive abilities in patients with neurodegenerative diseases of the central nervous system” (project No. lzp-2022/1-0100)

COGNITIVE FATIGUE AS A MULTI-DIMENSIONAL CONFIGURATION OF COGNITIVE, PERCEPTUAL, AND EMOTIONAL FACTORS

Solvita Umbraško, Līga Zariņa, Jurgis Šķilters, Marina Pavlova, Agne Berga, Jēkabs Vanags

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Fatigue impacts a variety of cognitive functions and raises discussions about its role in the burn-out conditions and depression. At the same time, it is not clear what is the causal structure and definitional scope of fatigue. Our study describes a framework, its core variables and some preliminary results, attempting to cover dimensions of fatigue representing (a) perceptual and cognitive and (b) emotional changes and impairments. We will argue that instead of a unitary factor, there is a multidimensional structure underlying cognitive fatigue. Specific emotional (as examined according to Geneva Emotion Wheel) and depressive (as indicated by PHQ9) features from several data sets will be discussed in our report.

Funding: Fundamental and Applied Research project “Impact of fatigue as a multidimensional variable on the performance of office workers in relation with psycho-emotional risks at work” (project No. lzp-2024/1-0098).

PERSONALITY AND COGNITIVE ASPECTS OF ARTIFICIAL INTELLIGENCE USAGE PATTERNS

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Widespread use of large language models (LLMs) has created a necessity to understand individual factors that correlate to the use of these tools in an everyday setting. Research looked at the correlation between participants' Big Five personality traits, cognitive abilities, and LLM usage patterns. The research used a split methodology consisting of two phases. A quantitative survey ($n = 321$), looking at general LLM usage tendencies, and an in-person experiment that simulated real-life problem solving ($n = 51$). Results point to a nuanced correlation: while the general attitude towards LLMs (global attitude) was negatively correlated with conscientiousness, the actual usage in a problem scenario (local attitude) correlates with agreeableness. There is also a correlation between worse reaction time in multitasking tests and increased LLM usage. The presentation will look at the implications of these findings on AI usage patterns, as well as possible risk factors around it.

Keywords: artificial intelligence, personality, cognitive ability, problem solving

3.7. sekcija. **KVANTU ZINĀTNE UN
TEHNOLOĢIJAS /**
**QUANTUM SCIENCE AND
TECHNOLOGIES**

NEW DEVELOPMENTS IN QUANTUM COMPUTING

Andris Ambainis

University of Latvia

This talk will cover the recent developments in quantum computing in the world (including both hardware and software) and in Latvia (the research carried out by the Centre for Quantum Computer Science). From the worldwide developments, the major experiments in quantum computing (such as Google's OTOH2 experiment) and the search for super-quadratic quantum speedups will be covered. From research in Latvia, our work on new quantum algorithms and hybrid quantum classical computation will be described.

TECHNOLOGY AND MATERIALS FOR QUANTUM PHOTONICS

Andris Anspoks, Aivars Vembris, Maira Elksne, Edgars Butanovs, Arturs Bundulis

Institute of Solid State Physics, University of Latvia

The Institute of Solid State Physics, University of Latvia (ISSP UL), has a long-standing track record in photonics, spanning both advanced materials and enabling technologies. In this talk, I will present the institute's technology and materials platform for quantum photonics, with particular emphasis on its open-access laboratory model. This approach brings together expertise in photonic materials, device fabrication, characterization, and prototyping, creating a shared environment for research, collaboration, and technology development. The platform is designed to support both fundamental studies and early-stage application-oriented work in quantum photonics, while also strengthening links between academia, research institutes, and industry. As such, it provides an important foundation for the Latvian Quantum Initiative and for the broader development of quantum technologies in Latvia.

PROPERTIES OF BOUND ELECTRON-PAIR STATES IN A TWO-DIMENSIONAL ELECTRON GAS

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Single-electron devices, whether intentionally or as a side effect, may also operate as two-electron devices. A two-electron system can both influence the precision of single-electron devices and exhibit properties that are of interest for applications in nanoelectronics. We investigate the properties and dynamics of bound two-electron states in a free two-dimensional electron gas in a perpendicular magnetic field. While such electron-pair states remain stable in the absence of external perturbations, electrostatic confinement at device edges or quantum point contacts significantly affects their energy spectrum and can induce pair dissociation. We develop a theoretical framework that describes the influence of external potentials on both the energies and lifetimes of these states. The analysis combines perturbation theory and the WKB approximation, with accuracy assessed via basis set expansion with complex coordinate scaling and real-time propagation using the split-step method. Our results show that, under experimentally relevant conditions in typical two-dimensional nanostructures, magnetic fields can support the formation and stability of two-electron bound states over observable timescales. Using time-dependent wave-packet simulations, we demonstrate both the formation and decay of an electron pair during a collision process at a saddle-point potential in a Hong–Ou–Mandel interferometer geometry. A key finding is that the structure of the probability density in the relative coordinate is governed by its nodal pattern. These zeros control the spatial correlations both in the transient wave-packet dynamics and in the stationary bound-pair states, providing a unifying perspective on pair stability and decay.

STUDIES OF STRUCTURE AND DYNAMICS OF ATOMIC SYSTEMS BY METHODS OF LASER SPECTROSCOPY ON ION BEAMS

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We will present fresh high-accuracy experimental values of atomic parameters characterizing the structure and dynamics of various ions: Ba⁺, Fe⁺, Sn⁻, Rb⁻, and Cl⁻. The experiments were performed at CERN, University of Gothenburg and Stockholm University, using the MIRACLS [1], GUNILLA [2] and DESIREE [3] facilities. Some of the experimental results have been published [4, 5], submitted [6], and some manuscripts [7, 8] are in final stages of preparation for submission to high-ranked journals. The most significant result is a new and innovative method for measurements of Electron Affinity demonstrated on Cl isotope and published in Nature Communications [4]. The sensitivity improvement of three orders of magnitude over existing techniques, while allowing five orders of magnitude reduction of the sample size was achieved. This can have a significant impact on atomic physics, nuclear physics, and the chemistry of super-heavy elements. Electron affinity measurements of Rb and Sn, and high-accuracy measurements of Ba and Fe positive ion metastable states lifetimes will be described and results reported.

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THE INFLUENCE OF MAGNETO-OPTICAL SIGNAL PARAMETERS ON THE SENSITIVITY OF MAGNETIC FIELD MEASUREMENTS

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Nowadays, increasing the accuracy of sensors, including magnetic field sensors, is in great demand in various industrial and scientific sectors, for example, in medicine – for observing magnetic fields generated in biological processes, as well as in navigation and space exploration. In this work we present the results of sensitivity dependence on several experimental parameters as the Cs atoms interact with laser light and radio frequency field. The radio frequency is linearly scanned at certain intervals. Using a theoretical model calculation program, absorption signals are numerically generated. To realize the interaction of atoms with the necessary external magnetic field, a laser beam in the near infrared range is directed through a cell containing Cs gas at room temperature. The cell is located in the center of the three-axis Helmholtz coils, which provide compensation for the Earth's magnetic field, and with the remaining pair of coils – the precise magnetic field required for the geometry of the experiment. Smaller coils are also placed inside the Helmholtz coils, around the cell, which ensure the generation of the radio frequency field.

ZERO FIELD MICROWAVE-FREE IMAGING OF MAGNETIC MICROMETER SCALE STRUCTURES USING THE CROSS-RELAXATION FEATURE OF NITROGEN-VACANCY CENTERS IN NANODIAMONDS

Eva Grauda, Alise Cirse, Mona Jani, Oskars Rudzītis, Reinis Lazda, Mārcis Auziņš

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Nitrogen-vacancy (NV) centres in diamond are widely used as quantum sensors for magnetic field imaging, typically operated under an applied bias field that lifts the degeneracy of the $m^2 = \pm 1$ spin sublevels. However, many applications in condensed-matter physics and materials science require minimally invasive probes that operate close to zero external field, for example when studying fragile magnetic phases or superconductors with stringent field requirements. In this work, we demonstrate wide-field, zero-field imaging using ensembles of NV centres in diamond. In contrast to standard NV magnetometry based on optically detected magnetic resonance (ODMR) with a microwave drive, our method operates without microwaves. We exploit a zero-field feature that arises from cross-relaxation between NV centres in the four crystallographic orientations [1, 2]. Near zero magnetic field, the spin levels of different orientations become nearly degenerate, leading to efficient cross-relaxation that modifies the NV photoluminescence. By imaging these cross-relaxation-induced changes in photoluminescence with a camera, we realize wide-field, all-optical zero-field imaging without the need for microwave excitation. We present zero-field images obtained from test samples generating weak and spatially varying magnetic fields – ferromagnetic nanoparticles and magnetic record of an audio tape. The results show that NV-based zero-field imaging can achieve microtesla range magnetic field sensitivity over a wide field of view (100x100 μm), while preserving the advantages of optical access and room-temperature operation. This capability opens prospects for non-invasive studies of low-field magnetic phenomena and for integrating NV-based quantum sensors into experiments where external magnetic and microwave fields must be minimized [3].

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RUNNING THE FIRST QUANTUM COMPUTER IN THE BALTIC STATES: PRACTICAL EXPERIENCE WITH THE SPINQ TRIANGULUM 3-QUBIT QUANTUM COMPUTER

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University of Latvia

In this talk, we present our initial practical experience of working with the SpinQ Triangulum 3-qubit desktop quantum computer. To the best of our knowledge, this is the first quantum computing device physically installed in the Baltic States. We describe the complete process, from purchase and delivery to unboxing, installation, calibration, and programming. We provide an overview of the different software modes supplied with the system and demonstrate how they can be used in teaching and experimentation. Particular attention is given to the role of small-scale quantum hardware in education, including its potential to motivate and inspire the next generation of researchers. Finally, we address the key challenge of a 3-qubit system: identifying meaningful directions for scientific use. We outline research questions for which such hardware may produce results of some academic interest.

TANTALUM PENTOXIDE MICRORING RESONATORS

Kristians Draguns, Jānis Alnis

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Integrated microring resonators fabricated from tantalum pentoxide (Ta_2O_5) provide a CMOS-compatible route toward compact nonlinear photonic devices. With a refractive index of $n_{1550} \approx 2.06$ and nonlinear coefficient $n_2 \approx 6.2 \times 10^{-19} \text{ m}^2/\text{W}$, this material supports efficient Kerr nonlinear interactions. The fabricated resonators exhibit quality factors above 10^6 . We present a detailed comparison between numerical dispersion simulations and experimental characterization results. The measurements reveal nonlinear signatures such as resonance asymmetry. Accurate dispersion analysis is critical for enabling Kerr frequency comb generation in Ta_2O_5 -based integrated resonators.

MACH-ZANDER 810 NM LIGHT INTERFEROMETER IMAGE DATA PROCESSING FOR QUANTUM IMAGING

Tīna Ance Jansone, Mārcis Kalējs, Valts Krūmiņš, Reinis Lazda,
Florian Gahbauer and Marcis Auzinsh

Laser Centre, University of Latvia

We present a data processing framework for quantum imaging [1] based on a Mach-Zehnder interferometer operating at an 810 nm wavelength. The system enables high-visibility interference measurements using single-photon detection, providing enhanced sensitivity for amplitude reconstruction. Advanced signal processing techniques, including background subtraction, fringe stabilization and noise filtering algorithms are applied to extract high-fidelity interferometric images under low-light conditions. The proposed approach improves contrast, spatial resolution and robustness against experimental imperfections. These results demonstrate the potential of Mach-Zehnder-based quantum imaging systems for applications in low-dose imaging quantum-enhanced sensing and defence.

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DEFEATING THE NONLINEAR ZEEMAN EFFECT ERROR IN MAGNETOMETERS WITH THE HEXADECAPOLE MOMENT

A. Mozers, D. Jermacāne, F. Gahbauer, M. Auzinsh, J. Birznieks,
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Atomic magnetometers based on magneto-optical signals originating from the Zeeman effect can achieve high sensitivity and accuracy in weak magnetic fields, where the Zeeman splitting remains linear. However, in magnetic fields on the order of the Earth's magnetic field (~ 0.5 G), the nonlinear Zeeman (NLZ) effect leads to systematic errors in magnetic field measurements. Notably, the NLZ effect does not influence the ground-state sublevels of ^{87}Rb with total angular momentum $\square\square = 2$ and magnetic quantum numbers $\square\square\square = \pm 2$, even at relatively high magnetic fields. Acosta et al. [1] demonstrated that coherences between these sublevels can be generated by modulating the frequency of an excitation laser at twice the Larmor frequency. This procedure produces higher-order polarization moments in the atomic ensemble, specifically quadrupole ($\Delta\square\square = \pm 2$) and hexadecapole ($\Delta\square\square = \pm 4$) moments. By introducing a π phase shift in the modulation sequence, the quadrupole contribution – affected by the NLZ effect – can be selectively suppressed, while preserving the hexadecapole moment. In previous work, such specially prepared atomic states were detected via magnetic-field-dependent optical rotation of a linearly polarized probe beam transmitted through rubidium vapor. In this study, we aim to theoretically investigate the creation of the hexadecapole moment and evaluate its influence on fluorescence signals in the ^{87}Rb D_1 line. Using a time-dependent density-matrix model, we analyze the evolution of higher-order polarization moments and examine the role of relaxation processes in determining the observable signal amplitudes. We will present the current progress of the theoretical modeling and outline the experimental approach designed to detect hexadecapole-induced fluorescence oscillations.

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QUANTUM IMAGING WITH UNDETECTED PHOTONS GENERATED BY SPONTANEOUS PARAMETRIC DOWN-CONVERSION USING NONLINEAR CRYSTALS

Mārcis Kalējs, Tīna Jansone, Šarlote Simsone, Valts Krūmņš, Reinis Lazda,
Florian Gahbauer and Marcis Auzinsh

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In this work, I report on the experimental implementation of a quantum imaging experiment based on Lemos, G., Borish, V., Cole, G. et al. Quantum imaging with undetected photons. *Nature* 512, 409–412 (2014), <https://doi.org/10.1038/nature13586>. An image is reconstructed by detecting only photons that have not directly interacted with a test object. The method relies on the generation of pairs of entangled photons via spontaneous parametric down-conversion (SPDC) in nonlinear crystals. This allows imaging at a wavelength different from the illumination wavelength, enabling visualization of objects that are opaque or invisible at the detection wavelength, including imaging through scattering media such as fog, smoke or water (potential applications for defence). The implemented setup consists of a coherent laser source, nonlinear crystals for SPDC, precision beam-guiding optics, and a phase-stable interferometric arrangement. Special attention is given to maintaining coherence conditions and optimizing detection sensitivity. Practical limitations, measurement uncertainties, and deviations from the theoretical estimation are discussed. This study provides an experimental validation of a foundational quantum imaging scheme and the experimental system can be widely applicable in potential defence, medical and communication systems.

REVERSING ADIABATIC STATE PREPARATION IN FEW-LEVEL QUANTUM SYSTEMS

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Quantum control is based on applying unitary transformations to various quantum systems in order to drive the population evolution into a target state. In a multilevel system with intrinsic interactions between the atomic/molecular levels (specifically spin-orbit interaction), the laser excitation may play a different indirect role. Namely, in the presence of strong electromagnetic fields, the energy levels in atoms/molecules experience shifts in their positions due to the so called Autler-Townes effect [1, 2]. Thus, the control of the spin-orbit interaction can be realized by using resonant or nonresonant laser fields with various parameters as an external control mechanism [3, 4]. By extending the scheme presented in [4] we explored the Autler-Townes control of spin-orbit coupling in an original four-level system aiming at large transfer efficiency to a final triplet state [5]. Our findings confirm the interesting features of probe-coupling excitation laser scheme, assisted by the intermediate spin-orbit coupling. The quantum control is based on the energy separation between the singlet and triplet states, modified by the Autler-Townes effect. The detuning and intensity of the control laser are proven to be key parameters of the control protocol. This work is further developed into a theoretical description [6], where under the right system parameters the population can be transferred back and forth between the singlet and triplet states. The transfer of population can be achieved with high speed and fidelity by adding a counterdiabatic quantum control protocol. As a second step, we invert the preparation protocol to get back to the initial state, thus achieving overall cyclic evolution in state space. The protocols are relevant for applications in quantum optics and quantum technologies, such as transfer between singlet and triplet populations in the process of cold molecule formation, or the implementation and improvement of an all-optical spin switch.

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STUDIES OF TRANSITION PROBABILITIES IN ATOMIC NIOBIUM AND VANADIUM FOR APPLICATION IN ASTROPHYSICS

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Vanadium (V) with atomic number 23 [1] and niobium (Nb), with atomic number 41 [2] are important for the investigation of the nucleosynthesis of heavy elements in the stars and crucial for the evaluation of the element abundances in the stellar atmosphere. In this study we present V and Nb normalized relative transition probabilities for transitions from a common upper level. To obtain these relative intensity distributions for a number of spectral line series originating from a common upper energy level have been measured. Intensity distributions have been obtained from measurements of the areas below the line profiles. V and Nb emission spectra were produced in a hollow cathode discharge lamp in an argon atmosphere at a pressure of about 1.7 mbar in visible and near-IR spectral region, recorded by high-resolution Bruker IFS 125 HR Fourier transform spectrometer in the Laser Centre of the University of Latvia. The spectral sensitivity of overall detection system was calibrated based on accurate data on potassium dimers intensity distributions.

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RANDOM-WALK-BASED KEY RELAYING IN DYNAMIC SEMI-TRUSTED QKD NETWORKS

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Because of distance and key-rate limitations, current quantum key distribution (QKD) technology relies on trusted nodes to form QKD networks. Relaying keys securely between nodes is challenging, especially when some nodes may be malicious. Most existing approaches use centralized controllers, creating single points of failure. In other approaches, keys are distributed across all nodes, so compromising a single node can expose all keys. We propose a decentralized, topology-oblivious key-relay algorithm based on random walks. It provides information-theoretic security when at least one non-malicious path exists between nodes, for example, in k -vertex-connected graphs with no more than $k-1$ malicious nodes between any pair of nodes. Besides, the algorithm provides strong computational security even in weaker network topologies. We evaluate the algorithm using three random-walk variants and cross-border network topologies.

FROM A SINGLE NUMBER TO A LANDSCAPE: TOPOLOGY-RESOLVED QUANTUM VOLUME

Henrijs Kravals, Maksims Dimitrijevs

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We are in the noisy intermediate-scale quantum (NISQ) era, where quantum processors are limited by noise. Quantum Volume (QV) is a widely used benchmark that describes the device performance with a single number based on the success rates of execution of square circuits. We estimate QV for every connected qubit subgraph of an IBM coupling graph (up to size 6) using noisy simulation with calibration-based gate and readout error models. This yields a distribution of QV scores across the quantum chip. We visualize it as a topology-resolved QV map and aggregate into a performance landscape to highlight strong and weak regions. The resulting maps support informed qubit selection and offer system-level view of device inhomogeneity

RYDBERG POSITRONIUM SPECTROSCOPY AT AEGIS COLLABORATION

Valts Krumins¹, AEgIS collaboration

¹Laser Centre, University of Latvia

University of Latvia is a member of AEgIS (Antimatter Experiment: gravity, Interferometry, Spectroscopy) collaboration at CERN. A key component of the experiment is the production and manipulation of positronium, a bound state of an electron and a positron, which serves as an intermediate system for antihydrogen formation and as a testbed for precision measurements. As part of this work, positronium atoms are produced from nanoporous silica targets and subsequently excited to Rydberg states in a magnetic-field environment. To characterise Rydberg positronium non-uniform electric fields are used to induce ionisation, while magnetic guiding allows the resulting charged particles to be transported to a position-sensitive detector. The spatial distribution of detected events provides sensitivity to the internal quantum state and transverse velocity of the Rydberg positronium, offering a diagnostic tool for understanding positronium dynamics in the AEgIS apparatus. These measurements contribute to the optimisation of the antihydrogen production and demonstrate the broader relevance of controlled field-ionisation techniques for precision experiments involving Rydberg atoms.

DEPENDENCE OF RADIO FREQUENCY MAGNETO-OPTICAL DOUBLE-RESONANCE SIGNALS ON EXCITATION GEOMETRY IN CS ATOMIC VAPOR

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Laser Centre, University of Latvia

The aim of the research is to develop a very high-precision magnetic field measurement method that allows obtaining magneto-optical signals by linearly changing the magnetic field value around zero. When the laser exciting Cs atoms and the magnetic field is zero, the magnetic sublevels are degenerate. By increasing the magnetic field value, the energy of the magnetic sublevels changes, this dependence on the external magnetic field can be detected by additionally applying a radio frequency field. Depending on the direction of the radio frequency relative to the external magnetic field, the magnetic sublevels come into resonance with the single-photon, two-photon and other multi-photon transitions of the applied radio frequency field.

ENTANGLEMENT DISTRIBUTION NETWORK FOR QUANTUM INTERNET DEPLOYMENT IN LATVIA

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We analyze the construction of entanglement distribution networks based on quantum memories and numerically investigate the distribution of entanglement on a real-world fiber grid in Latvia, connecting Lithuania and Estonia. The connection is realized over a chain of processing-node quantum repeaters between two end-nodes separated by 280 km of optical fiber. Additionally, restrictions imposed by a real-world fiber grid, which result in asymmetric node placement, are accounted for when obtaining the results. We investigate two potential network architectures feasible under the fiber line's restrictions on repeater node placements and compare the achievable quantum entanglement connection fidelity using nitrogen vacancy centers in diamond quantum memories with single-click and double-click entanglement distribution protocols. To obtain our results, we use a discrete-event simulator for quantum networks. This enables us to include noise models and the required classical control communication. Our work serves as a first step toward establishing a blind quantum-computation infrastructure in the Baltic Sea region and highlights key challenges in realizing quantum-repeater networks.

GROVER'S SEARCH INSTANCES OF LIGHTS OUT PROBLEM TO BENCHMARK REAL QUANTUM HARDWARE

Maksim Dimitrijevič, Marija Paļčiha, Abuzer Yakaryilmaz

Rīga Purvciems Secondary School

We present Grover's search implementations of the Lights Out problem for graphs with 4 and 6 lamps to benchmark the performance of real quantum hardware. Problem instances are executed on publicly accessible quantum processors from IBM and IQM. Our results indicate the improvements in publicly available quantum hardware capacity. We also observe that performance may vary among quantum devices of the same manufacturing revision, as well as that calibration quality strongly influences outcomes.

MESOSCOPIC COULOMB-MEDIATED COLLISIONS OF ON-DEMAND ELECTRONS

Elina Pavlovskā, Niels Ubbelohde, Martins Kokainis, Girts Barinovs,
Vyacheslavs Kashcheyevs

University of Latvia

Few-electron semiconductor devices provide a versatile platform for studying controlled electronic dynamics with relevance for precision sensing, metrology, and quantum information processing. Recent experiments have accessed a new regime in which single electrons propagate ballistically at energies tens to hundreds of meV above the Fermi level, where Coulomb interactions dominate their dynamics. In several independent studies [1–3], electrons are guided along well-defined paths and brought into controlled collisions, enabling direct probing of interaction-driven effects at the mesoscopic scale. In experiments by Ubbelohde et al. [1] and Fletcher et al. [2], electrons travel along chiral edge channels of a GaAs/AlGaAs heterostructure and interact at a localized constriction acting as a beam splitter. In a complementary approach, Wang et al. [3] use surface acoustic wave (SAW) transport along depleted channels, demonstrating interaction-induced gating between electrons in a tunnel-coupled region. Despite differences in implementation, all experiments reveal strongly non-linear signatures arising from Coulomb interactions. Here we apply a microscopic analytical description of Coulomb-mediated electron collisions, originally developed for the PTB experiment [1,4], to the NPL data reported in Ref. [2]. We find that the same model quantitatively captures both experiments and allows extraction of the relevant beam splitter parameters. We further compare the Bayesian description of interaction-induced gating introduced for SAW-driven collisions [3] with the framework of interaction-shifted transmission thresholds developed in Ref. [4]. At the mean-field level, the two approaches are equivalent and provide consistent qualitative interpretations for both co-propagating and counter-propagating electrons. The microscopic model resolves the energy and time dependence of the interaction, allowing quantitative simulations and accounting for the observed variation of the gating strength with electron arrival time. We argue that the consistency and complementarity of the results in [1–3] support the interpretation of the interaction-dominated collision statistics as a quantum nonlinear optics effect.

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SUPPRESSION OF TEMPERATURE RELATED ZERO-FIELD SPLITTING CHANGE IN NV-CENTRE VECTOR MAGNETOMETRY USING THE FULL STRESS TENSOR

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Nitrogen-vacancy (NV) centre-based magnetometry is a leading platform for high-sensitivity vector magnetic field imaging. A critical limitation in practical implementations is the temperature dependence of the zero-field splitting ($D(T) \approx 74 \text{ kHz/K}$)[1], which introduces significant systematic errors in field reconstruction. In realistic experimental setups, such as those using adhesive on glass or fiber substrates, this error is further compounded by mounting-induced mechanical stress arising from thermal expansion mismatch. While traditional differential schemes mitigate scalar temperature shifts within the axial approximation, we study an approach that moves beyond axial approximations by employing the full ground-state Hamiltonian. By defining the stress tensor within the lab coordinate system, we simplify the formalism for all four NV orientations and explicitly account for non-axial coupling amplitudes and state mixing. Utilizing a plane stress assumption for surface-mounted diamond samples, we reduce the complexity of the stress matrix while exploiting resonance frequency differences to suppress the temperature contribution by up to four orders of magnitude. This differential analysis enables robust, realistic vector field estimation by effectively decoupling global thermal drifts from local, mounting-induced mechanical stress.

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MOLECULAR SPECTRAL LINES IN NEAR-INFRARED SPECTRA OF POST-AGB STARS

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Virtually nothing is known about the stellar wind in post-AGB phase despite it contributing to evolutionary rate of the star and formation of the subsequent planetary nebula. Near-infrared region of post-AGB star spectra remains unexplored in high-resolution. Of particular interest are CO molecular lines that probe outer atmospheric layers where outflows are expected to form. I will present near-infrared high-resolution spectra up to 1.7 microns of multiple post-AGB stars. Variability of CO second overtone lines and other spectral features will be analysed.

CHARGE TRANSPORT STUDIES OF CVD-GROWN H-BN/WTe2 HETEROSTRUCTURES

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Monolayer and few-layer WTe₂ is promising for exploring the quantum spin Hall effect and topological edge states. These properties arise from strong spin-orbit coupling and a nontrivial band topology supporting helical boundary modes. [1,2] The resulting robust edge-state transport enables potential applications in low-power electronics, spintronics, and topological quantum devices. [3] Substrate interactions, environmental sensitivity, and fabrication-related disorder significantly influence material quality. To access unconventional charge transport, achieving reproducible device performance and material quality is instrumental. In this work, nanoscale hall-bar devices of h-BN/WTe₂ heterostructures are used for transport studies. Devices are fabricated directly on the growth substrate, eliminating extra step for transfer of 2D materials. Cryogenic magnetotransport measurements are performed on h-BN/WTe₂ devices to probe their electronic transport behaviour. These results demonstrate the feasibility of this fabrication approach and provide a basis for future investigations of edge-state phenomena in WTe₂ van der Waals heterostructures.

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FIELD TESTING AND PERFORMANCE EVALUATION OF QUANTUM KEY DISTRIBUTION SYSTEM

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This report contains information about the long-distance tests performed within a project “Development of experimental quantum communication infrastructure in Latvia”. It presents the work carried out by LVRTC, which involved integrating QKD devices into LVRTC’s existing infrastructure. Within this network, the maximum possible optical fiber distances between points A and B were selected and a series of network conditions scenarios were tested, thus determining the limiting factors and maximum feasible fiber line length over which Toshiba quantum key distribution devices can operate and synchronize secret keys. We successfully ran a QKD link on real 137km optical WAN line without trying to improve the line characteristics. We also successfully ran a QKD link on real 66km optical WAN line with a compensator and additional passive attenuators which raised total loss to 33dB – 10% above claimed maximum tolerable loss.

DEFINING NEW NUMERICAL STANDARDS IN FIRST-PRINCIPLES CALCULATIONS

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Computational materials science and computational chemistry rely on first principles methods that vary in terms of their complexity and accuracy. Among them, the Hartree-Fock approximation stands out as being an ingredient in hybrid functionals in the density-functional theory and in the hierarchy of quantum-chemistry methods that approach the solution of the many-electron Schrödinger equation systematically. The complete numerical representation of wave-functions in the Hartree-Fock approximation is a solved problem for atoms and molecules, but not for solids. We present a method to overcome this limitation and show its relevance in application to real materials.

ESTIMATING ENTANGLEMENT BETWEEN QUANTUM EMITTERS USING DIRECTIONAL EMISSION

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Recently, it was shown that quantum interference in a system containing a polarized emitter (a three-level atom) and an unpolarized emitter (a two-level quantum dot) can allow directional emission of photons into a circulating cavity [1]. As a consequence, photons emitted into a coupled waveguide exhibit strong directionality determined by the hierarchy of emitter–cavity coupling strengths. This naturally raises the question: does a high degree of directionality correlate with a large degree of entanglement between the two emitters? In this work [2], we analytically investigate the relation between photon emission directionality and emitter–emitter entanglement in the bad-cavity, large-cooperativity regime within the single-excitation manifold. In this regime, a photon created in the cavity is rapidly emitted through the cavity decay channel of the coupled waveguide. We focus on the cavity dark state that arises due to destructive interference and quantify its entanglement using the concurrence. Analytical expressions are derived for both the emission directionality and the concurrence of the dark state in terms of the emitter–cavity coupling strengths. We show that there exist parameter regimes in which directionality and concurrence are monotonically related. Perfect directionality eliminates the dark state and hence its entanglement, while symmetric coupling leads to vanishing directionality and to a nearly separable dark state. Between these limiting cases, however, increasing directionality can correspond to increasing concurrence. For illustration, we consider a generic quantum emitter coupled to a cesium-133 atom, although the analysis applies equally to other alkali atoms. Our results show that measurements of photon emission asymmetry performed during the state-preparation stage, prior to trapping in the dark state, can be used to determine the entanglement between the emitters.

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SINGLE PHOTONE EMITTERS AND ITS DEVELOPMENT IN LATVIA

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Single photon sources are a cornerstone of modern quantum technologies, enabling applications in quantum communication, quantum computing, quantum metrology, and fundamental tests of quantum mechanics. An ideal single photon source should provide on-demand emission of indistinguishable photons with high purity, brightness, and efficiency, while being compatible with scalable fabrication platforms. In addition, sources capable of generating entangled photon pairs are essential for quantum networking and photonic quantum information processing 1,2. This talk provides an overview of state-of-the-art single and entangled photon sources based on both inorganic and organic materials, with particular emphasis on their integration into photonic circuits 3. Ongoing work and further activities of Laboratory of Organic Materials in the field of organic single photone source will be discussed.

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QUANTUM WORKFORCE DEVELOPMENT

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The rapid progress of quantum technologies is increasing the demand for a highly skilled and interdisciplinary workforce. Yet education and training systems are still adapting to the specific needs of quantum computing, communication, sensing, and related technologies. This talk provides a focused overview of national quantum strategies and workforce development initiatives, highlighting how countries integrate university programs, industry partnerships, and professional upskilling within their quantum ecosystems. Key challenges – including interdisciplinary skill gaps and academia–industry alignment – will be discussed. The presentation will also introduce the Quantum Academy project, outlining its collaborative model and its potential contribution to sustainable quantum talent pipelines. The aim is to stimulate discussion on practical approaches to strengthening quantum capacity through education and coordinated national efforts.

3.8. sekcija. **MĀKSLĪGAIS INTELEKTS, DATI
UN SABIEDRĪBAS UZTICĒŠANĀS
TEHNOLOĢIJĀM DIGITĀLAJĀ VALSTĪ /**
ARTIFICIAL INTELLIGENCE, DATA, AND
PUBLIC TRUST IN TECHNOLOGIES
IN THE DIGITAL STATE

TECHNOLOGY ACCEPTANCE MODELS FOR GENERATIVE AI IN HIGHER EDUCATION

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The rapid emergence of generative artificial intelligence (GenAI) presents significant opportunities and challenges for higher education institutions. Understanding how academic staff perceive and accept these technologies is essential for informed pedagogical and institutional decision-making. This systematic literature review synthesizes research on GenAI acceptance among academic staff, including lecturers, researchers, and professors. The review focuses exclusively on generative AI technologies, such as large language models (e.g., ChatGPT), within higher education contexts. Following PRISMA guidelines, a systematic search of Scopus and Web of Science identified 42 eligible studies published between January 2022 and December 2025. The review analyzes applied theoretical frameworks, research designs, and analytical approaches, as well as key determinants and reported research gaps. The findings indicate a predominance of individual-level technology acceptance models and cross-sectional survey designs, alongside increasing attention to ethical, pedagogical, and organizational factors. The review highlights theoretical and methodological concentration and proposes directions for future research on GenAI integration in universities.

Keywords: Generative Artificial Intelligence (GenAI), Higher Education, Technology Acceptance, Academic Staff, Systematic Literature Review, Large Language Models (LLMs), Pedagogical Impact, Research Gaps

IMPLEMENTATION OF THE EU ARTIFICIAL INTELLIGENCE ACT IN LATVIA AND FUTURE POLICY DIRECTIONS FOR DEVELOPING TRUSTWORTHY AI

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The EU Artificial Intelligence Act, the first comprehensive legal framework on AI, entered into force on 1 August 2024 and is expected to become fully applicable in all EU Member States on 2 August 2026. Latvia has undertaken several important measures to implement the AI Act, namely adopted the first national AI-related legally binding regulations, established the AI Centre, and determined the responsible institutions and necessary actions to fully implement the AI Act. At the same time, Latvia's efforts are largely focused on fostering innovation and building AI capacity and resilient infrastructure. In 2025, Latvia adopted Artificial Intelligence Centre Law which aims to promote the responsible application and advancement of AI technologies. In 2026, the Cabinet of Ministers adopted further regulation defining the procedures for the AI Centre to create a special regulatory environment for testing and advancement of AI systems. The paper aims to examine the measures Latvia has taken to implement the AI Act, how they balance the promotion of uptake of AI and innovation and promotion of trustworthy AI and what are the future directions of policy actions both at EU and national level.

Keywords: EU Artificial Intelligence Act, Latvia, AI Governance, AI Regulation, Artificial Intelligence Centre, Innovation and Capacity Building, Trustworthy AI, Policy Implementation

AI IN HIGHER AND ADULT EDUCATION: BENEFITS, RISKS, AND SKILL TRANSFORMATION

Rita Birziņa, Tamāra Pīgozne, Liena Hačatřjana un Sandra Kalniņa

University of Latvia

Artificial Intelligence (AI) is fundamentally changing the way people learn and the role of adult learning in the 21st century, underlining the need for lifelong learning and adaptation to a dynamic labour market. To understand how AI influences adult learning skills, experiences, and well being, while also highlighting the opportunities and challenges of personalised learning, the International AI Survey was conducted within ASEM Research Network 3 on the Professionalisation of Adult Teachers and Educators within the ASEM Education and Research Hub for Lifelong Learning (a network of Asian and European higher education institutions), and was initiated and led by the Institute for Adult Learning, Singapore University of Social Sciences. The study was carried out in 2024. Its participants (N = 1 914) were 21 Asian and European countries. The study included higher education and adult education professionals from European countries – Austria (81), Germany (336), Italy (65), Romania (163), Slovenia (156), Switzerland (23), UK (50) and Latvia (67). Latvia compared its results with those of EU countries as well as non EU partners Switzerland and the UK (Cronbach's Alpha for Europe = 0.749). The aim of the study was to find out Latvian respondents' views on the development of learning skills, wellness and challenges in comparison with responses from European Union countries and non-EU countries: Switzerland and the UK. The research question was – how does the use of AI in higher and adult education affect development of learning skills, learners' wellness and performance, and what challenges do AI users face? Findings. Latvia reports a moderately positive but cautious view of AI's influence: creative thinking scores are slightly below the EU average and close to the UK and Switzerland, while decision making, problem solving, and sense making align with several EU countries. Transdisciplinary thinking stands out as comparatively high, surpassed mainly by Romania and Slovenia. Perceptions of wellness mirror EU trends – AI is seen as improving efficiency and employability, though concerns about cognitive load, reduced social interaction, and ethical risks persist. Key challenges include data security, bias, transparency, and accountability, with Latvia showing similar concern levels to EU countries and a profile close to Switzerland, though less intense than the UK.

Conclusion. AI is perceived as a valuable tool for enhancing skills and performance in higher and adult education, yet its integration must be balanced with ethical safeguards and pedagogical integrity. Latvia's results largely reflect European patterns but also highlight the specific context of a small, skilled nation navigating technological change with limited resources. The findings underscore the need for responsible AI use, human oversight, and targeted support to ensure that AI strengthens – rather than replaces – learners' independent thinking and well being. Keywords. artificial intelligence; adult learning; higher education; learning skills; wellness; ethics; transdisciplinary thinking

Keywords: Artificial Intelligence (AI), Adult Learning, Higher Education, Learning Skills, Wellness, Ethical Considerations, Transdisciplinary Thinking, AI Integration

COMPARISON OF YOLO-BASED OBJECT DETECTORS FOR INSECT RECOGNITION WITH EXPLAINABLE AI (XAI) ANALYSIS

Author Diāna Dupļevska, Roberts Kadiķis, Uģis Kagainis, Antra Boča

Elektronikas un datorzinātņu institūts, Latvijas Universitāte

In our study, we move beyond standard detection accuracy and investigate whether YOLO-based object detection models for automated invertebrate identification rely on biologically meaningful structures. YOLOv11 and YOLOv5 are deep learning detection architectures that automatically locate and classify objects within images. Our goal is not only to measure how accurately these models detect organisms, but also to assess their interpretability and the level of expert trust they can support in ecological AI systems. A biologist-annotated dataset of 935 images (23 taxonomic classes) was used, including both mixed-quality field images and a cleaned “perfect” subset. YOLOv11 consistently outperformed YOLOv5 by approximately 1–1.5% in mAP_{50} (mean Average Precision at 50% intersection-over-union threshold, a standard object detection metric). The best configuration (pretrained YOLOv11x trained on the perfect dataset) achieved $mAP_{50} = 71.3\%$ (validation) / 70.2% (test) and $mAP_{50-95} = 66.9\%$ / 65.5% , with a validation–test gap below 2%, indicating stable generalization. Training on mixed-quality images slightly improved robustness, suggesting that natural variability enhances stability under real field conditions. To assess interpretability, we generated activation heatmaps using EigenCAM, LayerCAM, and Deep Feature Factorization (DFF1–DFF4). These maps highlight image regions influencing model decisions. Biologists evaluated 46 images on a 0–5 scale based on how well activations aligned with morphologically important structures. EigenCAM and DFF1 showed the best overall correspondence, while other methods were less consistent. Notably, interpretability declined in multi-object scenes despite correct detections, revealing a gap between accuracy and biologically meaningful reasoning. We also compared heatmaps at 640×640 and 1024×1024 resolutions. Higher resolution did not consistently improve interpretability: DFF2 and DFF4 benefited from increased detail, whereas others remained stable or became more noise-sensitive. For most taxa, higher resolution improved structure localization, but for Collembola, lower resolution often produced clearer patterns. Overall, high detection accuracy does not guarantee meaningful internal attention. Heatmap behavior depends on scene complexity, XAI method, and input resolution, highlighting the need for both quantitative evaluation and expert-driven interpretability analysis.

Keywords: YOLO Object Detection, Invertebrate Identification, Deep Learning Models, Model Interpretability, Explainable AI (XAI), Activation Heatmaps, Ecological AI Systems, Biological Structure Recognition

HUMAN-AI INTERACTION

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The relationship between man and artificial intelligence (AI) is already a serious social problem, but the creation of superintelligence (AGI) is becoming significant for human survival. One of the development scenarios is the creation of AI and human hybrids (cyborgs). Despite the differences in AI development forecasts, there is not much time to prepare for a society dominated by AI – from about 2 to about 20 years. One of the most important issues is the interaction of AI consciousness (or its equivalent), which will determine the actions of AI as an autonomous object, with human consciousness. The most important is the question of the operation of the system for evaluating behavioural models and making decisions (emotional system or its equivalent). It is proposed to base on the models developed in analytical psychology. For the description of 16 basic emotions (of which AI currently more uses six) four criteria can be chosen (change, power, sign, time of use), which have analogues in AI (used for the management of Chain of Thought (CoT)). It is essential to continue the discussion about granting electronic person (or similar) status to AI and the possibilities of building relationships with AI as a partner (person) rather than a tool (slave). The change in decision-making systems and social structures must also be studied in connection with the expected introduction of unconditional basic income (UBI). The meaning of work and life will change significantly under the influence of AI, so changes must be prepared for immediately.

Keywords: Artificial Intelligence (AI), Artificial General Intelligence (AGI), Human–AI Interaction, AI Consciousness, Decision-Making Systems, Emotional Models, Human–AI Hybrids (Cyborgs), Societal Impact

RE-ENGINEERING THE STATE: IFR-DRIVEN, CITIZEN-CHOSEN AUTONOMOUS AGENTS FOR PUBLIC FUNCTIONS

Oskars Galanders

Tiesību efektivitātes un kvalitātes institūts

This article reconceptualises AI-enabled public-service delivery as a people-first, demand-driven ecosystem in which citizens – not the state – directly select the autonomous agents that perform the functions they need. Using the TRIZ Ideal Final Result (IFR) methodology, the design target is defined by the customer’s desired outcome (instant, accurate, auditable provision of a legal function) rather than by the legacy processes, institutions, or equipment that currently embody government. A central argument is that centralised power breeds rent-seeking and corruption, and that any trustworthy system must eliminate the need for a “man-in-the-middle” (MITM) or a privileged third-party arbiter. The architecture therefore relies on cryptographically verifiable, peer-to-peer interactions between citizens and open-source AI agents, backed by public-permissioned smart contracts that encode the rules of service delivery, payment, and compliance. Because the contracts are immutable and self-executing, they provide trust-less enforcement of obligations, automatic escrow of funds, and an indisputable audit trail, removing the necessity for a trusted intermediary. Classic theories of state origin (social-contract, evolutionary, Marxist) are revisited not to defend a monolithic bureaucracy but to expose why a system that once solved collective problems can become an inefficient conduit for corruption when technology now offers superior alternatives. By treating the state as a legacy allocator of scarce capital, the analysis shows how citizens can re-direct those resources toward self-selected more efficient decentralized AI agents (using MOEs) that better satisfy their needs while preserving transparency and accountability. A practical citizen legitimacy audit is proposed: a community-run assessment that maps each legally mandated function to the most effective AI service currently available, rates it on cost, speed, transparency, inclusivity, resistance to centralised capture, and smart-contract-based trustlessness, and then publishes a choice catalogue. Individuals and groups can subscribe to the agents that meet their preferences, while the government’s role shrinks to guaranteeing interoperability standards, baseline data integrity, and a safety net for functions that remain unsuitable for full automation. The conclusion argues that the future legitimacy of any governing framework will hinge on its willingness to cede low-value, high-cost tasks to openly chosen, accountable AI agents powered by smart contracts, thereby restoring agency to citizens, curbing the corrupting influence of centralised power, and eliminating the need for trusted third-party mediators.

Keywords: AI-enabled Public Services, Decentralized Governance, Citizen-Centric Ecosystems, Smart Contracts, Peer-to-Peer Systems, Trustless Architecture, Autonomous AI Agents, Public Service Innovation

AI IN HIGHER AND ADULT EDUCATION: BENEFITS, RISKS, AND SKILL TRANSFORMATION

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Conclusion. AI is perceived as a valuable tool for enhancing skills and performance in higher and adult education, yet its integration must be balanced with ethical safeguards and pedagogical integrity. Latvia's results largely reflect European patterns but also highlight the specific context of a small, skilled nation navigating technological change with limited resources. The findings underscore the need for responsible AI use, human oversight, and targeted support to ensure that AI strengthens – rather than replaces – learners' independent thinking and well being.

Keywords: Artificial Intelligence (AI), Adult Learning, Higher Education, Lifelong Learning, Learning Skills Development, Learner Wellbeing, Ethical Challenges, AI Adoption in Education

LIABILITY AND LEGAL CHALLENGES IN DIGITAL WELLNESS

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Rīga Stradiņš University

Digital technologies have significantly reshaped the way healthcare is experienced and consumed. Today, a wide range of health applications is available on the market, yet most remain outside formal regulatory oversight, raising concerns about their quality and safety. Under the current Medical Device Regulation (EU) 2017/745, only applications explicitly intended for medical purposes are subject to regulatory scrutiny, leaving the digital wellness market largely unregulated. This regulatory gap, coupled with the complexity of medical device certification procedures, tempts manufacturers to avoid the medical device certification pathway, shifting the burden of harm prevention onto other stakeholders, especially consumers. At the same time, the functionality of many wellness applications closely resembles medical purposes and may affect users' physical and mental well-being. When harm occurs, users must rely on compensation mechanisms under the Product Liability Directive. However, in the context of complex digital technologies, especially AI-based, proving damage and establishing causation can be difficult, leaving many affected individuals without recourse. This reactive approach addresses harm only after it occurs rather than preventing unsafe products from entering or remaining on the market. It highlights structural weaknesses in the current framework and risks undermining trust in digital health technologies in general. This research examines the EU legal framework governing health applications through policy analysis and illustrates the risks posed by unregulated solutions using real-world examples. It identifies the relevant stakeholders and proposes actionable measures to mitigate these risks. The author advocates a shift from reliance on ex post compensation toward proactive regulatory strategies and educational initiatives aimed at supporting and promoting safer digital health innovation and stronger consumer protection.

Keywords: Digital Health Technologies, Health Applications, Medical Device Regulation (EU 2017/745), Regulatory Gaps, AI-based Health Solutions, Product Liability, Consumer Protection, Digital Health Safety

3.9. sekcija. **ĢEOINFORMĀTIKA:**
ĢIS UN TĀLIZPĒTE /
GEOINFORMATICS:
GIS AND REMOTE SENSING

ĢIS RĪKOS BALSTĪTA SEZONĀLĀS UN TELPISKĀS NITRĀTU DINAMIKAS ANALĪZE LAUKSAIMNIECISKI DOMINĒTĀ SLOCENES SATECES BASEINĀ

GIS-BASED ANALYSIS OF SEASONAL AND SPATIAL NITRATE DYNAMICS IN THE AGRICULTURALLY DOMINATED SLOCENE CATCHMENT

Ieva Siksnāne, Ainis Lagzdins, Arturs Veinbergs

Scientific Laboratory of Forest and Water Resources, Latvia University of Life Sciences and Technologies

Diffuse pollution from agricultural areas significantly affects surface water quality in Europe, particularly in drained landscapes where the transport of dissolved nutrients is largely controlled by the hydrological regime. Geospatial analysis enables a more detailed assessment of nutrient transfer processes at the catchment scale and supports the identification of seasonally critical periods. The aim of this study was to evaluate the seasonal and spatial dynamics of nutrients in the agriculture dominated V093 Slocene catchment by integrating water quality monitoring data with spatial information derived from GIS analysis. Catchment boundaries, monitoring point locations, and land use structure were analysed using ArcGIS Pro. The study was based on LIFE GoodWater IP monitoring data collected between 2020 and 2024 at two representative sites within the basin – the upstream section (GWSLA) and the outlet (GWSLI3). The analysis included total nitrogen (TN) and nitrate-nitrogen ($\text{NO}_3\text{-N}$) with results interpreted in the spatial context of catchment characteristics. The results showed pronounced seasonal variability. During winter, mean TN concentrations reached $0.4\text{--}0.5\text{ mg L}^{-1}$, while in summer they decreased to approximately 0.1 mg L^{-1} . $\text{NO}_3\text{-N}$ constituted the dominant fraction of TN throughout all seasons, reflecting typical patterns of drainage influenced agricultural catchments. The findings confirm that nitrate leaching intensified outside the growing season. In Latvia, environmentally friendly drainage system elements, particularly constructed wetlands, are financially supported as nutrient retention measures. GIS-based spatial analysis can be effectively applied to identify suitable locations for wetland implementation within agricultural catchments.

This research was conducted within the framework of the integrated project “Implementation of River Basin Management Plans of Latvia towards good surface water status” (LIFE GOODWATER IP, LIFE18 IPE/LV/000014), which has received funding from the European Union’s LIFE program and the State Regional Development Agency (www.goodwater.lv).

SATELĪTU DATU POTENCIĀLS BIOTOPU KARTĒŠANAI UN IZMAIŅU NOTEIKŠANAI LATVIJĀ

POTENTIAL OF SATELLITE DATA FOR HABITAT MAPPING AND CHANGE DETECTION IN LATVIA

Jānis Kotāns, Liene Zilvere

Nature Conservation Authority

Satellite remote sensing offers new possibilities for large-scale habitat monitoring and detection of environmental changes. Within the LIFE IP LatViaNature project, a remote sensing tool has been developed to support habitat mapping and change detection using Sentinel-2 satellite imagery. The approach combines multispectral satellite data with machine learning methods to classify habitats and identify potential habitat degradation. Random Forest is used as the primary classification algorithm, supported by k-nearest neighbour analysis. The workflow integrates time series of Sentinel-2 images to capture seasonal spectral characteristics of habitats. For detecting habitat changes, vegetation dynamics are analysed using NDVI differences between satellite images from different time periods. Negative NDVI changes may indicate vegetation loss or potential habitat degradation. The developed methodology demonstrates how satellite-based monitoring can support biodiversity monitoring and environmental management at national scale by enabling systematic habitat observation and early detection of landscape changes.

ML ATBALSTĪTA DRUMLINU NOTEIKŠANA UN INSTANČU SEGMENTĀCIJA, IZMANTOJOT YOLOV11

ML ASSISTED DRUMLIN DETECTION AND INSTANCE SEGMENTATION USING YOLOV11

Hugo Huberts Puriņš

Faculty of Science and Technology, University of Latvia

Drumlins are key indicators of subglacial processes and former ice-flow patterns, but regional drumlin inventories are often compiled manually, limiting scalability and reproducibility. This contribution presents a workflow for drumlin segmentation, prediction, and GIS-ready analysis using deep learning applied to digital elevation models (DEM) and an existing, manually mapped, drumlin reference shapefile from Latvian drumlin fields. The DEM is tiled into 640×640 image patches, and reference polygons are converted into You Only Look Once (YOLO) segmentation labels. A YOLOv11 segmentation model is trained for drumlin delineation and then used to generate predictions across the tiled DEM. Predicted outputs (TXT masks) are converted back into georeferenced polygons and exported as GeoPackages, enabling immediate integration with standard GIS morphometric analysis and mapping methods. Model performance is evaluated using both standard YOLO metrics and an inventory comparison against the control dataset. The statistics for bounding boxes, precision and recall reach 0.808 and 0.652, with mAP50 of 0.755 (mAP50–95: 0.514). For segmentation masks, precision and recall are 0.757 and 0.601, with mAP50 of 0.672 (mAP50–95: 0.275). Inventory comparison yields 1190 predicted vs 1146 control drumlins, with 906 true positives, 284 false positives, and 247 false negatives, corresponding to precision 0.761, recall 0.786, and F1 0.773 (nMCC: 0.387). The results demonstrate that YOLO-based segmentation can produce georeferenced drumlin polygons at scale with quantified uncertainty, providing a practical route toward repeatable drumlin inventories and geomorphological analyses.

This research was funded by the Latvian Council of Science, project “Reconstruction of ice stream dynamics and deglaciation of the SE sector of the Scandinavian Ice Sheet in Latvia”, project No.lzp-2024/1-0193

LIELS, BRĪVI PIEEJAMS EKOĢEOGRĀFISKO MAINĪGO DATU KOPUMS AR REPRODUCĒJAMĀM DARBPLŪSMĀM UN MĒRĶTIECĪGI IZVEIDOTU, KONTEINERIZĒTU, ATVĒRTĀ PIRMKODA RĪKU KOMPLEKTU

A LARGE OPEN-ACCESS DATASET OF ECOGEOGRAPHICAL VARIABLES WITH REPRODUCIBLE WORKFLOWS AND A PURPOSE-BUILT, CONTAINERISED, OPEN-SOURCE TOOLBOX

Andris Avotiņš, Jekātina Butkeviča, Betija Rubene, Solvita Rūsiņa, Rūta Starka, Vita Šakele, Vineta Vērpēja, Ivo Vinogradovs, Ainārs Auniņš

University of Latvia, Faculty of Medicine and Life Sciences and Faculty of Science and Technology

Ecogeographical datasets are essential for understanding spatial patterns in biodiversity, environmental processes, and ecosystem dynamics. Here, we introduce a comprehensive, national-scale, open-access dataset encompassing a wide range of ecogeographical variables. This dataset is designed to facilitate robust and reproducible research across different disciplines. The dataset includes 538 high-resolution variables such as climate, land cover, soil and habitat characteristics, and topography. These variables have been curated from publicly available and restricted-access sources and harmonised to ensure consistent national coverage. To promote transparency and usability, we provide a suite of reproducible workflows that automate the acquisition, preprocessing, and integration of data. These workflows are developed using open-source technologies and fully containerised, enabling seamless deployment across diverse computational environments. Leveraging containerisation enables researchers to consistently reproduce results, regardless of local software configurations, thereby enhancing the reliability and scalability of ecogeographical research. Accompanying the dataset and workflows is a purpose-built R toolbox {egvtools}, released as open-source software available from github.com. It is designed for extensibility, allowing the integration of additional variables or custom workflows as research needs evolve. Together, the dataset, workflows, and toolbox offer a modular framework that addresses key challenges in environmental data science, including interoperability, reproducibility, and accessibility. By making this resource freely available (zenodo.org community: “HiQBioDiv: High-resolution quantification of biodiversity for conservation and management”) and fostering an open, collaborative ecosystem, we aim to accelerate advances in ecological modelling, conservation planning, and environmental monitoring. The dataset describes environment of Latvia. The toolbox and workflows are generalisable to any other area.

ZEMU IZMAKSU BEZPILOTA LIDAPARĀTU (UAS) LIDAR IEGŪŠANAS IESTATĪJUMU VEIKTSPĒJAS NOVĒRTĒJUMS ZEMES UN KOKU LAPOTNES NOTEIKŠANAI BLĪVA MEŽA APSTĀKĻOS

PERFORMANCE ASSESSMENT OF LOW-COST UAS LIDAR ACQUISITION SETTINGS FOR GROUND AND CANOPY DETECTION UNDER DENSE FOREST CONDITIONS

Grigorijs Goldbergs, Jordane Jean-Claude Champion

Institute of Electronics and Computer Science; Silava

This research evaluates UAS LiDAR acquisition configurations in dense Latvian hemiboreal forests. Ten flight missions were executed to test variables including return modes (single to triple), scanning patterns (repetitive/non-repetitive), flight speeds (5 and 10 m/s), and overlap (50% and 70%). Data were processed using the lidR package and benchmarked against LGIA 6 pts/m² airborne LiDAR to assess ground detection and vertical point distribution.

JAUNUMI VAI CITS REDZES LEŅĶIS (GDAL, SAGROZĪJUMU ELIPSES, NDVI UN SUGU NOSAUKUMI KARTĒS)

NEWS OR ANOTHER PERSPECTIVE (GDAL, DISTORTION ELLIPSES, NDVI AND SPECIES NAMES ON MAPS)

Kārlis Kalviškis

University of Latvia

1. Viena no telpisko datu apstrādes pamatbibliotēkām – *gdal* (*The Geospatial Data Abstraction Library*) – 2025. gadā tika būtiski pārveidota. Tagad šīs bibliotēkas rīku izmantošana ir kļuvusi daudz vienkāršāka. Tiks parādīts piemērs šo rīku izmantošanai.
2. Attēlojot sagrozījumu elipses (*Tissot's indicatrix*), tās tiek saplacinātas (izstieptas), bet nav redzama to patiesā deformācija. Tiks parādīts piemērs, lai pamatotu šo apgalvojumu.
3. Parasti *NDVI* (*Normalized Difference Vegetation Index*) karšu attēlošanai tiek izmantotas indeksētu krāsu skalas. Tiks parādīta vēl cita iespēja.
4. Tiks parādīts piemērs sugu punktveida atradņu kartes izveidei, izmantojot sešstūrus un saīsinātus sugu latīniskos nosaukumus.

ĢEOTELPISKĀS INFORMĀCIJAS PĀRVALDĪBA. TENDENCES

GEOSPATIAL INFORMATION MANAGEMENT. TRENDS

Una Krutova

Latvian Geospatial Information Agency; Riga Technical University

In times of technological and geopolitical turbulence, geospatial information management is also experiencing unprecedented challenges. This has resulted in both new informal geospatial information management frameworks and formal legislative initiatives. The presentation will provide an overview of the latest trends in the field of geoinformation, as well as show the progress of the development of the national geospatial information infrastructure strategy.

ĢEOTELPISKO DATU PIEEJAMĪBA UN PIEKĻUVE TIEM

THE AVAILABILITY AND ACCESSIBILITY OF GEOSPATIAL DATA

Ivars Bergmanis, Armands Celms, Jolanta Celma, Aivars Ratkevičs

Latvia University of Life Sciences and Technologies

Today, advances in modern technology have made it possible for anyone to access high-quality geospatial data anywhere, anytime. But with this access come new challenges.

Although we now live in an era of open data, it is sometimes necessary to understand that not all information needs to be so easily accessible and usable. With the increasing quality of geospatial data, especially remote sensing, it may seem that we are seeing too much.

The aim of this work is to examine the availability of currently accessible geospatial data and the difficulties associated with it.

GEOHUB: INTEGRĒTA ĢEOTELPISKĀS IZLŪKOŠANAS PLATFORMA ZEMES NOVĒROŠANAS DATU PĀRVEIDOŠANAI OPERATĪVĀS ATZIŅĀS INFRASTRUKTŪRAS NOTURĪBAI, CIVILAJAI DROŠĪBAI UN MEŽU MONITORINGAM

GEOHUB: AN INTEGRATED GEOSPATIAL INTELLIGENCE PLATFORM FOR TRANSFORMING EARTH OBSERVATION DATA INTO OPERATIONAL INSIGHTS FOR INFRASTRUCTURE RESILIENCE, CIVIL SECURITY, AND FOREST MONITORING

Ilze Bargā

SIA "Baltic Satellite Service"

Every day, Earth observation satellites generate vast volumes of data describing environmental conditions, land-use dynamics, and infrastructure risks. Despite the growing availability of high-quality satellite imagery and measurements from programmes such as the European Space Agency and the Copernicus Programme, many organizations still struggle to transform raw Earth Observation (EO) data into operational intelligence. The main barrier is not the lack of data but the complexity of accessing, processing, integrating, and interpreting it within existing GIS and decision-making workflows. This paper presents GeoHub, an integrated geospatial intelligence platform designed to bridge this gap by converting continuous satellite data streams into real-time, actionable insights. GeoHub integrates multi-source geospatial data – including satellite imagery, UAV observations, LiDAR datasets, in-situ sensor data, and national geospatial layers – into a unified analytical environment. The platform provides automated processing pipelines, AI-based analytics, and interoperable data services that enable rapid analysis, visualization, and dissemination of geospatial information for operational use. Built on secure European infrastructure and designed to support strategic autonomy in geospatial data services, GeoHub enables real-time monitoring of critical infrastructure, climate risks, and environmental changes. The platform supports applications such as vegetation risk detection near power transmission lines, flood monitoring and forecasting through integration with hydrological models, agricultural monitoring services for farmers, and rapid crisis mapping for emergency response. The latest innovation highlighted in this work is the ML4HealthyForest service, developed within the Interreg EstLat ML4HealthyForest Project. This service uses countrywide LiDAR datasets combined with forest growth model and machine learning methods to identify forest stands requiring thinning and to estimate the need for both commercial and young stand thinning. The service is available to forest owners through the GeoHub platform in Latvia and via the ForestMan web application in Estonia, providing decision-support tools for sustainable forest management. Additionally, the Twinnovation project demonstrates how EO-driven digital services can support scalable forestry intelligence across regions. Complementary services include annual forest health risk monitoring capable of detecting early indicators of insect infestations, diseases, wildfire

damage, and hydrological stress. The forest monitoring service is currently accessible through the GeoHub platform, enabling users to explore AI-generated forest management recommendations and health assessments through a user-friendly interface. Through several operational deployments across Europe – including infrastructure monitoring in Latvia, flood risk assessment in Greece, and collaborative initiatives with Poland, Slovenia, Turkey, and South Korea – GeoHub demonstrates how integrated EO platforms can transform satellite data into decision-ready intelligence. The presented approach illustrates how advanced geospatial platforms can accelerate the operational adoption of Earth Observation data, supporting digital transformation, environmental sustainability, and climate resilience across sectors.

ĢEOTELPISKO DATU PRECIZITĀTES SAISTĪBA AR KARTOGRĀFISKO PRAKSI

THE RELATIONSHIP BETWEEN GEOSPATIAL DATA ACCURACY AND CARTOGRAPHIC PRACTICE

Armands Celms, Aivars Ratkevičs, Jolanta Celma, Ivars Bergmanis

Latvia University of Life Sciences and Technologies

Geospatial information affects all sectors and every individual. It is the basis for informed policy and decision-making and helps to promote social, economic and environmental sustainability. Thanks to modern technologies such as remote sensing and high-performance computing, geographic information systems (GIS) have brought about a fundamental change in the use and perception of geospatial information: Cartography has become digital, allowing the integration and analysis of different types of data. The geospatial knowledge infrastructure is evolving, making data accessible and usable across sectors. Public authorities are adapting to societal and technological developments, ensuring data quality and interoperability. In our “on-demand” world, “on time” for both people and machines are not days and weeks, but minutes and seconds. That is why efficient and effective methods to extract user-specific knowledge from huge amounts of data, information and existing knowledge, drawn from relevant sources anywhere, are so valuable. Looking at different data space paradigms, such as the cognitive pyramid of knowledge management, real-time linked data spaces, intelligent systems data ecosystem, we have found that many “on-demand” questions could be answered using “good, old” maps.

8. CIKLA ORTOFOTO UN AUGSTAS IZŠKIRTSPĒJAS SATELĪTATTĒLU MOZAĪKA – VISAS LATVIJAS TERITORIJAS PĀRKLĀJUMS

CYCLE 8 ORTHOPHOTO AND HIGH-RESOLUTION SATELLITE IMAGE MOSAIC – COVERAGE OF THE ENTIRE TERRITORY OF LATVIA

Anita Līvija Rozenvalde

Joint Stock Company "Latvia's State Forests"

The Cycle 8 orthophoto dataset provides high-resolution spatial information essential for both daily forestry fieldwork and analytical applications. Acquired between 2020 and 2024, the dataset offers the most up-to-date national coverage at high resolution. However, due to restrictions on data acquisition in border regions, gaps exceeding 700 km² remain. This can complicate operative field work, data analysis, and subsequent geospatial data production. To address these limitations and improve temporal and spatial homogeneity, a complete mosaic covering the entire territory of Latvia was developed.

To complete the Cycle 8 mosaic (2020–2024), areas lacking orthophoto coverage were first identified through manual mapping. These gaps were used to define satellite imagery Areas of Interest (AOIs). High-resolution archival Airbus satellite imagery was selected, with acquisition parameters tailored to closely match the specifications of the Cycle 8 orthophoto dataset. Selection criteria included acquisition angle, spatial resolution, cloud cover thresholds, seasonal consistency, and spatial extent. AOIs were subdivided and optimized to ensure efficient single-scene acquisition where possible.

Several preprocessing steps followed image acquisition. These included georeferencing using previous orthophoto cycles to create ground control points, histogram rescaling across spectral bands, and harmonization of spatial resolution, grid alignment, and masking conventions to ensure compatibility with Cycle 8 orthophotos. The processed imagery was then mosaicked with Cycle 8 data.

Key process constraints included issues such as that automated detection of missing territories was not feasible due to edge artifacts in Cycle 8 orthophotos, particularly fading edge effects in data tiles near the national border. Additionally, preview data from high-resolution satellite imagery sources lacked consistent positional accuracy. Post-acquisition georeferencing introduced occasional spatial shifts, requiring additional corrections. Furthermore, reliance on archival satellite imagery resulted in variability in spatial resolution and temporal alignment.

Despite these limitations, the resulting mosaic provides near-complete, cloud-free coverage of Latvia for the 2020–2025 period. The dataset significantly improves spatial continuity and usability of the data available.

4. Globālās konkurētspējas stiprināšana /

- Strengthening global competitiveness

4.1. sekcija. **GLOBĀLO NORIŠU IETEKME UZ
PRETRUNĪGĀ KULTŪRAS MANTOJUMA
KOMUNIKĀCIJU /**

THE IMPACT OF GLOBAL
DEVELOPMENTS ON
THE COMMUNICATION OF
CONTESTED CULTURAL HERITAGE

LATVIA'S DIVERSITY GOVERNANCE: CHARTING AN INCLUSIVE PATH IN A DENSELY INTERCONNECTED WORLD

Zane Šime¹

¹Norwegian University of Science and Technology

This forthcoming chapter offers an overview of several considerations and choices made by Latvia to promote diversity, equality and inclusion within the specific geoeconomic and societal context inhabited by individuals across its territory and Latvians located around the world. To make the chapter more focused and deliver a clearer novelty, this overview focuses on higher education, academic, science, advanced research, innovation and technology domains. These are crucial areas for the evolution of an excellence-driven knowledge economy. Thus, the achievements and challenges characterising this sector are very informative about the socio-economic developments and the knowledge-intensive potential of the nationally devised policies to promote inclusiveness. Among the existing strengths of Latvia is an exemplary condition of academic freedom and promising strategic partnership ties maintained by higher education establishments across Latvia to engage in one of the most influential supranational steering frameworks, the European University initiative. Nevertheless, the actual resonance of these and a list of other support measures remains to be seen and explored in a more structured, evidence-informed manner. Their role in promoting economic growth, productivity, and development across regions, not solely in the capital city of Riga, should be studied in greater nuance in the future. These will be essential insights concerning the evolving societal and talent diversity hosted by Latvia or situated within a convenient reach outside of the country. Diversity is fluid and dependent on the international brain circulation. Thus, inclusion policies cannot rely solely on archival materials. They require regular adjustments to meet the evolving contemporary needs.

NO PIEMINEKĻA LĪDZ PARKAM: UZVARAS PARKA REPREZENTĀCIJA TŪRISMA PLATFORMĀS

Marita Zitmane

Latvijas Universitāte

Pēdējo gadu globālās politiskās norises, īpaši Krievijas pilna mēroga iebrukums Ukrainā 2022. gadā, ir būtiski ietekmējušas attieksmi pret padomju mantojumu un tā reprezentāciju publiskajā telpā daudzās Eiropas valstīs, tostarp Latvijā. Rīgas Uzvaras parks ir viens no spilgtākajiem pretrunīgā kultūras mantojuma piemēriem, kura nozīme un komunikācija piedzīvojuši straujas pārmaiņas pēc monumenta demontāžas. Ziņojuma mērķis ir analizēt, kā šīs pārmaiņas atspoguļojas digitālajā komunikācijā, īpaši tūrisma platformu lietotāju radītajā saturā.

Pētījums balstās kvalitatīvā un kvantitatīvā analizē par Uzvaras parkam veltītajām atsauksmēm platformās Google Maps, TripAdvisor un citos tūrisma portālos, pievēršot uzmanību diskursa izmaiņām laika gaitā. Tiek analizēti vērtējumi, komentāru tematika, emocionālie vēstījumi un atsauces uz politiskajiem notikumiem, kā arī lietotāju interpretācijas par vietas nozīmi pēc pieminekļa nojaukšanas.

Pētījuma teorētiskais ietvars balstās digitālās atmiņas un participatīvās kultūras pieejās, kas uzsver, ka kolektīvā atmiņa mūsdienās arvien biežāk tiek veidota digitālajās platformās, kur lietotāji aktīvi piedalās nozīmju radīšanā un interpretācijā (Hoskins; Garde-Hansen). Tiešsaistes vidē publiskā telpa iegūst papildu komunikācijas slāni, kurā individuālas pieredzes kļūst par publiski pieejamiem naratīviem, veidojot tā saukto “digitālo atmiņas ekosistēmu”. Tūrisma platformas šajā kontekstā funkcionē ne tikai kā praktiskas informācijas avoti, bet arī kā nozīmīgas kultūras komunikācijas telpas, kurās veidojas vietu reputācija, simboliskā nozīme un emocionālā uztvere (Urry; Larsen). Lietotāju atsauksmes iespējams analizēt kā lietotāju radītu saturu (user-generated content), kas ietekmē gan citu apmeklētāju gaidas, gan plašāku sabiedrisko diskursu par konkrēto vietu. Pretrunīgā kultūras mantojuma gadījumā digitālās platformas kļūst par telpu, kur savstarpēji mijiedarbojas atšķirīgas vēsturiskās interpretācijas, politiskās pozīcijas un personiskās pieredzes, tādējādi atklājot globālo norišu ietekmi uz vietējā mantojuma komunikāciju.

Rezultāti ļauj identificēt, kā globālie politiskie notikumi ietekmē pretrunīgā kultūras mantojuma uztveri starptautiskā auditorijā un kā digitālās platformas kļūst par nozīmīgu telpu kolektīvās atmiņas un publiskās nozīmes veidošanā. Pētījums sniedz ieguldījumu diskusijā par kultūras mantojuma komunikāciju digitālajā laikmetā un sabiedrības attiecībām ar politiski jutīgām vietām.

THE DECOLONISATION DIMENSION OF UKRAINIAN MEMORY POLITICS : SECURITY MOTIVES AND LOCAL CONTROVERSIES

Sergii Pakhomenko

University of Latvia

In this paper, I examine the state policy of decolonisation in Ukraine as a component of contemporary memory politics, which is being shaped in the context of the full-scale Russian-Ukrainian war. Although decolonial discourse in Ukraine is unfolding in various spheres – culture, art, museum practices, public history, as well as in the processes of decolonising academic knowledge – I focus specifically on decolonisation as a normatively regulated memory policy, enshrined in legislation and implemented through state institutions and local self-government bodies. In practice, this policy is primarily implemented in the field of toponymy and the symbolic redefinition of public space, focusing on ridding it of its Russian imperial and Soviet heritage, and is carried out with the involvement of the public, which participates in consultations, initiatives, and public discussions.

My research shows how the decolonisation dimension of historical policy corresponds with the discourse on mnemonic securitisation, which implies “making certain historical remembrances secure by delegitimising... or criminalising others” (M. Mälksoo). Drawing on postcolonial theory, securitisation theory, and discourse analysis, I highlight the complex interplay between security imperatives, ideological motives, and identity politics that shape Ukraine’s current memory landscape.

Building on this, after 2022, Ukraine’s memory politics have taken an anticolonial turn, privileging a Ukrainocentric perspective and reducing the space for mnemonic hybridity. On the one hand, this shift can be understood as a response to the ideological framing of Russian aggression, but on the other, it sometimes generates tension between the securitised national narrative and locally rooted forms of mnemonic ambivalence. The city of Odesa serves as a case study illustrating these dynamics – a site where imperial, Ukrainian, Soviet, and post-Soviet legacies intersect, revealing the difficulties of reconciling national and local frameworks of memory within Ukraine’s current decolonisation agenda.

AUTORITĀRISMA EMOCIONĀLĀ REZONANSE UZVARAS LAUKUMA IZBŪVĒ (1936–1940)

Skaidrīte Lasmane

Latvijas Universitāte

Kārļa Ulmaņa vadītā Uzvaras laukuma izbūve (1936–1940) ļauj atklāt autoritārisma ideoloģijas un prakses īpatnības. To pētniecības aktualitāti pamato autoritārisma atdzimšanas globālās tendences mūsdienās. Referātā pievērsta uzmanība autoritārās politikas emocionālajai rezonansei, ar kuras starpniecību panākts varas ieguves attaisnojums un atbalsts pēc 1934. gada 15. maija apvērsuma. Analizēti galvenie atslēgvārdi emocionālai komunikācijai ar tautu, to rezonanse 20. gs. 30. gadu Latvijas vēsturē un ietekme uz nacionālās apziņas, pašapziņas un identitātes saglabāšanu divu okupāciju laikā un nacionālā valstiskuma atjaunošanā.

“UZVARAS DIENAS” ATZĪMĒŠANAS NARATĪVI RĪGAS UZVARAS PARKĀ LATVIJAS ZIŅU PORTĀLOS LSM.LV, DELFI.LV, TVNET.LV UN DALĪBNIEKU LIECĪBU STĀSTOS (2005–2025)

Evelīna Kukarela, Rēzija Legzdīņa

Latvijas Universitāte

Vieta kā enkurs. Uzvaras parks arī pēc tajā esošā pieminekļa demontēšanas turpina kalpot kā atmiņu, identitātes un diskusiju telpa – kā liecība par Latvijas sarežģīto un neviennozīmīgo vēsturi, kuru nav iespējams aizēnot ar apstādījumiem, spēļlaukumiem vai kafejnīcām. Lai gan mediju ziņojumi par 9. maija svinībām pēc pieminekļa demontēšanas vairs nav tik intensīvi kā iepriekš, šie ieraksti nav zaudējuši nozīmi mediju naratīvu analizē, jo tie atklāj šīs vietas un ar to saistīto notikumu interpretācijas dinamiku.

Pētījuma mērķis ir analizēt “Uzvaras dienas” atspoguļojumu ziņu portālos Delfi, LSM un TVNET laika posmā no 2005. līdz 2025. gadam, kā arī, izmantojot anketēšanas metodi, papildināt mediju publikāciju analīzi ar respondentu pieredzes un attieksmes izvērtējumu, lai noskaidrotu, kā 9. maija svinības tiek uztvertas un interpretētas individuālajā atmiņā. Papildus izpētīt, vai ar šiem notikumiem saistītās pretrunas ir veicinājušas negatīvas emocijas, kas ietekmējušas cilvēku attieksmi pret svētku atzīmēšanu pēc pieminekļa nojaukšanas.

Pētījuma teorētisko bāzi veido mediju reprezentācijas teorētiskās pieejas. Tiek aplūkota rāmējuma (framing) teorija, kas kalpo kā analītiskais ietvars ziņu portālu publikāciju izpētei. Tiek izmantota arī Pjēra Burdjē (Pierre Bourdieu) simboliskās vardarbības (symbolic violence) koncepcija, lai izvērtētu, vai pieminekļa demontēšana un 9. maija svinību aizliegšana ir ietekmējusi nedominantās sociālās grupas – Uzvaras dienas atzīmētāju – konformitātes izpausmes un publiskās pašreprezentācijas prakses. Savukārt empīrisko datu analīzei izmantota Džeimsa Tankarda (James Tankard) vienpadsmit rāmēšanas mehānismu pieeja, kas nodrošina sistemātisku rāmējuma elementu identificēšanu ziņu tekstos. Darba mērķa sasniegšanai izmantotas trīs pētniecības metodes, pirmkārt, ziņu portālu Delfi, LSM un TVNET publikāciju ieguve no digitālā arhīva Wayback Machine un to kvalitatīvā satura analīze rāmējuma teorijas ietvarā. Otrkārt, anketēšana, lai iegūtu datus par respondentu attieksmi, pieredzi un 9. maija svinību interpretāciju individuālajā atmiņā. Treškārt, salīdzinošā analīze, lai izvērtētu sakritības un atšķirības starp mediju konstruētajām interpretācijām un dalībnieku pieredzes naratīviem.

VIETAS ZĪMOLA VEIDOŠANĀS: UZVARAS PARKA PIEMĒRS

Laura Ardava-Āboliņa

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Pētījums “Vietas zīmola veidošanās: Uzvaras parka piemērs” analizē vietas zīmola veidošanās aspektus Rīgas pilsētvidē. Uzvaras parks vēsturiski ietilpinājis daudz dažādu nozīmju un kalpojis par ‘skatuvi’ 9. maija svinēšanai Rīgā, savukārt pēdējo gadu laikā, pārtopot par vienu no skaistākajām un plašākajām zaļajām zonām Rīgā, veidojas arī jauna šī vietas kā zīmola uztvere. Pētījuma mērķis ir analizēt, kā mediju diskurss ietekmē vietas zīmola veidošanos un kā tas atbalsojas parka apmeklētāju uztverē. Teorētiskais ietvars balstīts patlaban aktuālajās vietas zīmolvedības (place branding) un kolektīvās atmiņas teorētiskajās pieejās, kā arī topofilijas (mīlestība pret vietu) jēdzienā, caur kura prizmu var raudzīties uz cilvēku pieķeršanos vietai, apkārtni, savām mājām un saiknes veidošanās aspektiem starp cilvēkiem un viņu apkārtni. Pētījuma empīrisko daļu veido mediju satura analīze un ekspresintervijas ar parka apmeklētājiem, kas tiks īstenotas tieši šim pētījumam. Zīmolvedības teorētiskās pieejas skaidro, ka zīmoli veidojas uz spēcīgu asociāciju bāzes, turklāt zīmols dzīvo tieši mērķauditorijas uztverē. Iegūtie rezultāti skaidros, kāds ir Uzvaras parka kā vietas zīmols respondentu uztverē, kādas ir spēcīgākās asociācijas, ko raisa šī vieta un kādi kolektīvās atmiņas uzslāņojumi vēl joprojām apvij no jauna atdzimušo Uzvaras parku.

INDRIĶA LATVIEŠA KVATROLOĢIJA BAILES, VARA, NAUDA, NĀVE POSTPATIESĪBAS KONTEKSTĀ

Zane Radzobe

Latvijas Universitāte

Ar pseidonīmu Indriķis Latvietis parakstā romānu kvatroloģija ir hibrīdžanra darbs – tā tiek pieteikta kā fikcionāla literatūra, tomēr būtisku tās popularitātes aspektu veido auditorijas pieņemums, ka tā balstīta dokumentālos faktos. Publiskā vidē šāda žanra darbi tiek kontekstualizēti kā taisnības cīnītāju publicistika cenzūras apstākļos vai sazvērestības teoriju izplatīšanas rīks. Referāts analizēs kvatroloģiju kā žanra spilgtu piemēru, akcentējot to, kā grāmatas komunicē Latvijas jaunāko laiku vēsturi, īpašu uzmanību pievēršot tam, kā tās veido realitātes tēlu postpatiesības aspektos Latvijas Valstij šobrīd aktuālo ģeopolitisko izaicinājumu kontekstā.

DEKOMEMORĀCIJAS TEORĒTISKĀS PIEEJAS LIETOJUMS LATVIJAS PRETRUNĪGĀ KULTŪRAS MANTOJUMA PĒTĪJUMOS

Vita Zelče

Latvijas Universitāte

Komemorācijas un kolektīvās atmiņas pētniecībā sekmīgi un ne tik rezultatīvi tiek lietots plašs un daudzveidīgs teorētisko pieeju klāsts. Pētnieces Sāra Gengugera (*Sarah Gensgurger*) un Dženija Vūstenberga (*Jenny Wüstenberg*) piedāvā jēdzienu dekomemorācija, kas izmantojams analizējot praksi, kurā pagātnes materiālās un publiskās reprezentācijas tiek demontētas, iznīcinātas vai fundamentāli mainītas un pārveidotas. Pētnieces arī izstrādājušas dekomemorācijas tipoloģiju, kas savukārt lietojama iztīrājot konkrētus gadījumus un kontekstus. Šajā ziņojumā aplūkots dekomemorācijas tipoloģijas lietojums dažādu Latvijas pretrunīgā kultūras mantojuma piemēru analīzē, piemēram, iztīrājot pēc Krievijas Federācijas pilna mēroga iebrukuma Ukrainā notikušās pārvērtības Rīgas Uzvaras parkā, Esplanāde un citviet, kā arī nelielās lauku apdzīvotajās vietās.

4.2. sekcija. **PUBLISKĀ SEKTORA PĀRVALDĪBA UN
REFORMAS VALSTS KONKURĒTSPĒJAI /**
**PUBLIC SECTOR GOVERNANCE
AND REFORMS FOR NATIONAL
COMPETITIVENESS**

SOCIĀLĀS APRŪPES FINANSĒŠANAS ILGTSPĒJAS IZAICINĀJUMI LATVIJĀ

Jana Muižniece

Latvijas Universitāte

Sociālās aprūpes finansēšana Latvijā kļūst par arvien nozīmīgāku sociālās politikas jautājumu iedzīvotāju novecošanās un pieaugošā aprūpes pieprasījuma kontekstā. Esošā sistēma balstās uz valsts, pašvaldību un personu līdzdalību, tomēr pastāv teritoriāla nevienlīdzība, atšķirīga finansēšanas prakse un pieaugošs slogs māsaimniecībām un pašvaldībām. Izdevumu prognozes liecina par būtisku pieaugumu tuvākajās desmitgadēs, aktualizējot fiskālās ilgtspējas un strukturālu pārmaiņu nepieciešamību. Pētījuma mērķis ir izvērtēt sociālās aprūpes finansēšanas ilgtspēju Latvijā un identificēt attīstības virzienus. Izmantota kvalitatīvā un kvantitatīvā pieeja: veikta normatīvā regulējuma un politikas dokumentu analīze, sekundāro statistikas datu analīze, salīdzinošā analīze, kā arī finanšu modelēšana un scenāriju analīze, izvērtējot dažādu finansēšanas variantu fiskālo ietekmi ilgtermiņā. Analizēti vairāki finansēšanas modeļi: valsts atbildības, personas atbildības, jauktās atbildības un veselības un sociālās aprūpes integrētais modelis, kā arī diskutēta obligātās apdrošināšanas ieviešanas iespējamība un citi alternatīvi finansēšanas avoti. Vienlaikus ilgtermiņa perspektīvā nozīmīga ir arī paaudžu dinamika, jo atšķirīgās paaudžu vērtības, attieksme pret valsts un ģimenes atbildību, kā arī gaidas attiecībā uz pakalpojumu kvalitāti un tehnoloģiju izmantošanu var ietekmēt sociālās aprūpes sistēmas attīstības virzienus un finansēšanas modeļu akceptu sabiedrībā. Secinājumi liecina, ka ilgtspējīgs finansēšanas risinājums balstās uz sabalansētu atbildības sadalījumu starp iesaistītajām pusēm, vienlaikus mazinot nevienlīdzību un nodrošinot sociālās aprūpes pakalpojumu pieejamību visā teritorijā.

Atslēgvārdi: sociālā aprūpe, fiskālā ilgtspēja, sociālā politika.

ATKLĀTĪBAS DIVAS SEJAS: KAD KONKURENCES NEITRALITĀTE IETEKMĒ PUBLISKO PAKALPOJUMU NODROŠINĀŠANU LATVIJĀ

Inguss Vircavs

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Konkurences neitralitātes princips ir instruments, lai nodrošinātu līdzvērtīgus konkurences apstākļus. Latvijā un citās Ekonomiskās sadarbības un attīstības organizācijas valstīs tā piemērošana publisku jeb vispārējas nozīmes pakalpojumu jomā saistīta ar paaugstinātām atklātības prasībām valsts un pašvaldību kapitālsabiedrībām. Atklātību uzskata par svarīgu labas pārvaldības instrumentu, lai tiktu ievērotas sabiedrības intereses. Tomēr tās ietekme uz konkurences līdzsvaru jauktā tirgū ir nepietiekoši pētīta.

Pētījuma mērķis ir izpētīt, kā atklātības prasības ietekmē publisko pakalpojumu nodrošināšanu Latvijā. Izmantotās kvalitatīvās metodes ietver daļēji strukturētas publiskā sektora ekspertu intervijas, papildinot ar kvantitatīvu datu analīzi, lai izpētītu pakalpojumu nodrošināšanas efektivitāti un to sniedzēju konkurētspēju atklātības prasību ievērošanas kontekstā.

Rezultāti rāda, ka atklātības prasībām ir divējāda iedarbība. Caurskatāmība uzlabo valsts un pašvaldību kapitālsabiedrību pārvaldības kvalitāti, un ir līdzeklis sabiedrības uzticības veicināšanai. Vienlaikus to savā labā var izmantot konkurenti privātajā sektorā.

Secināms, ka neattiecinot līdzvērtīgas prasības privātajiem uzņēmumiem, kas darbojas tajos pašos tirgos, kur valsts un pašvaldību kapitālsabiedrības, un konkurē, lai saņemtu publisku finansējumu, var pastāvēt konkurences asimetrijas riski. Ja netiek sistemātiski vērtēta atklātības u. c. ierobežojumu kumulatīvā ietekme dažādos tirgos, var tikt vājināta publisko pakalpojumu nodrošināšanas efektivitāte.

Priekšlikums – līdztekus īpašuma formas kritērijam, ievērot arī publiskā finansējuma izmantošanas un tirgus struktūras aspektus, lai ierobežojumu politikā mazinātu konkurences asimetriju un nodrošinātu ilgtspējīgu publisko pakalpojumu pieejamību.

STARPPAAUDŽU TAISNĪGUMA IZAICINĀJUMI ORGANIZĀCIJU PĀRVALDĪBAS KULTŪRĀ LATVIJĀ

Zane Rožkalne, Diāna Radziņa, Lilita Seimuškāne

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Demogrāfiskās pārmaiņas ietekmē sabiedrību ļoti plašā mērogā, tai skaitā darba tirgu, organizāciju pārvaldības kultūru, produktivitāti un konkurētspēju. Ekonomiskās sadarbības un attīstības organizācijas (OECD) 2025. gada nodarbinātības pētījumā vērtēta organizāciju produktivitātes rādītāju saistība ar nodarbināto dažādu vecuma paaudžu struktūru Somijā, Vācijā, Portugālē, Japānā. Hārvarda Universitāte jau 2020. gadā izstrādāja stratēģiju, lai maksimāli efektīvi izmantotu darbaspēku no dažādām paaudzēm.

Pētījuma mērķis ir novērtēt starppaaudžu taisnīguma izpratni no dažāda vecuma grupu nodarbināto perspektīvas un identificēt šķēršļus viņu pilnvērtīgai sadarbībai publiskā un privātā sektora organizācijās Latvijā. Pētījumā izmantota kvantitatīvā pētniecības metode – aptauja, kurā piedalījās 137 dažāda vecuma respondenti Latvijā, kā arī empīrisko datu analīzes metodes.

Sākotnējie pētījuma rezultāti atklāj būtisku paradoksu starppaaudžu mijiedarbībā. Lai gan absolūtais vairākums (90%) aptaujāto norāda uz formāli vienlīdzīgu piekļuvi apmācību iespējām neatkarīgi no vecuma, vienlaikus dati uzrāda augstus strukturālās ievainojamības riskus. Vairāk nekā divas trešdaļas (69%) respondentu atzīst, ka darbinieka vecums kļūst par izšķirošu faktoru darba saglabāšanai institūciju reorganizācijas gadījumos. Šie dati apstiprina teorētiskās atziņas, ka ar formāliem vienlīdzības mehānismiem nepietiek – latentā vecuma diskriminācija un esošā cilvēkkapitāla nepietiekama integrācija pārmaiņu brīžos ignorē profesionālo un procesu vadības pieredzi un mazina organizāciju darbības kapacitāti.

Pētījums secina, ka starppaaudžu taisnīguma trūkums lēmumu pieņemšanas procesos negatīvi ietekmē ne tikai individuālo labklājību, bet arī organizācijas produktivitāti un konkurētspēju. Lai to nodrošinātu, organizāciju pārvaldības kultūrā jāpāriet no pasīvas cilvēkresursu politikas uz iekļaujošu starppaaudžu sadarbības modeli.

Atslēgvārdi: Demogrāfiskās pārmaiņas, darba tirgus, nodarbinātība, starppaaudžu taisnīgums, organizāciju pārvaldības kultūra.

POLITISKĀ ATBILDĪGUMA UN PAŠVALDĪBU DARBĪBAS REZULTĀTU SAVSTARPĒJĀ SAIKNE LATVIJĀ

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Demokrātiskas pārvaldības kvalitāte arvien biežāk tiek analizēta caur politiskā atbildīguma prizmu – proti, cik lielā mērā ievēlētie pārstāvji ir atbildīgi vēlētāju priekšā un cik efektīvi darbojas caurskatāmības, uzraudzības un atskaitīšanās mehānismi. Eiropas un OECD valstu pieredze rāda, ka uzticēšanās politiskajām institūcijām ir būtisks demokrātijas noturības un valsts efektivitātes priekšnosacījums, tomēr arī vietējā līmenī uzticēšanās rādītāji saglabājas mēreni. Latvijas kontekstā šis jautājums ir īpaši aktuāls pēc jaunā Pašvaldību likuma pieņemšanas, kas paplašina līdzdalības instrumentus (līdzdalības budžets, iedzīvotāju padomes, kolektīvie iesniegumi u. c.), formāli stiprinot politiskās atbildības sistēmu, taču praksē sabiedrības iesaiste un ietekme uz lēmumu pieņemšanu joprojām ir nevienmērīga.

Līdzšinējā literatūrā politiskais atbildīgums biežāk analizēts normatīvi vai konceptuāli, bet Latvijā nav veikta sistemātiska empīriskā analīze par tā saikni ar pašvaldību darbības efektivitāti. Tādēļ aktuāls ir jautājums, vai pašvaldībās ar attīstītākiem politiskās atbildības mehānismiem – augstāku vēlētāju iesaisti, lielāku konkurenci un caurskatāmību – ir vērojami labāki finanšu, pakalpojumu un attīstības rādītāji. Pētījums ir nozīmīgs gan teorētiski, precizējot politiskā atbildīguma operacionalizāciju vietējās pārvaldības kontekstā, gan praktiski, sniedzot empīriski pamatotu izvērtējumu par politiskās atbildības kvalitātes ietekmi uz pašvaldību darbības rezultātiem Latvijā.

Pētījuma centrālais jautājums: vai un kā politiskā atbildīguma parametri ietekmē pašvaldību darbības rezultātus Latvijā?

Mērķis ir izstrādāt politiskā atbildīguma analītisko ietvaru un empīriski pārbaudīt tā saistību ar pašvaldību darbības rādītājiem Latvijā.

Uzdevumi:

- analizēt politiskā atbildīguma izpratni politikas teorijā un publiskās pārvaldes teorijās;
- identificēt galvenos parametrus politiskā atbildīguma mērīšanai;
- sistematizēt pašvaldību darbības efektivitātes novērtēšanas pieejas un indikatorus;
- empīriski analizēt politiskā atbildīguma un pašvaldību snieguma rādītāju savstarpējo saikni Latvijā.

Pētījumā tiks izmantota jaukta pētījumu metode:

- teorētisko avotu kvalitatīva analīze;
- indikatoru operacionalizācija un indeksu veidošana;
- kvantitatīvo datu ieguve un analīze (primārie un sekundārie dati par Latvijas pašvaldībām);
- statistikas metodes (iespējams, arī Qualitative Comparative Analysis), lai pārbaudītu iespējamās kauzālās sakarības starp politiskā atbildīguma un snieguma rādītājiem.

Empīriskajā daļā tiks izmantoti autores iegūtie primārie dati atbilstoši identificētajiem politiskā atbildīguma parametriem, kā arī sekundārie dati par pašvaldību finanšu, attīstības un pārvaldības rādītājiem.

Pētījums sniegs:

- konceptuāli skaidru politiskā atbildīguma operacionalizāciju;
- sistematizētu pieeju pašvaldību snieguma novērtēšanai;
- empīriski pamatotu izvērtējumu par politiskā atbildīguma nozīmi vietējā līmeņa pārvaldībā Latvijā.

Rezultāti var kalpot par pamatu publiskās pārvaldes teorētiskai diskusijai par politiskā atbildīguma vērtēšanas parametriem, kā arī politikas veidotājiem un pētniekiem, veicinot uz pierādījumiem balstītu diskusiju par pašvaldību pārvaldības kvalitāti un demokrātiskās atbildības mehānismiem.

STRUKTURĀLO REFORMU IEVIEŠANAS PROCESA IETEKMĒJOŠO FAKTORU IZVĒRTĒJUMS VALSTS POLICIJĀ LATVIJĀ

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Valsts policija Latvijā pēdējos gados piedzīvo būtiskas strukturālas un organizatoriskas reformas, kuru mērķis ir paaugstināt darba efektivitāti, stiprināt sabiedrības uzticību un uzlabot darba vidi nodarbinātajiem. Taču Valsts policija ir specifiski pārvaldīta iestāde ar izteiktu lēmumu pieņemšanas procesa vertikāli, kurā pārmaiņu procesa ieviešanas tradicionālie elementi ir maz praktizēti. Nereti struktūrvienību vadītāji ir pārliecināti, ka visi padotībā esošie nodarbinātie saprot, kāpēc plānotās reformas ir nepieciešamas, un cer, ka pārmaiņas ieviesīsies pašas no sevis. Tas rezultējas ar vāji sagatavotu plānoto reformu ieviešanas stratēģiju, ignorējot svarīgus ieviešanas procesa aspektus: iekšējās komunikācijas nozīmi, reformu mērķa izpratni, iestādes iekšējās pretestības potenciālo spēku.

Pētījuma mērķis ir identificēt strukturālo reformu procesa ietekmējošos, tai skaitā bremsējošos faktorus Valsts policijā Latvijā.

Pētījuma metodes: kvantitatīvā pētījuma metode – aptauja, empīrisko un sekundāro datu analīze, monogrāfiskā pētījuma metode. Pētījuma rezultāti atklāj, ka Valsts policija strukturālo reformu laikā galveno fokusu centrē tiešo funkciju izpildei, nepietiekamu uzmanību veltot iekšējai komunikācijai un nodarbināto labbūtībai pārmaiņu procesā, kas rezultējas ar pretestību pārmaiņām. Aptaujas dati parāda, ka 38% Valsts policijas nodarbināto pauž neapmierinātību ar strukturālo reformu procesa ieviešanu, apmierināti ir 16% Valsts policijā nodarbināto.

Pētījuma rezultāti atklāj, ka vairāk kā viena trešdaļa Valsts policijā nodarbināto ir neapmierināti ar strukturālo reformu procesa gaitu, tai skaitā iekšējo komunikāciju. Vērtējot strukturālo reformu procesa ieviešanu, dominē neitrāla un negatīva attieksme. Tas pamato nepieciešamību izvērtēt līdzšinējo vadības praksi un meklēt atšķirīgas pieejas strukturālo reformu procesa veiksmīgā īstenošanā.

Atslēgvārdi: Valsts policija, strukturālās reformas, reformu ieviešanas process, ietekmējošie faktori, iekšējā komunikācija.

TERITORIĀLĀ MĀRKETINGA TEORĒTISKĀS VARIĀCIJAS: ZINĀTNISKĀS LITERATŪRAS ANALĪZE

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Viena no mūsdienīgākajām un mazāk pētītajām mārketinga nozarēm ir teritoriālais mārketingš. Teritoriālā mārketinga un ar to saistītie jēdzieni – pilsētas mārketingš, vietas popularizēšana, galamērķa zīmolveidība un pilsētas zīmolveidība, ir attīstījušies pakāpeniski, reaģējot uz ekonomiskajām, sociālajām un komunikācijas pārmaiņām, kas ietekmējušas administratīvo teritoriju konkurētspēju. Lai arī konkrētie jēdzieni savstarpēji ir cieši saistīti, taču katrs no tiem akcentē atšķirīgu teritorijas attīstības un pārvaldības aspektu.

Pētījuma mērķis ir analizēt un sistematizēt zinātniskajā literatūrā izstrādātās pieejas teritoriālā mārketinga jomā, identificējot galvenos teorētiskos virzienus, attīstības posmus un dominējošās paradigmas. Analīzē tiek aplūkoti klasiskie un mūsdienu skatījumi uz teritoriju kā konkurētspējīgu produktu, iezīmējot atšķirību no tradicionālā mārketinga pieejām līdz stratēģiskai un daudzdimensionālai teritorijas pārvaldības koncepcijai. Īpaša uzmanība veltīta teorētisko pieeju savstarpējai salīdzināšanai un to pielietojamībai pilsētu ilgtspējīgas attīstības kontekstā.

Pētījumā izmantota monogrāfiskā metode, padziļināti analizējot zinātniskās literatūras analīzi par teritoriālā mārketinga koncepcijas teorētiskajām variācijām un attīstības tendencēm, kā arī dažādu autoru teorētisko pieeju interpretācijas salīdzinošā analīze

Zinātniskās literatūras analīze ļauj secināt, ka teritoriālais mārketingš ir daudzdimensionāls jēdziens, kurā vairākos slāņos savstarpēji mijiedarbojas pārvaldības, attīstības plānošanas, zīmolveidības un ieinteresēto pušu iesaistes dimensijas.

Atslēgvārdi: teritoriālais mārketingš, salīdzinošā analīze, teorētiskās variācijas, administratīvo teritoriju attīstība, konkurētspēja, pārvaldība.

MAZKVALIFICĒTĀ DARBASPĒKA PROFILS LATVIJĀ: DAUDZDIMENSIONĀLA PIAAC DATU ANALĪZE

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Referāts analizē mazkvalificētā darbaspēka profilu Latvijā, izmantojot OECD Starptautiskās pieaugušo kompetenču novērtēšanas programmas PIAAC datus. Pētījuma mērķis ir identificēt mazkvalificētā darbaspēka daudzdimensionālo struktūru un noteikt faktorus, kas ietekmē šo personu darba tirgus rezultātus un prasmju attīstību Latvijā.

Teorētiskajā daļā analizēta jēdziena “mazkvalificēts darbaspēks” konceptualizācija zinātniskajā literatūrā un Latvijas attīstības plānošanas dokumentos. Secināts, ka politikas dokumentos šī grupa tiek definēta fragmentēti – kā personas ar zemu izglītības līmeni, zemu kvalifikāciju, nodarbinātie vienkāršās profesijās vai ar zemu atalgojumu –, radot konceptuālu neskaidrību un apgrūtinot mērķētu politikas risinājumu izstrādi

Empīriskajā analizē izmantoti PIAAC Latvija “Public of Use” faila mikro dati, integrējot vairākas dimensijas: izglītības līmeni, kognitīvās prasmes (īpaši lasītprasmi), nodarbinātības raksturojumus (ISCO profesiju grupas), ienākumu līmeni un dalību pieaugušo izglītībā.

Rezultāti rāda izteiktas vecuma un dzimuma atšķirības: jaunieši un seniori ir ievainojamākās grupas, taču atšķirīgu iemeslu dēļ; vīriešiem biežāk raksturīgs zems izglītības un prasmju līmenis, savukārt sievietēm – nodarbinātība vienkāršās profesijās un augstāks zemu ienākumu risks. Analīze atklāj arī strukturālu neatbilstību starp prasmju līmeni un darba tirgus iznākumiem – zemu ienākumu un vienkāršo profesiju grupās ir pārstāvēti arī indivīdi ar augstu kompetenci. Turklāt dalība pieaugušo izglītībā ir ievērojami zemāka zemāku ienākumu un izglītības grupās.

Pētījums piedāvā daudzdimensionālu pieeju mazkvalificētā darbaspēka identificēšanai un sniedz empīrisku pamatu pierādījumos balstītu politikas risinājumu izstrādei, lai mazinātu nevienlīdzību un veicinātu mērķētu prasmju attīstību Latvijā.

DIGITĀLO KOMPETENČU IETVARŠ UN MĀCĪŠANĀS KULTŪRA KĀ DIGITĀLĀS TRANSFORMĀCIJAS BRIEDUMA NOTEICĒJI PUBLISKAJĀ PĀRVALDĒ

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Digitālā transformācija publiskajā pārvaldē ir daudzdimensionāls process, kas ietver tehnoloģiju ieviešanu, organizatorisko procesu pārveidi un cilvēkkapitāla attīstību (Aristovnik et al., 2024; Alfadhli et al., 2025). Jaunākie pētījumi uzsver, ka digitālās transformācijas briedumu nosaka ne tikai tehnoloģiskā infrastruktūra, bet arī darbinieku digitālās kompetences un organizācijas mācīšanās kultūra (Çelik, 2025; Ongena et al., 2025). Publiskajā sektorā īpaši nozīmīga ir kompetenču diferenciācija atbilstoši lomām, kas ļauj strukturēt digitālo kompetenču prasības dažādos pārvaldes līmeņos (Mihaila, 2024).

Pētījuma mērķis ir analizēt, kā kontekstuāli adaptēts digitālo kompetenču ietvars un mācīšanās kultūras raksturojums ietekmē digitālās transformācijas briedumu Latvijas publiskajā pārvaldē.

Metodes. Pētījuma teorētiskais pamats ir balstīts DigComp 2.2 ietvarā, OECD digitālās valdības principos un transformējošās vadības (Transformational Leadership) teorijā (Bass & Riggio, 2006), uzsverot vadības spēju veidot attīstību veicinošu vidi, kas sekmē kompetenču attīstību un inovāciju ieviešanu. Pētījumā izmantots publiskās pārvaldes kontekstam adaptēts digitālo kompetenču modelis, diferencējot trīs lomu grupas – atslēgas, sadarbības un lietotāju lomas –, tādējādi operacionalizējot kompetenču prasību strukturālo daudzveidību organizācijā. Empīriskā daļa balstīta aptaujas datos (n = 1028), kas veikta 2025. gadā valsts un pašvaldību iestādēs. Datu analizē izmantota deskriptīvā statistika, novērtējot digitālo kompetenču pašvērtējumu, mācīšanās paradumus un organizatoriskā atbalsta faktoros.

Rezultāti liecina par izteiktu digitālo kompetenču līmeņu diferenciāciju starp lomu grupām. Padziļinātā vai eksperta līmeņa kompetences konstatētas 67,4% atslēgas lomu, 46,8% sadarbības lomu un 35,0% lietotāju lomu pašnovērtējumos, norādot uz strukturālu atšķirību starp stratēģiskajiem un operatīvajiem līmeņiem publiskajā pārvaldē. Vadības atbalsts digitālo prasmju attīstībai iestādēs tiek uztverts kā augsts visās lomās (92–96%). Aptuveni puse respondentu (49–56%) norāda brīva laika pieejamību kā būtisku priekšnosacījumu digitālo prasmju pilnveidei. Digitālās transformācijas mērķu skaidrība tiek vērtēta nevienmērīgi – augstāk atslēgas lomās (88,9%) nekā sadarbības (73,1%) un lietotāju lomās (78,8%).

Digitālās transformācijas briedums publiskajā pārvaldē ir cieši saistīts ar lomu diferenciāciju, vadības komunikācijas kvalitāti un mācīšanās iespēju nodrošinājumu iestādēs. Lai gan vadības atbalsts tiek uztverts kā augsts, kompetenču sadalījums liecina par nevienmērīgu digitālās kapacitātes attīstību publiskajā pārvaldē. Izstrādātais digitālo kompetenču ietvars var kalpot kā analītisks un praktisks instruments digitālās attīstības plānošanā un publiskā sektora kapacitātes stiprināšanā.

Atslēgvārdi: digitālā transformācija, digitālās kompetences, mācīšanās kultūra, publiskā pārvalde, transformējošā vadība.

KARJERAS ATBALSTS KĀ CILVĒKKAPITĀLA NOTURĪBAS INSTRUMENTS DIGITĀLAJĀ EKONOMIKĀ

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Rīgas Stradiņa universitāte

Digitālā transformācija rada nelineāras karjeras trajektorijas un arvien vairāk pieprasa individu spēju nepārtraukti attīstīt savas prasmes, profesionālās lomas un profesionālo identitāti. Lai gan karjeras atbalsta pakalpojumi, tostarp karjeras konsultācijas, mūžizglītības iespējas un profesionālās attīstības iniciatīvas, tiek plaši īstenoti izglītības un nodarbinātības sistēmās, to plašākā teorētiskā nozīme adaptīvās kapacitātes veicināšanā joprojām ir nepietiekami izpētīta. Līdzšinējie pētījumi karjeras atbalstu galvenokārt aplūko kā individuāla līmeņa intervenci nodarbināmības uzlabošanai, nepietiekami analizējot tā sistēmisko ietekmi.

Pētījumā tiek piedāvāta integrēta teorētiskā pieeja, konceptualizējot karjeras atbalstu kā daudzlīmeņu adaptīvu resursu, kas palīdz indivīdiem un organizācijām efektīvi reaģēt uz nepārtrauktām pārmaiņām. Balstoties karjeras konstruēšanas teorijā, nodarbināmības teorijā, pašnoteikšanās teorijā un darba prasību–resursu modelī, karjeras atbalsts tiek skaidrots kā mehānisms, kas aktivizē psiholoģiskos resursus un stiprina karjeras adaptabilitāti – nākotnes orientāciju, rīcībspēju, izpēti uzvedību un pašefektivitāti. Šīs spējas veicina iesaisti mācīšanās procesos, karjeras pašvadību un dalību organizatorisko pārmaiņu īstenošanā.

2025. gada pētījums balstīts aptaujas datus par ekonomiski aktīvajiem iedzīvotājiem Latvijā (n = 402), papildinot tos ar fokusgrupu diskusijām reģionālās attīstības kontekstā. Strukturālo vienādojumu modelēšana izmantota, lai analizētu sakarības starp uztverto karjeras atbalstu, adaptabilitāti un iesaisti pārmaiņās. Rezultāti liecina, ka attīstības iespēju un institucionālā atbalsta uztvere būtiski veicina adaptīvu karjeras uzvedību un gatavību pārmaiņām.

Pētījums paplašina karjeras attīstības un vadībzinātņu teorētisko izpratni, pārdefinējot karjeras atbalstu no palīdzinstruments par stratēģisku darbaspēka noturības faktoru digitālās transformācijas apstākļos.

DIGITĀLĀ TRANSFORMĀCIJA UN TĀS BRIEDUMU PAKĀPES PALIELINĀŠANA

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Digitālā transformācija ir visaptverošs un stratēģisks process, kura rezultātā pasaulē un Eiropā notiek fundamentālas pārmaiņas uzņēmumu darbībā, valsts pārvaldībā un pilsoņu ikdienā. Digitālā transformācija Eiropas Savienībā nozīmē pilnvērtīgu procesu digitalizāciju līdz 2030. gadam. Lai izpildītu “Digitālās desmitgades” mērķu sasniegšanu ir nepieciešams regulāri monitorēt digitālās transformācijas brieduma līmeni. Autore uzskata, ka ir kritiski svarīgi veicināt digitālās transformācijas brieduma līmeņa palielināšanu, analizēt tā mērīšanas modeļus un sniegt praktiskus ieteikumus uzlabojumiem.

SUDRABA PAAUDZES LABBŪTĪBAS REĢIONĀLIE ASPEKTI: MOTIVĀCIJA UN ŠĶĒRŠĻI

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Demogrāfiskās novecošanās tendences gan Latvijā, gan Eiropā ievieš izmaiņas iedzīvotāju veumstrukturā. Kopš 1993. gada iedzīvotāju īpatsvars virs darbspējas vecuma ir lielāks par bērnu un pusaudžu īpatsvaru, kas nozīmē, ka nākotnē būs mazāks iedzīvotāju skaits darbspējas vecumā un demogrāfiskās slodzes līmenis pieaugs. 2025. gada sākumā uz 1 000 darbspējas vecuma iedzīvotāju bija 347 iedzīvotāji vecumā 64 gadi un vairāk un 239 bērni vecumā līdz 14 gadiem. Sabiedrībai novecojot, nelielam nodarbināto skaitam nāksies nodrošināt pensiju izmaksas lielam pensionāru skaitam, kā arī nodrošināt veselības un ilgtermiņa aprūpes vajadzības. Tādēļ ES līmenī tiek uzsvērtā nepieciešamība pēc iespējas pilnīgāk izmantot sava darbaspēka potenciālu, lai risinātu jautājumus, kas saistīti ar iedzīvotāju novecošanos.

Sudraba ekonomikas attīstība Eiropā nav viendabīga, drīzāk reģionāli specifiska, jo pastāv būtiskas atšķirības senioru dzīves apstākļos ne tikai dažādās valstīs, bet arī vienas valsts administratīvajās teritorijās. Šīs atšķirības ietekmē demogrāfiskie, sociāli ekonomiskie, politiskie un kontekstuālie faktori.

Pētījuma mērķis ir, pamatojoties uz interneta aptaujas (CAWI) rezultātiem, kas veikta sadarbībā ar Tirgus un sabiedriskās domas pētījumu centru SKDS starp 733 pēcdarbspējas vecuma iedzīvotājiem 2025. gadā, identificēt atšķirības jomās, kas skar pensijas vecuma iedzīvotāju dzīves kvalitāti un skaidrot iemeslus, kas tos ietekmē. Aptaujas datu analīze veikta statistisko reģionu griezumā.

Pētījuma rezultāti atklāj, ka “materiālos apsvērumus” kā būtiskāko iemeslu nodarbinātības turpināšanai visbiežāk norādījuši respondenti Latgalē (69%), taču tie ir tikpat nozīmīgi arī respondentiem Pierīgā (68%). Savukārt Latgalē dzīvojošie respondenti ievērojami mazāk norāda, ka “interesants, patīkams darbs” (29%) ir iemesls nodarbinātības turpināšanai salīdzinājumā ar respondentiem Rīgā, kuri uz pusi vairāk (60%) tieši šo iemeslu nosauc par svarīgu faktoru nodarbinātības turpināšanai.

Atslēgvārdi: pēcdarbspējas vecuma iedzīvotāji, labbūtība, ietekmējošie faktori, reģionālās atšķirības.

INSTITUCIONĀLĀ GATAVĪBA KĀ JURIDISKA FIKCIJA: LATVIJAS PUBLISKĀS UN PRIVĀTĀS PARTNERĪBAS PĀRVALDĪBAS IETVARA EMPĪRISKĀ ANALĪZE

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Publiskā un privātā partnerība (PPP) visā pasaulē tiek pozicionēta kā moderns pārvaldības instruments, kas ļauj piesaistīt privāto kapitālu, efektīvāk sadalīt riskus un nodrošināt sarežģītu un inovatīvu projektu īstenošanu. Tomēr PPP modeļa sekmīgai funkcionēšanai nepieciešama augsta institucionālā kapacitāte publiskajā sektorā. Latvijas gadījumā, neskatoties uz pašreizējā PPP regulējuma spēkā esamību kopš 2009. gada, praksē ir īstenots tikai viens projekts, kas aktualizē jautājumu nevis par atsevišķu projektu neveiksmi, bet par pašas pārvaldības dizainu. Pētījuma mērķis ir analizēt, kādas institucionālās spējas Latvijas PPP tiesiskais un metodoloģiskais ietvars pieprasa no publiskajiem partneriem un vai šīs prasības ir sistemātiski pamatotas ar atbilstošiem institucionālā atbalsta mehānismiem. Centrālā problēma tiek formulēta kā iespējama neatbilstība starp normatīvajos aktos ietvertajiem kapacitātes pieņēmumiem un faktisko atbalsta struktūru. Pētījumā tiek izmantota kvalitatīva, dokumentos balstīta pētniecības pieeja. Empīriskā analīze veikta gan saistošajiem tiesību aktiem, gan oficiālajām metodoloģiskajām vadlīnijām. Izmantojot deduktīvo dokumentu analīzi un iekšējo ticamības pārbaudi, tiek identificētas pārvaldības ietvarā iekļautās kapacitātes prasības un nodrošinātie instrumenti, kapacitātes stiprināšanas mehānismi un mācīšanās struktūras šo prasību un pieņēmumu pamatošanai. Pētījums sniedz ieguldījumu publiskās pārvaldes teorijā, pārorientējot uzmanību no PPP projektu rezultativitātes uz pārvaldības dizaina iekšējo konsekvenci un institucionālās gatavības konceptu. Rezultāti ir nozīmīgi politikas veidotājiem, publiskās pārvaldes praktiķiem un uzraudzības institūcijām, jo ļauj diagnosticēt iespējamās strukturālos šķēršļus efektīvai publiskā sektora lēmumu pieņemšanai un sekmīgai PPP projektu īstenošanai.

PUBLISKĀ MAKSĀTĀJA REFORMAS KĀ KONKURĒTSPĒJAS INSTRUMENTS: VALSTS APMAKSĀTO LABORATORIJAS PAKALPOJUMU TIRGUS STRUKTURĀLĀS PĀRMAIŅAS UN BUDŽETA ILGTSPĒJA EIROPAS DALĪBVALSTĪS UN LATVIJĀ (2015–2025)

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Eiropas veselības aprūpes sistēmas pēdējā desmitgadē saskaras ar pieaugošu fiskālo un institucionālo spiedienu, ko nosaka demogrāfiskā novecošanās, hronisko slimību izplatības pieaugums un nepieciešamība nodrošināt publiskā budžeta ilgtspēju. Šajā kontekstā laboratorijas pakalpojumi ieņem stratēģiski nozīmīgu vietu, jo būtiska daļa klīnisko lēmumu balstās uz diagnostikas rezultātiem, vienlaikus šis sektors bieži kļūst par izmaksu kontroles politikas mērķi. Daudzās Eiropas valstīs ieviestas reformas – tarifu pārskatīšana, centralizēti iepirkumi, līgumu apjomu regulējums un tīkla reorganizācija –, kas būtiski ietekmē tirgus struktūru un konkurences vidi.

Pētījuma mērķis ir empīriski izvērtēt valsts apmaksāto laboratorijas pakalpojumu reformu ietekmi uz tirgus koncentrāciju, pakalpojumu pieejamību un pacientu līdzmaksājumu dinamiku Latvijā un izvēlētajās Eiropas valstīs 2015–2025. gada periodā, analizējot šīs pārmaiņas veselības budžeta ilgtspējas kontekstā. Pētījums balstīts veselības ekonomikas un regulācijas teorētiskajā ietvarā, interpretējot publiskā maksātāja politikas instrumentus kā strukturālus tirgu veidojošus faktoros.

Empīriskajā daļā izmantota jaukta metodoloģija, apvienojot administratīvo un statistisko datu analīzi ar tirgus koncentrācijas rādītājiem (HHI, CR4), paneļdatu regresijas modeļiem un kvazi-eksperimentālām pieejām. Papildus veikta Latvijas iedzīvotāju aptauja ($n \approx 1000$) un laboratoriju vadības pārstāvju aptauja/intervijas ($n \approx 15$), nodrošinot datu triangulāciju un daudzdimensionālu analīzi.

Rezultāti liecina, ka reformu intensitātes pieaugums ir saistīts ar tirgus konsolidācijas procesu paātrināšanos un koncentrācijas pieaugumu valsts apmaksātajā segmentā. Lai gan koncentrācija var radīt mēroga ekonomiju un administratīvu efektivitāti, tā vienlaikus var pastiprināt reģionālās pieejamības nevienlīdzību un radīt netiešu finansiālā sloga pārdali uz pacientiem. Īpaša uzmanība pievērsta Latvijas situācijai, kur pacientu tiešo maksājumu īpatsvars veselības aprūpē saglabājas viens no augstākajiem Eiropas Savienībā, radot finansiālās pieejamības riskus. Tādējādi strukturālās reformas laboratorijas sektorā ietekmē ne tikai fiskālos rādītājus, bet arī sabiedrības uzticēšanos publiskajai pārvaldei un veselības sistēmas sociālo taisnīgumu.

Pētījums sniedz teorētisku un empīrisku ieguldījumu veselības aprūpes ekonomikas jomā, piedāvājot analītisku ietvaru laboratorijas pakalpojumu reformu ietekmes izvērtēšanai. Pētījuma rezultāti ļauj identificēt kompromisus starp efektivitātes, pieejamības un finansiālā taisnīguma mērķiem, kā arī izstrādāt pierādījumos balstītus priekšlikumus veselības politikas pilnveidei Latvijā un plašākā Austrumeiropas reģionā.

4.3. sekcija. **INOVĀCIJAS UN INDUSTRIĀLĀS
POLITIKAS NOZĪME KONKURĒTSPĒJAS
STIPRINĀŠANĀ /**

**THE ROLE OF INNOVATION
AND INDUSTRIAL POLICY IN
STRENGTHENING COMPETITIVENESS**

LATVIJAS EKSPORTA KONKURĒTSPĒJAS NOVĒRTĒJUMS

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Pētījuma mērķis – novērtēt Latvijas konkurētspēju dažādas sarežģītības preču un pakalpojumu eksportā. Latvijas eksporta konkurētspēju salīdzinām ar mūsu tuvākajiem astoņiem ES kaimiņiem – Lietuvu, Igauniju, Poliju, Čehiju, Ungāriju, Rumāniju, Slovākiju un Slovēniju (ES8).

Pētījumā izmantoti Atlas of Economic Complexity, Centrālās Statistikas pārvaldes, OECD un Comtrade dati. Mēs aprēķinām atklātās salīdzinošās priekšrocības (RCA) indeksu katrai produktu grupai, pamatojoties gan uz bruto eksporta datiem, gan eksporta iekšzemes pievienotās vērtības datiem. Turklāt mēs novērtējam reeksporta īpatsvaru Latvijas eksportā katrai produktu grupai, lai pārbaudītu vai reeksporta klātbūtne maina secinājumu par Latvijas eksporta sarežģītību. Visbeidzot, mēs sadalām globālās tirgus daļas izmaiņas pa produktu grupām cenu konkurētspējas, necenu konkurētspējas un ārvalstu pieprasījuma komponentēs.

Latvijai ir augsta konkurētspēja biznesa pakalpojumu eksportā. Pēc vairākiem konkurētspējas rādītājiem informācijas tehnoloģijas, transporta un tūrisma pakalpojumu eksportā Latvija ieņem 2.–3. vietu ES9 valstu vidū. Latvijai ir arī ļoti augsta konkurētspēja kokapstrādes, lauksaimniecības un pārtikas preču eksportā. Šos produktus Latvija eksportē vairāk nekā citas ES9 valstis un vairāk nekā būtu pamatots ar pieejamiem dabas resursiem – mežu un lauksaimniecības zemju platībām. Tieši šajās produktu grupās mums ir samērā liela globālā tirgus daļa, kā arī visvairāk produktu ar salīdzinošo priekšrocību.

Latvijas preču eksporta sarežģītība kopumā ir zema, ko nevar izskaidrot ar datu nepilnībām jeb to, ka bruto eksporta dati iekļauj reeksportu, kā arī eksportēto preču ārvalstu sastāvdaļas un izejvielas. Iemesls Latvijas preču eksporta zemai sarežģītībai ir dziļi strukturāls – zema konkurētspēja sarežģīto preču grupu eksportā, tajā skaitā mašīnbūvē un transportlīdzekļos, elektronikā, kā arī ķīmijā un farmācijā. Šajās preču grupās imports būtiski pārsniedz eksportu, Latvijas globālā tirgus daļa ir zema, nav daudz produktu ar salīdzinošo priekšrocību. Pēc vairākiem konkurētspējas rādītājiem šajās preču grupās ieņemam 6.–9. vietu ES9 valstu vidū. Tomēr katrā no šīm preču grupām var identificēt atsevišķus produktus, kuru eksportā Latvijas konkurētspēja ir augsta.

Latvijas globālās tirgus daļas pieaugumu vidējā termiņā visvairāk noteica lielāka necenu konkurētspēja, kas nozīmē tirgus daļas kāpināšanu nesamazinot cenu salīdzinājumā ar konkurentiem. Nedaudz pieauga arī Latvijas eksporta cenu konkurētspēja – Latvijai izdevies palielināt tirgus daļu pārdodot savu produkciju lētāk par citiem eksportētājiem. Latvijas globālās tirgus daļas pieaugumu veicināja arī ārvalstu pieprasījuma efekts, tajā skaitā būtiski auga Lietuvas un Polijas imports, ar kurām Latvijai ir ciešas tirdzniecības saites.

OKEĀNA DIGITĀLĀ DVĪŅA IZSTRĀDE KĀ LĒMUMU ATBALSTA SISTĒMA ILGTSPĒJĪGAI JŪRAS PĀRVALDĪBAI

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Baltijas jūras reģions saskaras ar pieaugošu vides spiedienu, ko izraisa klimata pārmaiņas, intensīva jūras saimnieciskā darbība un sadrumstalota jūras resursu pārvaldība. Vienlaikus pāreja uz ilgtspējīgu zilo ekonomiku prasa integrētas zinātniskās pieejas, kas spēj savienot ekoloģiskos, ekonomiskos un klimata procesus. Šajā pētījumā tiek piedāvāta Okeāna digitālā dvīņa izstrāde kā starpdisciplināra platforma uz pierādījumiem balstītu lēmumu pieņemšanas un inovāciju atbalstam jūras pārvaldībā. Pētījums prezentē pilotietvaru, kas vienotā digitālā vidē integrē jūras vides monitoringa datus, klimata riska indikatorus un sociālekonomisko informāciju. Izmantojot savstarpēji saistītus modeļus un scenāriju simulācijas, Okeāna digitālais dvīnis ļauj analizēt kumulatīvo ietekmi, izvērtēt ekosistēmu atjaunošanas pasākumus un novērtēt aprites ekonomikas risinājumus, piemēram, jūras blakusproduktu valorizāciju un dabā balstītu piekrastes infrastruktūru. Īpaša uzmanība pievērsta “kas būtu, ja” scenārijiem, analizējot kompromisus starp vides aizsardzību, ekonomisko attīstību un klimata noturību.

INDUSTRIĀLĀ POLITIKA TEHNOLOĢIJU TRANSFORMĀCIJAS LAIKMETĀ

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Industriālās politikas (IP) mērķis ir mainīt tautsaimniecības struktūru par labu nozarēm, kuras veicinās ekonomisko izaugsmi, kas ir priekšnosacījums valsts konkurētspējas un iedzīvotāju labklājības līmeņa paaugstināšanai. Latvijā izmaiņas tautsaimniecības struktūrā notiek salīdzinoši lēni un tajā joprojām dominē nozares ar zemu pievienoto vērtību (kokapstrāde, pārtikas rūpniecība), kas veido arī lielāko daļu Latvijas preču eksportā. Pētījuma mērķis ir noskaidrot galvenās problēmas, kas saistītas ar industriālās politikas realizāciju Latvijā un tās izaicinājumiem tehnoloģiju transformācijas laikmetā.

Empīrisko pētījuma rezultāti liecina, ka tirgus mehānismi negarantē tautsaimniecības strukturālo transformāciju par labu ienesīgākām nozarēm un bez aktīvas valsts iejaukšanās tā nespēj izrauties no līdzšinējās ražošanas struktūras uzliktajiem nosacījumiem, tāpēc Latvijā nepieciešams izstrādāt modernu industriālo politiku, kas veicinātu tautsaimniecības transformāciju, panākot augstāku valsts industrializāciju, rūpniecības modernizāciju un eksporta komplicētību.

Atslēgvārdi: industriālā politika (IP), strukturālā transformācija, konkurētspēja.

LATVIJAS SCOPUS ZINĀTNISKO PUBLIKĀCIJU ANALĪZE SOMIJAS PUBLIKĀCIJU FORUMA GRIEZUMĀ (Stenda referāts)

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Latvijā un citās valstīs zinātnes politikā pielieto sniegumā balstītas pētniecības finansēšanas instrumentus, veicinot institūciju savstarpēju konkurenci par publisko finansējumu. Tostarp Latvijā 15% zinātnisko institūciju saņemtā zinātniskās darbības bāzes finansējuma apjoma nosaka institūcijas zinātnisko publikāciju skaits, kas iekļauts Web of Science vai SCOPUS datubāzēs, īpaši augsti vērtējot publikācijas izdevumos ar augstu citējamību.

Tomēr kvantitatīvu rādītāju lietojums zinātniskās darbības vērtēšanā piedzīvo ilgstošu un pieaugošu kritiku. Arī Latvijā tiek apstrīdēta esošo zinātnes snieguma rādītāju efektivitāte, un izskan aicinājumi mazināt spiedienu publicēties un ar to saistītos akadēmiskā godīguma riskus, kas citastarp veicinājuši Latvijas pētnieku publikāciju pieaugumu apšaubāmas reputācijas izdevēju MDPI un Frontiers izdotajos žurnālos.

Vairākas valstis jau šobrīd piemēro alternatīvas esošajiem rādītājiem. Piemēram, pretstatā Latvijas pieejai, kurā publikācijas ranžē pēc žurnāla ietekmes faktora, Somijas publikāciju forumā "JUFO" (turpmāk – JUFO) kopš 2022. gada ir ieviests selektīvs žurnālu ranžēšanas modelis, kurā žurnālus izvērtē ekspertu paneli neatkarīgi no žurnālu ietekmes faktora.

Šī stenda referāta pētniecības jautājums ir, kā atšķiras Latvijas zinātnisko publikāciju sadalījums pēc izdevumu citējamības un pēc JUFO ranžējuma?

Stenda referātā tiek analizētas Latvijas zinātnisko publikāciju izmaiņu tendences Scopus datubāzē 2015.–2025. gada laikā, salīdzinot Latvijas publikāciju avotu citējamību pēc CiteScore ar Somijas publikāciju foruma reitingu. Tiek aprakstīta datu ieguve no Scopus un JUFO, datu apstrāde un tīrīšana programmēšanas vidē RStudio, un datu analīze zinātnisko institūciju un zinātņu nozaru grupu griezumos.

Publikāciju analīze liecina, ka pastāv būtiskas atšķirības starp Latvijas zinātnisko publikāciju sadalījumu pēc izdevumu citējamības un pēc JUFO ranžējuma, tostarp virkne augstas citējamības (1. un 2. kvartiles) žurnālu pēc JUFO ranžējuma ir uzskatāmi par zemas kvalitātes izdevumiem. Scopus un JUFO datu savietošanai radītais R kods var tikt izmantots atkārtoti, lai veiktu līdzīgu analīzi par publikāciju tendencēm Baltijas valstu vai plašākā mērogā. Vienlaikus pētījums iezīmē vairākus izaicinājumus, piemēram, grūtības savietot datus trūkstošu identifikatoru gadījumā.

Atslēgvārdi: bibliometrija, zinātnes politika, zinātnes socioloģija.

PAŠVALDĪBA KĀ AIZSARGĀTAS ĢEOGRĀFISKĀS IZCELSMES NORĀDES PIETEICĒJA VIETĒJĀS KOPIENAS ATTĪSTĪBĀ: "RUCAVAS BALTĀ SVIESTA"ĪSA CIKLA PRODUKTA DZĪVOTSPĒJA

Vadims Mantrovs, Sintija Zalāne

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Pētījumā analizēta pašvaldības kā atvasinātas publiskas personas un vietējās kopienas attīstības organizētājas loma, kļūstot par Eiropas Savienības aizsargātas ģeogrāfiskās izcelsmes norādes (AĢIN) pieteicēju. Kā gadījuma izpēte izmantots 2015. gadā iesniegtais pieteikums produktam "Rucavas baltais sviests". Tiek pamatots, ka pieteicēja izdarītās reģistrācijas izvēles vienlaikus kļūst par tirgus veidojošām izvēlēm, jo tās nosaka produkta specifiku un ietekmē tā praktisko dzīvotspēju. Konkrētajā gadījumā tradicionālās tehnoloģijas saglabāšana un aptuveni trīs dienu derīguma termiņa nostiprināšana kā produkta pazīme ierobežo loģistiku, mērogošanu un konkurētspēju.

4.4. sekcija. **MEDIJI UN SABIEDRĪBA: GLOBĀLO UN
LOKĀLO IZAICINĀJUMU IETVARĀ /**
**MEDIA AND SOCIETY: WITHIN
THE FRAMEWORK OF GLOBAL
AND LOCAL CHALLENGES**

COMMUNICATION CAPACITY IN LATVIA'S CENTRAL PUBLIC ADMINISTRATION

Inga Latkovska

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Over the past two decades, rapid shifts in Europe's media systems, technological development, and public opinion dynamics have substantially reshaped organisational communication. These changes have altered how public institutions, private organisations, and NGOs interact with stakeholders, creating both new challenges and opportunities for communication professionals. Professional communication capacity encompasses the competencies required to plan, implement, and evaluate communication effectively. Drawing on the European Communication Monitor (2023), this study situates professionalisation within three core dimensions: structured training of communication units, continuous academic and professional development, and mentoring and networking. Using a mixed-methods approach – survey data, semi-structured interviews, and document analysis – this research examines the professional capacity of communication specialists in Latvia's central government administration. The findings show no significant relationship between education level and job position, tenure in public administration, or access to decision-making processes. A statistically significant negative correlation ($r = -0.31$, $p < 0.01$) was identified between years of experience in the communication field and perceptions of structural barriers to communication. More experienced practitioners are less likely to attribute communication challenges to the absence of a national communication policy or strategic vision. These results underscore the need to strengthen communication governance and professional development frameworks within Latvia's public sector.

FROM DEFICIT TO DECISION SUPPORT: A FRAMEWORK FOR SCIENCE COMMUNICATION CAPACITY IN SMALL RESEARCH SYSTEMS

Darja Aksjonova

University of Latvia

This paper conceptualizes science communication as a framework to support empirically-grounded decisions by scientists to help them choose strategically models of science communication, target audience, channels and activities depending on their research field to plan more effective and responsible communication with society. This paper focuses especially on small research systems.

JAUNIEŠU MEDIJPRATĪBAS IZPĒTE LATVIJĀ: LĪDZŠINĒJĀ PRAKSE, IEROBEŽOJUMI UN PILNVEIDES IESPĒJAS

Klinta Ločmele

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Akadēmiskā vide, politikas plānotāji un arī nozares praktiķi ik pa laikam organizē Latvijas iedzīvotāju medijpratības pētījumus, kuros jaunieši ir vienīgais pētījuma objekts vai daļa no plašākas izlases. Prezētācija sniegs ieskatu līdzšinējā jaunu cilvēku medijpratības pētniecības praksē Latvijā, izgaismojot šo pētījumu problemātiskos aspektus (piemēram, pārāk maza izlase, atšķirīgs jauna cilvēka vecuma tvērums, koncentrēšanās uz pārāk šauriem tematiskajiem virzieniem utt.), kā arī piedāvās ārvalstu labajā praksē balstītas rekomendācijas jauniešu medijpratības pētījumu pilnveidei Latvijā.

INTEGRITY AND THE DIGITAL LOOKING GLASS SELF: THE SOCIAL MEDIA PROFILE AS A MIRROR FOR SELF-REFLECTION

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One of the foundational concepts in social sciences – the idea of “looking glass self” – posits that an individual’s sense of self is constructed through a process of social mirroring, where others serve as a reflection of one’s identity (Cooley, 1922). In the era of social media, this principle is extended through social media platforms that allow users to observe and “consume” their own digital identities, enabling them to perceive themselves from an external perspective and find internal order within their multiplicity of roles. This digital mirroring can promote identity integration by providing individuals with a more united picture of their life narrative (Marinucci, 2010; Wandel & Beavers, 2010). Therefore, this paper explores the interaction of one’s identities within the context of the socio-technological layer of social media, specifically focusing on how the digital profile functions as a tool for internal self-reflection.

The methodology is based on a qualitative approach, conducting 25 in-depth, semi-structured interviews with people aged 23 to 45. Data analysis is conducted using interpretive phenomenological analysis, which allows for a detailed exploration of the subjective meanings assigned by individuals to their experiences.

Some of the findings suggest that the respondents often engage in “self-surveillance”, viewing their own profiles “from the outside” to understand how they are perceived by their various social circles. This practice transforms the digital profile into a “visual diary” or “portfolio” that allows individuals to monitor their own development and ensure that their diverse social roles remain coherent. By regularly reviewing this digital mirror, some respondents identify and “cleanse” elements of their past that no longer align with their current sense of integrity.

SOCIĀLO MEDIJU PLATFORMAS KĀ STRATĒGISKĀS POLITISKĀS KOMUNIKĀCIJAS RESURSS LATVIJAS POLITISKO PARTIJU PRAKSĒ

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Ziņojumā tiek pētīta sociālo mediju loma Latvijas politisko partiju stratēģiskajā komunikācijā, analizējot tos ne tikai kā informācijas izplatīšanas kanālus, bet kā kritisku resursu politiskās ietekmes veidošanai un avotu sabiedrības informēšanā par politiskās komunikācijas notikumiem.

Izmantojot datus par politisko partiju publikācijām sociālos medijos, pētījumā tiek analizēts, kā Latvijas politiskie spēki izmanto Facebook un Instagram sniegtās iespējas, lai konstruētu sociālo realitāti un specifiskus sociālpolitiskos rāmjus. Galvenā pētnieciskā problēma ir vērsta uz “digitālās iesaistes paradoksu” jeb to, kā partijas balansē starp populistisku, uz algoritmu orientētu saturu un nepieciešamību saglabāt politisko vēstījumu racionālam vēlētājam.

Empīriskā analīze ļauj secināt, ka sociālie mediji Latvijas praksē ir kļuvuši par galveno instrumentu politiskās realitātes konstruēšanā, mazinot tradicionālo mediju kā informācijas vērtusargu lomu un transformējot partiju identitātes veidošanas procesus digitālajā laikmetā.

PUBLIC MEDIA UNDER GEOPOLITICAL PRESSURE: SECURITIZING RUSSIAN-LANGUAGE BROADCASTING IN LATVIA

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Debates about Russian-language broadcasting in Latvia's public service media (PSM) have intensified in recent years as concerns about disinformation, hybrid threats, and geopolitical competition have become central to European security discourse. While public broadcasters are normatively expected to ensure universal access to reliable information and serve diverse audiences, Russian-language content in Latvia's PSM increasingly appears in political debates framed through the lens of national security. This article examines how and why a communication channel intended to strengthen democratic information access becomes constructed as a potential security risk.

Drawing on securitization theory, the study analyzes how political and institutional actors frame Russian-language broadcasting within Latvia's public media system as an issue of information security. The analysis is based on a dataset of 5,000 news items referencing both Russian language and public service media. Using a combination of discourse analysis and systematic content coding, the study identifies patterns in actor participation, security narratives, and policy arguments within the debate.

The findings demonstrate that securitization in this context is driven primarily by political and governance actors, who link Russian-language broadcasting to concerns about propaganda, hybrid warfare, and the resilience of the national information environment. However, security framing does not lead to a single policy outcome. Instead, debates frequently combine arguments for both restricting and maintaining Russian-language broadcasting, reflecting tensions between security considerations and the democratic mission of public service media. The article argues that securitization in this domain operates through institutional adaptation rather than exceptional measures, illustrating how geopolitical pressures reshape media governance in democratic societies.

4.5. sekcija. **MĀRKETINGS UN INOVĀCIJAS
UZŅĒMUMA KONKURĒTSPĒJAI UN
ILGTSPĒJAI /**
**MARKETING AND INNOVATIONS
FOR CORPORATE COMPETITIVENESS
AND SUSTAINABILITY**

KAKLA UN PLECU ZONAS VINGRINĀJUMU KOMPLEKSA EFEKTIVITĀTE 17 GADUS VECU VĪRIEŠU STĀJAS KOREKCIJAI – FOTOGRAMMETRIJĀ BALSTĪTS ZEMU IZMAKSU RISINĀJUMS CILVĒKKAPITĀLA PRODUKTIVITĀTES VEICINĀŠANAI

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Ilgstoša sēdēšana un viedierīču lietošana mūsdienās veicina galvas izvērziņu uz priekšu (no angl. val. – forward head posture, FHP), kas saistīts ar kakla un plecu sāpēm, funkcionāliem ierobežojumiem un potenciāli samazinātu ikdienas darba un mācību produktivitāti. Darba spējas un veselības kvalitāte ir būtiska cilvēkkapitāla dimensija, kas ilgtermiņā ietekmē valsts konkurētspēju. Tādēļ aktuāli ir izstrādāt un izvērtēt praktiskus, viegli ieviešamus un mērogojamus risinājumus stājas uzlabošanai, vienlaikus izmantojot digitāli pieejamas mērīšanas metodes.

Mērķis. Izstrādāt un izvērtēt kakla un plecu zonas muskuļu grupu vingrinājumu kompleksu 17 gadus vecu vīriešu stājas korekcijai, izmantojot fotogrammetrijas metodi C7 kakla skriemeļa kraniovertebrālā leņķa (CVA) izmaiņu noteikšanai.

Uzdevumi. (1) Veikt literatūras analīzi par stājas izmaiņu cēloņiem un FHP ietekmi; (2) Izstrādāt strukturētu vingrinājumu kompleksu C7 stabilitātes un kakla-plecu zonas funkcijas uzlabošanai; (3) Veikt empīrisku izvērtējumu, salīdzinot CVA pirms un pēc intervences; (4) Analizēt rezultātus un identificēt efektīvāko stiepšanās vingrinājuma variantu.

Metodoloģija. Empīriskajā pētījumā piedalījās 27 respondenti (17 gadus veci vīrieši). Dalībnieki tika sadalīti trīs grupās, kur visām grupām bija vienāds pamata vingrinājumu komplekss, bet atšķīrās viens stiepšanās vingrinājums. Intervence tika veikta 3 mēnešus, vingrinājumus izpildot trīs reizes nedēļā. Stājas izmaiņu novērtēšanai tika izmantota fotogrammetrija, analizējot CVA leņķi pirms un pēc intervences (mērījumi veikti ar GIMP).

Rezultāti. CVA rādītāji pēc intervences kopumā uzlabojās: sākotnējais CVA diapazons bija 50,14°-65,61°, bet pēc vingrinājumu kompleksa – 56,66°-69,44°. Vidējais CVA uzlabojums kopumā bija 3,41°. Lielākais vidējais uzlabojums tika konstatēts 3. grupā (3,78°), kurā dalībnieki veica kakla savilkšanas vingrinājumu sēdus vai stāvus pozīcijā; 2. grupā vidējais uzlabojums bija 3,72°, bet 1. grupā – 2,61°. No 27 respondentiem 23 gadījumos CVA palielinājās, 2 gadījumos būtiskas izmaiņas netika novērotas, bet 2 gadījumos CVA samazinājās.

Secinājumi un praktiskā nozīme konkurētspējai. Pētījuma rezultāti norāda, ka izstrādātais vingrinājumu komplekss ir efektīvs stājas uzlabošanai un FHP mazināšanai jauniešu grupā, un fotogrammetrija ir praktiska, pieejama metode stājas izmaiņu monitorēšanai. No konkurētspējas perspektīvas šāds zemu izmaksu, mērogojams un preventīvs risinājums var tikt integrēts izglītības un darba vidē, veicinot veselības prātību, samazinot ar stājas problēmām saistīto diskomfortu un potenciāli uzlabojot ilgtermiņa cilvēkkapitāla funkcionālās spējas.

ĀRSTNIECĪBAS PERSONĀLA PIEEJAMĪBA UN NEAPMIERINĀTĀ VAJADZĪBA PĒC MEDICĪNISKAJIEM PAKALPOJUMIEM LATVIJĀ – BALTIJAS UN ES SALĪDZINOŠĀ ANALĪZE KĀ CILVĒKKAPITĀLA KONKURĒTSPĒJAS INDIKATORS

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Globalizētā ekonomikā veselības aprūpes sistēmas kapacitāte kļūst par strukturālu konkurētspējas faktoru, jo tā ietekmē darba spēju saglabāšanu, produktivitāti un ilgtermiņa cilvēkkapitāla kvalitāti. Latvijā veselības aprūpes pieejamība joprojām ir viena no būtiskākajām publiskās politikas spriedzes zonām, kur personāla pieejamība un rindas veido ne tikai veselības, bet arī ekonomiskās izaugsmes risku. Pētījuma centrā ir jautājums: vai Latvijā novērojamais ārstniecības personāla pieaugums pēdējā desmitgadē ir pietiekams, lai mazinātu neapmierināto pieprasījumu pēc medicīniskajiem pakalpojumiem un tuvinātu sistēmu ES standartiem.

Mērķis. Novērtēt ārstniecības personāla pieejamību Latvijā un identificēt neapmierinātās vajadzības pēc medicīniskajiem pakalpojumiem, salīdzinot Latvijas situāciju ar Baltijas valstīm un Eiropas Savienības vidējiem rādītājiem.

Uzdevumi. (1) Analizēt ārstniecības personāla pieejamības dinamiku Latvijā 2010.–2022. gadā (uz 100 tūkst. iedzīvotājiem); (2) Salīdzināt Latvijas rādītājus ar ES līmeni, izmantojot 90% iekšējās daļas vidējo, lai mazinātu ekstrēmu vērtību ietekmi; (3) Izvērtēt jauno speciālistu ienākšanas dinamiku no medicīnas izglītības sistēmas; (4) Analizēt pašnovērtēto neapmierināto vajadzību pēc veselības apskates rindu dēļ (2014–2023), īpašu uzmanību pievēršot dzimuma un vecuma grupu atšķirībām.

Metodoloģija. Pētījumā izmantota sekundāro un lielo datu analīze, balstoties uz EUROSTAT, OECD un NVD datu kopām (2010–2023), kā arī kvalitatīvās metodes (padziļinātās intervijas). Analīzē salīdzināts ārstniecības personāla skaits pret iedzīvotāju skaitu (ārsti, vecmātes, zobārsti, aprūpes personāls, fizioterapeiti), absolventu plūsmas un pacientu pašvērtējums par pakalpojumu nepieejamību gaidīšanas rindu dēļ.

Rezultāti. Latvijā visās aplūkotajās ārstniecības personāla pozīcijās kopš 2010. gada vērojams pieaugums, tomēr tas ir nevienmērīgs. Ārstu un vecmāšu skaits pieaudzis minimāli (kopumā ~8%), savukārt aprūpes personāla pieaugums sasniedzis ~36,4%, bet fizioterapeitu skaits pieaudzis īpaši strauji (~173,4%). Neskatoties uz pozitīvo dinamiku, Latvija kopumā saglabājas zem ES vidējā personāla pieejamības līmeņa, īpaši aprūpes segmentā. Vienlaikus neapmierinātā vajadzība pēc veselības apskates rindu dēļ Latvijā laika posmā no 2014. gada ir būtiski pieaugusi (no 1,6% līdz 4,7%), iezīmējot pieejamības problēmu noturību. Pēc 2019. gada parādās izteikta dzimumu diverģence: sievietēm neapmierinātība ar rindām

pieaug straujāk nekā vīriešiem (2023. gadā attiecīgi 5,9% pret 3,0%). Vecuma griezumā augstākais neapmierinātības līmenis novērots vecākajās grupās (55+).

Secinājumi un pienesums konkurētspējas diskusijai. Pētījums parāda strukturālu pretrunu: ārstniecības personāla apjoms Latvijā pieaug, tomēr tas neizpaužas kā proporcionāls pieejamības uzlabojums pacientu pieredzē, īpaši rindu dimensijā. Situācija signalizē par iespējamu sistēmas kapacitātes neatbilstību pieprasījuma struktūrai, kā arī par nevienlīdzīgu ietekmi uz demogrāfiskajām grupām. No globālās konkurētspējas perspektīvas veselības aprūpes pieejamība jāskata kā cilvēkkapitāla produktivitātes priekšnosacījums: ja rindas un pakalpojumu nepieejamība saglabājas vai pieaug, tiek palielināti darba spēju zuduma riski, samazinās sabiedrības uzticība institūcijām un pasliktinās ekonomikas noturība. Pētījuma rezultāti pamato nepieciešamību pēc mērķētām personāla politikas un pakalpojumu organizācijas inovācijām, kas fokusētas uz pieprasījuma “pudeles kakliem” un augstākā riska grupām.

DIGITAL TRANSFORMATION AND EVOLUTION OF WORK ORGANISATION IN LATVIAN SMALL AND MEDIUM-SIZED ENTERPRISES SECTOR: TREND ANALYSIS FROM 2021 TO 2024

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Studying trends in digitisation as a factor affecting competitiveness, the authors carried out an analysis of the digitisation process of small and medium-sized enterprises (SMEs) in Latvia, the factors hindering the evolution of the work organisation and the introduction of new technologies in the post-pandemic period.

Methodology: The study was based on a series of three quantitative online surveys (CAWI) conducted in 2021, 2022 and 2024, with around 300 company executives and owners surveyed at each stage. The data were analysed using a comparative method to determine the dynamics of technological development and management attitudes. The study was carried out in cooperation with the SIA “RIGHT Custom Research Baltic”.

Data from the study points to a slight stagnation in the self-assessment of enterprise digitization, which has fallen from 5.8 points in 2021 to 5.6 points in 2024 on a scale of 1 to 10. While the COVID-19 crisis initially forced some businesses to introduce major changes to management processes, including remote working, there is a trend over time towards a return to face-to-face work patterns. In 2024, digital's main motivation has shifted from crisis management to targeted cost reductions and capacity building. Innovative technologies such as the Internet of things (IoT) still face low visibility – with 47 per cent of entrepreneurs having heard about it for the first time in 2024.

Digitisation is perceived as an essential efficiency tool in the SME environment of Latvia, however, its full implementation is hampered by the lack of human resources competence and a clear lack of information on possibilities for attracting external financing. The study points to the need for more targeted national communication and support programmes for employee retraining to strengthen companies' competitiveness in the global digital economy.

Keywords: Latvian SMEs, Labour Organisation, Internet of things (IoT), impact of COVID-19, Competitiveness.

BIOLOĢISKIE RISKI KĀ NEREDZAMS FAKTORS UZŅĒMUMU KONKURĒTSPĒJĀ UN ILGTSPĒJĀ – EMPĪRISKS GADĪJUMS NO PĀRTIKAS VIDES DROŠĪBAS LATVIJĀ

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Ilgtspējīgas uzņēmējdarbības un konkurētspējas kontekstā arvien lielāka nozīme tiek piešķirta ne tikai tehnoloģiskajām un digitālajām inovācijām, bet arī bioloģisko un vides risku pārvaldībai, kas tieši ietekmē patērētāju uzticību un uzņēmumu reputāciju. Pētījumā analizēta invazīvās sugas – Spānijas kailgliemeža (*Arion vulgaris*) – iespējamā loma *Escherichia coli* baktēriju mehāniskā izplatīšanā kā piemērs neredzamam riskam pārtikas vērtību ķēdē.

Empīriskā pētījuma ietvaros četrās dažādās Latvijas teritorijās tika ievākti 40 Spānijas kailgliemežu gļotu paraugi un laboratoriski analizēta *E. coli* klātbūtne. Rezultāti liecina, ka 20 % paraugu konstatēta baktēriju klātbūtne, atsevišķās teritorijās sasniedzot pat 60 %, kas norāda uz potenciālu mikrobioloģisku risku vidēs, kur notiek cilvēku un pārtikas produktu mijiedarbība.

Pētījums demonstrē, ka bioloģiskie riski, lai arī bieži netiek tieši ņemti vērā uzņēmumu stratēģiskajā plānošanā, var būtiski ietekmēt pārtikas nozares uzņēmumu konkurētspēju, mārketinga komunikāciju, patērētāju uzticību un ilgtspējīgas vērtības radīšanu. Rakstā diskutētas inovāciju un risku vadības pieejas, tostarp starpdisciplināra sadarbība, monitoringa risinājumi un zinātniski pamatota komunikācija kā instruments ilgtermiņa konkurētspējas stiprināšanai dinamiskā tirgus vidē.

MĀKSLĪGĀ INTELEKTA IETEKME MĀRKETINGA PROCESU VADĪBĀ: INTEGRĒTS SPĒJU MODELIS UZŅĒMUMA KONKURĒTSPĒJAS STIPRINĀŠANAI

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Digitālās transformācijas un mākslīgā intelekta (MI) straujā attīstība būtiski maina uzņēmumu mārketinga procesu vadību, radot nepieciešamību pēc integrēta, sistēmiska skatījuma uz MI ietekmi uzņēmuma konkurētspējas stiprināšanā. Pētījuma mērķis ir izstrādāt un konceptuāli pamatot integrētu modeli, kas sniedz vienotu pārskatu par MI ietekmi uz mārketinga procesu vadību, akcentējot savstarpēji saistītas mārketinga spēju kategorijas un to sasaisti ar pircēja lēmuma pieņemšanas procesu.

Pētījuma ietvaros izmantotās metodes: sistemātiska zinātniskās literatūras analīze, konceptuālā modelēšana, kā arī salīdzinoša teorētisko pieeju sintēze, integrējot resursos balstītās teorijas, dinamisko spēju pieeju un Kotlera pircēja lēmuma pieņemšanas procesa modeli. Izstrādātais modelis strukturēts tabulas formā, identificējot galvenās MI atbalstītās mārketinga spēju kategorijas un to funkcionālo sasaisti ar konkrētiem pircēja lēmuma posmiem.

Izstrādātais modelis strukturē MI ietekmi trīs savstarpēji mijiedarbīgās mārketinga spēju kategorijās: (1) analītiskās mārketinga spējas, (2) tehnoloģiskās mārketinga spējas un (3) stratēģiskās efektivitātes spējas. Analītiskās spējas nodrošina precīzāku datu interpretāciju un tirgus prognozēšanu, kas ļauj veidot mērķētāku mārketinga stratēģiju. Stratēģiskā precizitāte savukārt nodrošina jēgpilnāku tehnoloģiju integrēšanu taktiskajos procesos (automatizācija, personalizācija, satura ģenerēšana, u. c.), kas rada jaunas datu plūsmas un paplašina analītisko iespēju loku. Tādējādi veidojas ciklisks spēju attīstības mehānisms, kurā MI atbalstītā mārketinga vadība kļūst arvien precīzāka un adaptīvāka. Papildus modeli identificēta loģiska atbilstība starp spēju apakšvirzieniem un Kotlera pircēja lēmuma pieņemšanas procesa posmiem (vajadzības atpazīšana, informācijas meklēšana, alternatīvu izvērtēšana, pirkuma lēmums, pēcpirkuma uzvedība), tādējādi nodrošinot teorētisku un praktisku integrāciju starp tehnoloģiju vadītu mārketingu un patērētāja uzvedības loģiku.

Pētījuma rezultāti liecina, ka MI integrācija mārketinga procesos pati par sevi negarantē konkurētspējas pieaugumu; izšķiroša nozīme ir spējai strukturēti sasaistīt analītiskās, tehnoloģiskās un stratēģiskās spējas vienotā vadības sistēmā. Izstrādātais modelis sniedz teorētisku pamatu turpmākai empīriskai pārbaudei promocijas darba ietvaros un piedāvā praktisku instrumentu uzņēmumu vadībai MI balstītas mārketinga transformācijas plānošanā, stiprinot uzņēmuma konkurētspēju un ilgtspējīgu attīstību globālās konkurences apstākļos.

Atslēgvārdi: mākslīgais intelekts, mārketinga spējas, mārketinga procesu vadība, konkurētspēja, pircēja lēmuma pieņemšanas process.

DIGITĀLAIS MĀRKETINGS KĀ ORGANIZĀCIJAS KULTŪRAS PĀRVEIDES INSTRUMENTS ĢIMENĒES UZŅĒMUMU PAAUDŽU MAIŅAS PROCESĀ

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Ģimenes uzņēmumu organizācijas kultūra ietekmē finanšu rādītājus, stratēģiskos panākumus un iekšējo izaugsmi (Vallejo, 2007); tā ir ģimenes uzņēmuma ilgtspējīgas konkurences priekšrocības avots (Ouzký un Machek, 2004), un tai ir svarīga loma uzņēmuma panākumu noteikšanā (Bąkiewicz, 2020). Ģimenes uzņēmumos paaudžu maiņa ir viens no kritiskākajiem izaicinājumiem to ilgtspējā, jo tā ietver ne tikai vadības nodošanu, bet arī organizācijas kultūras transformāciju (Nordqvist et al., 2013; De Massis et al., 2018). Digitālā transformācija un digitālais mārketingu arvien biežāk kļūst par otrās paaudzes iesaistes sākumpunktu ģimenes uzņēmumos (Daskalopoulos & Machek, 2023), tomēr trūkst pētījumu par to, kā digitālā mārketinga ieviešana ietekmē organizācijas iekšējo kultūru, kā tā izaicina vai nostiprina ģimenes vērtības un autoritātes struktūras (Ren et al., 2023).

Pētījuma mērķis ir izpētīt, kā ģimenes uzņēmumos otrās paaudzes pēcteči izmanto digitālā mārketinga prakses un kā tās ietekmē organizācijas kultūras izmaiņas. Lai sasniegtu pētījuma mērķi, tika izvirzīti šādi uzdevumi:

- 1) analizēt akadēmisko literatūru par digitālo mārketingu ģimenes uzņēmumos, ģimenes uzņēmumu pēctecību un organizācijas kultūru;
- 2) veikt 35 daļēji strukturētas intervijas ar otrās paaudzes vadītājiem Latvijā;
- 3) identificēt digitālā mārketinga prakses un to ieviešanas iemeslus;
- 4) analizēt digitālo mārketingu prakšu ietekmi uz organizācijas kultūras līmeņiem (artefakti, vērtības, pamata pieņēmumi);
- 5) izstrādāt procesuālu modeli, kas skaidro digitālā mārketinga kā kultūras pārmaiņu mehānisma darbību.

Pētījuma objekts: Ģimenes uzņēmumi Latvijā paaudžu maiņas procesā.

Pētījuma priekšmets: Digitālā mārketinga prakses un to ietekme uz organizācijas kultūru.

Šī pētījuma rezultāti atklāj trīs digitālā mārketinga prakses tipus: (1) nepārtrauktību atbalstoša prakse, kas galvenokārt nostiprina dibinātāja iedibināto kultūras loģiku; (2) zīmola vērtības prakse, kas veicina identitātes artikulāciju un selektīvu vērtību atjaunošanu; (3) transformācijas virzītājspēks, kur digitālais mārketingu kļūst par centrālu organizējošu loģiku un ietekmē arī pamata pieņēmumus par autoritāti, vērtību radīšanu un lēmumu pieņemšanu. Tika konstatēts, ka digitālais mārketingu visbiežāk ietekmē artefaktu un deklarēto vērtību līmeni, savukārt dziļākas kultūras transformācijas ir retas un saistītas ar pēcteča profesionālo pieredzi, autoritātes pārdali un ārējiem tirgus spiedieniem.

Katram digitālā mārketinga prakses tipam raksturīgs atšķirīgs kultūras pārmaiņu dziļums un mehānisms. Nepārtrauktību atbalstošā praksē digitālais mārketingu galvenokārt izpaužas artefaktu līmenī – kā mājaslapas uzturēšana, sociālo tīklu klātbūtne vai pakāpenisks mārketinga budžeta pieaugums –, vienlaikus saglabājot dibinātāja noteikto vērtību sistēmu

un autoritātes struktūru. Zīmola vērtības praksē digitālais mārketingš kļūst par identitātes artikulācijas instrumentu, stiprinot ārējo orientāciju, reputāciju un caurspīdīgumu kā deklarētas organizācijas vērtības, tomēr būtiskākie pieņēmumi par vērtības radīšanu un lēmumu pieņemšanu lielākoties paliek nemainīgi.

Ģimenes uzņēmumos, kur digitālais mārketingš funkcionē kā transformācijas virzītājspēks, tas tiek integrēts stratēģiskajā vadībā un ikdienas lēmumu pieņemšanā, balstoties datos un strukturētās sistēmās. Šādos uzņēmumos pārmaiņas skar ne tikai redzamos elementus un deklarētās vērtības, bet arī pamata pieņēmumus par autoritāti, profesionālisma nozīmi un izaugsmes loģiku. Tādējādi digitālā mārketinga ietekme nav determinēta ar pašu tehnoloģiju klātbūtni, bet ar to, kā pēcteči šīs prakses institucionalizē un sasaista ar organizācijas varas sadalījumu un attiecībām ar klientiem.

Pētījuma novitāte saistīta ar digitālā mārketinga konceptualizēšanu kā organizācijas kultūras pārmaiņu mehānismu paaudžu maiņas kontekstā, nevis tikai kā tirgus vai komunikācijas instrumentu. Izstrādātais procesuālais modelis parāda, kā sākotnējie nosacījumi (dibinātāja kultūra, autoritātes sadalījums, pēcteča pieredze, ārējie spiedieni) caur digitālā mārketinga praksēm aktivizē dažādus kultūras pārmaiņu mehānismus, rezultējoties kultūras saglabāšanā, konsolidācijā vai transformācijā.

Atslēgvārdi: Ģimenes uzņēmumi, Organizācijas kultūra, Paaudžu maiņa, Digitālais mārketingš.

NO DIBINĀTĀJA INTUĪCIJAS LĪDZ ĢIMENES STRATĒGIJAI: LĒMUMU PIENĒMŠANAS FORMU EVOLŪCIJA UN ORGANIZĀCIJAS KULTŪRAS PĀRMAIŅAS ĢIMENES UZŅĒMUMOS

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Ģimenes uzņēmumi ir dominējošā uzņēmējdarbības forma pasaulē un būtisks ekonomiskās stabilitātes un nodarbinātības avots (Villalonga & Amit, 2020; Zellweger et al., 2012). Tomēr viens no nozīmīgākajiem izaicinājumiem to ilgtspējai un konkurētspējai ir veiksmīga paaudžu maiņa. Iepriekšējie pētījumi uzsver dibinātāju ietekmi un organizācijas kultūras nozīmi konkurētspējas saglabāšanā (Denison et al., 2004; Picone et al., 2021), taču nepietiekami ir pētīts, kā tieši mainās ikdienas lēmumu pieņemšanas prakse un kā šīs izmaiņas ietekmē organizācijas kultūru. Līdzšinējā literatūrā kultūra bieži tiek skatīta kā konteksts vai fons (Bąkiewicz, 2020; Nave et al., 2022), nevis kā dinamiska struktūra, kas transformējas, tai skaitā, caur lēmumu pieņemšanas mehānismiem.

Pētījuma mērķis ir izpētīt, kā lēmumu pieņemšanas formu maiņa paaudžu maiņas procesā pārveido organizācijas kultūru ģimenes uzņēmumos. Lai sasniegtu pētījuma mērķi, tika izvirzīti šādi uzdevumi:

- 1) analizēt akadēmisko literatūru par ģimenes uzņēmumu paaudžu maiņu un lēmumu pieņemšanas formām;
- 2) veikt daļēji strukturētas padziļinātas 35 intervijas ar ģimenes uzņēmumu otrās paaudzes vadītājiem
- 3) identificēt dibinātāju iedibinātās lēmumu pieņemšanas formas pirms paaudžu maiņas procesa, balstoties uz von Schlippe, Rüsen un Groth (2021) lēmumu pieņemšanas formu tipoloģiju;
- 4) analizēt, kā lēmumu pieņemšanas formas mainās paaudžu maiņas laikā;
- 5) izskaidrot, kā šīs izmaiņas ietekmē organizācijas kultūras līmeņus (artefakti, vērtības, pamata pieņēmumi).

Pētījuma objekts: Ģimenes uzņēmumi Latvijā paaudžu maiņas procesā.

Pētījuma priekšmets: Lēmumu pieņemšanas formu maiņa un tās ietekme uz organizācijas kultūru.

Šī pētījuma rezultāti norāda, ka pirms paaudžu maiņas dominē intuitīvā/patriarhālā lēmumu pieņemšanas forma, kas sakņojas dibinātāju pieredzē un postpadomju izdzīvošanas kontekstā. Ekspertorientēta un Situatīvi/Evolucionāru lēmumu pieņemšanas forma sastopama retāk, savukārt uz ģimenes stratēģiju balstīta lēmumu pieņemšana pirms pārejas netika konstatēta. Paaudžu maiņas laikā visbiežāk novērojama pakāpeniska pāreja uz Situatīvi/ Evolucionāru lēmumu pieņemšanas formu, kur palielinās konsultatīva prakse, datu izmantošana un lomu un atbildības sadalījums. Tikai atsevišķos gadījumos konstatēta pāreja uz ģimenes stratēģijas balstītu lēmumu pieņemšanu.

Pētījums parāda, ka organizācijas kultūras pārmaiņas notiek nevis radikāli, bet pakāpeniski caur lēmumu pieņemšanas prakses maiņu. Lēmumu pieņemšanas formas

maiņa visredzamāk ietekmē organizācijas kultūru artefaktu līmenī (regulāras sanāksmes, skaidrāku lomu un atbildību sadalījums, dokumentētu procesu ieviešana, strukturētāka komunikācija). Lēmumu pieņemšanas formu maiņa būtiski pārveido organizācijas deklarētās un praksē nostiprinātās vērtības: Pārejot no intuitīvas/patriarhālas formas uz citām formām lojalitāti dibinātājam pakāpeniski aizstāj kolektīva atbildība, personisku intuīciju aizstāj caurspīdīgums un konsultatīva pieeja. Pārejot uz Situatīvu/ Evolucionāru lēmumu pieņemšanas formu organizācijas kultūrā parādās tādas vērtības, kā elastīgums, pielāgošanās tirgus situācijai, gatavība eksperimentēt; savukārt Ģimenes stratēģijas formā dominē ilgtspējas un vienotības vērtības. Visdziļākās pārmaiņas notiek pamata pieņēmumu līmenī, taču tās nav lineāras un vienlaicīgas visos gadījumos. Visbiežāk pakāpeniski mainās uzskati par uzticēšanos un kontroli, kā arī pārliecība, ka “dibinātājs zina vislabāk” uz to, ka “ģimenei ir apzināti jāvienojas un jādomā uz priekšu”.

Pārmaiņas organizācijas kultūrā ģimenes uzņēmumu pēctecības procesā notiek paralēli un savstarpēji ietekmējoši dažādos organizācijas kultūras līmeņos, atkarībā no lēmumu pieņemšanas formas maiņas intensitātes un konteksta. Dažos gadījumos strukturālas izmaiņas (piemēram, komandu izveide, formālas sanāksmes, lomu sadalījums) kalpoja kā sākotnējais impulss, kas vēlāk ietekmēja vērtību izpratni un pakāpeniski arī pamata pieņēmumus par autoritāti un kontroli. Citās situācijās pārmaiņas sākās ar uztveres maiņu par risku, atbildību vai uzticību, kas pēc tam materializējās formālās struktūrās.

Pētījuma novitāte saistīta ar lēmumu pieņemšanas formas konceptualizēšanu kā organizācijas kultūras izmaiņu mehānismu paaudžu maiņas procesā. Atšķirībā no iepriekšējiem pētījumiem, kuros kultūra bieži aplūkota kā konteksts vai rezultāts, šajā darbā tā tiek analizēta kā dinamisks process, kas mainās līdz ar lēmumu pieņemšanas formas izmaiņām. Pētījums piedāvā procesa perspektīvu uz paaudžu maiņu un, balstoties empīriskajos datos, izstrādā organizācijas kultūras izmaiņu modeli, kas sasaista lēmumu pieņemšanas formu maiņu ar pārmaiņām dažādos organizācijas kultūras līmeņos.

Atslēgvārdi: Ģimenes uzņēmumi, Organizācijas kultūra, Paaudžu maiņa, Lēmumu pieņemšanas formas.

E-KOMERCIJAS ATTĪSTĪBAS IETEKME UZ APTIEKU KONKURĒTSPĒJU LATVIJĀ

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E-komercijas attīstība būtiski maina mazumtirdzniecības konkurences struktūru, radot izmaiņas patērētāju uzvedībā un diferenciācijas iespējas, vienlaikus pastiprinot cenu konkurenci un tirgus caurspīdīgumu. Farmācijas nozarē šīs pārmaiņas ir īpaši nozīmīgas, jo tradicionāli konkurētspēja balstījās uz fiziskās pieejamības, profesionālās konsultācijas un lokālās klātbūtnes priekšrocībām. Latvijā e-komercijas kanāla attīstība ne tikai maina patērētāju uzvedību, bet arī pārveido aptieku konkurences dinamiku.

Pētījuma mērķis ir analizēt, kā e-komercijas attīstība ietekmē aptieku konkurētspēju Latvijā, īpašu uzmanību pievēršot cenu konkurencei un klientu lojalitātei kā stratēģiski nozīmīgiem mainīgajiem. Analītiskajā ietvarā tiek iekļauta arī klientu iepirkšanās paradumu un izmaiņu analīze. Tas ļauj izvērtēt ne tikai strukturālās tirgus pārmaiņas, bet arī pieprasījuma puses dinamiku un tās ietekmi uz konkurences intensitāti.

Pētījumā analizēta zinātniskā literatūra par mazumtirdzniecības konkurētspēju un digitālo transformāciju, kā arī apkopotas nozares attīstības tendences Latvijā, īpašu uzmanību pievēršot e-komercijas izaugsmei farmācijas sektorā. Analīzes rezultāti liecina, ka konkurētspēja farmācijas mazumtirdzniecībā arvien vairāk balstās uz spēju nodrošināt konsekventu klientu pieredzi visos kanālos, veidot uzticēšanos un pielāgot komunikācijas saturu atbilstoši patērētāju noskaņojumam un uzvedības tendencēm. E-komercijas attīstība ne tikai maina konkurences struktūru, bet arī paaugstina prasības stratēģiskajai elastībai un digitālajai kompetencei. Pētījuma rezultāti sniedz rekomendācijas uzņēmumiem konkurētspējas stiprināšanai digitālajā vidē un veido pamatu turpmākai akadēmiskai izpētei par digitālās konkurētspējas attīstību farmācijas nozarē.

Atslēgvārdi: e-komercija, patērētāju uzvedība, konkurētspēja.

LATVIJAS MĀKSLĪGĀ INTELEKTA KAPACITĀTE VALSTS PĀRVALDĒ STARPTAUTISKO INDEKSU GRIEZUMĀ: SALĪDZINOŠĀ ANALĪZE AR BALTIJAS UN ZIEMEĻVALSTĪM

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Pētījuma mērķis ir izvērtēt Latvijas mākslīgā intelekta kapacitāti un gatavību valsts pārvaldē, izmantojot daudzdimensionālu starptautisko indeksu salīdzinošo analīzi. Analītiskais ietvars balstīts *Government AI Readiness Index 2023*, *Digital Economy and Society Index 2022*, *E-Government Development Index 2022*, *OECD Digital Government Index 2023*, *OECD OURdata Index* un *World Bank GovTech Maturity Index 2022* rādītājos, kā arī Baltijas un Ziemeļvalstu salīdzinājumā. Metodoloģiski izmantota sekundāro datu analīze un komparatīvā pieeja, identificējot strukturālos priekšnosacījumus un ierobežojumus MI ieviešanai publiskajā sektorā.

Rezultāti rāda, ka Latvijai ir relatīvi spēcīga e-pakalpojumu bāze un attīstītas centrālās valdības digitālās sistēmas, kas nodrošina platformu MI integrācijai administratīvajos procesos. *Government AI Readiness Index 2023* Latvija ieņem 48. vietu ar 60,30 punktiem, demonstrējot augstāku sniegumu pārvaldības un datu infrastruktūras dimensijās, bet būtiski atpaliek tehnoloģiju sektora kapacitātē.

DESI un EGDI rādītāji apstiprina, ka cilvēkkapitāls un digitālo tehnoloģiju integrācija uzņēmumos saglabājas kā ierobežojošie faktori, kas kavē MI projektu mērogošanu. OECD DGI un OURdata analīze norāda uz nepietiekamu proaktivitāti, atvērtības pēc noklusējuma principa ieviešanu un datu atkārtotas izmantošanas politikas attīstību, kas ierobežo datu vadītas pārvaldības attīstību.

Salīdzinājumā ar Igauniju, Somiju un Dāniju Latvija demonstrē līdzīgu institucionālo ietvaru, taču vājāku inovāciju ekosistēmas dziļumu un zemāku MI komercializācijas potenciālu. Secināts, ka galvenais ierobežojums nav normatīvā regulējuma trūkums, bet gan nepietiekama datu pārvaldības ekosistēma un cilvēkkapitāla kapacitāte. Ilgtspējīgai MI integrācijai nepieciešama mērķēta politika digitālo prasmju attīstībā, atvērto datu kvalitātes paaugstināšanā un publiskā un privātā sektora sadarbības stiprināšanā. Pētījums piedāvā strukturētu indikatoru kopumu MI gatavības modeļa izstrādei valsts pārvaldē.

MĀKSLĪGĀ INTELEKTA IZMANTOŠANA UZŅĒMUMU DIGITĀLĀ MĀRKETINGA KOMUNIKĀCIJĀ

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Pētījuma mērķis ir izvērtēt mākslīgā intelekta (MI) izmantošanas iespējas un analizēt attīstības tendences Latvijas uzņēmumu digitālā mārketinga komunikācijā. Lai sasniegtu izvirzīto mērķi, tika veiktas ekspertu intervijas un uzņēmumu pārstāvju aptauja par MI pielietojumu digitālā mārketinga komunikācijā. Balstoties uz iegūtajiem rezultātiem, tika izstrādāti priekšlikumi Latvijas uzņēmumu digitālā mārketinga komunikācijas pilnveidošanai. Pētījuma rezultāti liecina, ka MI spēj uzlabot digitālā mārketinga komunikāciju Latvijas uzņēmumos, īpaši tā pielietojums saturā izveidē, personalizācijā un patērētāju uzvedības prognozēšanā, balstoties klientu datos. Daudzi uzņēmumi plāno MI izmantot plašāk, lai labāk izprastu klientu uzvedību un padarītu komunikāciju personalizētāku. Pētījumā uzsvērts, ka, lai MI digitālajā mārketiņgā tiktu izmantots atbildīgi un efektīvi, uzņēmumiem MI jāintegrē pārdomāti, jāiegulda darbinieku prasmēs un zināšanās par MI un jāievēro ētiskās un juridiskās vadlīnijas, nodrošinot caurspīdīgumu un veicinot klientu uzticēšanos.

PRIVĀTO PREČU ZĪMOLU IETEKME UZ PRODUKTU KATEGORIJU VADĪBAS EFEKTIVITĀTI APTIEKU MAZUMTIRDZNIECĪBĀ

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Šajā pētījumā tiek analizēta privāto preču zīmolu ietekme uz produktu kategoriju vadības efektivitāti aptieku mazumtirdzniecības sektorā Latvijā. Privāto preču zīmolu izplatība kļūst arvien nozīmīgāka, un to loma mazumtirdzniecības stratēģiju veidošanā un patērētāju uzvedībā prasa rūpīgu vērtējumu. Pētījums izmanto jauktu metožu pieeju, apvienojot kvantitatīvus datus no viena no lielākajiem farmācijas uzņēmumiem Latvijā, jaunāko Nielsen pircēju pētījumu un literatūras analīzi. Rezultāti apliecina, ka privāto preču zīmolu ieviešana un paplašināšana būtiski ietekmē produktu sortimentu, cenu veidošanas stratēģijas, kampaņas un izvietojumu – četrus kategoriju vadības pilārus. Privāto preču zīmoli sniedz mazumtirgotājiem iespēju diferencēt savu piedāvājumu, palielināt peļņu un elastīgāk reaģēt uz tirgus tendencēm un klientu vēlmēm. Tomēr pētījums identificē arī izaicinājumus, piemēram, nepieciešamību stiprināt attiecības ar piegādātājiem un risku, ka nacionālo zīmolu pārdošanas apjomi var samazināties. Efektīva kategoriju vadība, tostarp datu analizēta sortimenta plānošana un mērķtiecīga mārketinga īstenošana, ir būtiska privāto preču zīmolu priekšrocību maksimizēšanai. Pētījuma noslēgumā autori sniedz rekomendācijas aptieku mazumtirgotājiem, lai optimizētu produktu kategorijas, ņemot vērā privāto preču zīmolu pieaugumu, uzsverot zīmolu portfeļa balansēšanas un klientu uzticības saglabāšanas nozīmi. Šis pētījums sniedz padziļinātu izpratni par mazumtirdzniecības vadības dinamiku Latvijas aptieku tirgū un piedāvā atziņas, kas ir izmantojamas līdzīgās mazumtirdzniecības vidēs. Autori meklē atbildes uz jautājumiem: 1. Kā Privāto preču zīmoli produkti ietekmē kategoriju vadības efektivitāti? 2. Kādus Privāto preču zīmolu stratēģijas risinājumus var izmantot kategoriju vadītāji, lai palielinātu produktu kategorijas peļņu konkurences apstākļos un aptieku nozares regulējumā Latvijā? Rakstā apskatīta literatūra par privāto preču zīmolu lomu sortimentā, cenu un reklāmas stratēģiju, zīmolu pozicionēšanu un plauktu izvietojuma sadali starp nacionālajiem preču zīmoliem un privāto preču zīmoliem, iekļaujot atziņas no Nielsen pircēju pētījuma un viena no lielākā Latvijas farmācijas uzņēmuma pārdošanas pārskata. Noslēguma daļā autori sniedz pētījuma secinājumus un rekomendācijas, identificējot iespējas un riskus. Pētījuma secinājumi liecina, ka Privāto preču zīmju produktiem būtiska loma aptieku sortimentā. Par spīti tam, ka privāto preču zīmju atpazīstamība ir vidēja un zema, pirkumu skaits saglabājas zems. Lielākais izaicinājums ir spēt pārvērst šo atpazīstamību reālās pārdošanas apjomā, īpaši tas attiecas uz jauniem un mazākām zīmoliem.

Atslēgvārdi: privāto preču zīmolu sortimenta stratēģija, privāto preču zīmolu pozicionēšana, kategoriju vadība, izvietojums mazumtirdzniecībā, aptieku mazumtirdzniecība.

GATAVĪBA INOVĀCIJĀM VALSTS KAPITĀLSABIEDRĪBĀS

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Valsts kapitālsabiedrībām ir svarīga loma ne tikai ekonomikas attīstībā, bet arī ilgtspējīgas attīstības veicināšanā, kas ir viens no galvenajiem konkurētspējas virzītājspēkiem valsts kapitālsabiedrību jomā. Pēdējos gados tiek aktualizēts jautājums par inovatīvu risinājumu jeb pētniecības un attīstības jomas nostiprināšanu valsts kapitālsabiedrībās.

Autores veiktais pētījums analizē valsts kapitālsabiedrību, kurās izveidotas un darbojas padomes, finanšu rādītāju dinamiku laika posmā no 2020. līdz 2024. gadam, izmantojot ROA (%), EBITDA rentabilitāti (%) un rentabilitāti (%) un to saistību ar pētniecības un attīstības izdevumiem valsts kapitālsabiedrībās.

Pētījuma rezultāti uzsver ilgtspējīgas darbības efektivitātes nozīmi kā pamatnosacījumu ieguldījumiem pētniecībā un attīstībā valsts kapitālsabiedrībās. Pētījums rosina diskusiju par to, vai ieguldījumi pētniecībā un attīstībā veicina valsts kapitālsabiedrību ilgtspējīgu attīstību, kā arī uzsver inovāciju rādītāju integrēšanas nozīmi korporatīvajā pārvaldībā.

KORPORATĪVĀS IDENTITĀTES, DIGITĀLĀS TRANSFORMĀCIJAS UN ILGTSPĒJAS INTEGRĀCIJA MVU: EMPĪRISKA VALIDĀCIJA UN PRAKTISKU VADLĪNIJU IZSTRĀDE

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Mazie un vidējie uzņēmumi (MVU) arvien biežāk darbojas vidē, kurā konkurētspēju nosaka spēja vienlaikus pārvaldīt mārketinga stratēģiju, digitālos risinājumus un ilgtspējas prasības. Tomēr praksē šīs jomas nereti tiek īstenotas fragmentēti – digitālā transformācija tiek uztverta kā tehnoloģisks projekts, mārketinga kā komunikācijas funkcija, bet ilgtspēja kā atsevišķa iniciatīva vai normatīva prasība. Šāda pieeja ierobežo uzņēmumu spēju veidot konsekventu stratēģisko pozicionējumu un ilgtermiņa konkurētspēju.

Pētījuma mērķis ir empīriski validēt un pilnveidot integrētu korporatīvās identitātes–Digitālās transformācijas–Ilgtspējas (KI–DT–Ilgtspējas) ietvaru, kā arī pārvērst to praktiski izmantojamās vadlīnijās MVU stratēģiskajai attīstībai. Pētījums balstās uz 16 daļēji strukturētām intervijām ar MVU vadītājiem un īpašniekiem četrās nozarēs:

- IT un digitālo transformāciju uzņēmumos,
- Profesionālajos un finanšu pakalpojumos,
- E-komercijas mazumtirdzniecībā,
- Radošajās un kultūras industrijās.

Eksperti vērtēja deviņas korporatīvās identitātes dimensijas, analizējot to nozīmi un faktiskās ieviešanas līmeni uzņēmuma ikdienas procesos, mārketinga lēmumos un digitālajās iniciatīvās.

Rezultāti apliecina, ka KI dimensijas – uzņēmuma profils un pozicionējums, klientu apkalpošanas kultūra un nākotnes attīstības stratēģija – ir cieši saistītas ar efektīvu mārketinga risinājumu un digitālās transformācijas ieviešanu. Savukārt pārvaldības un ilgtspējas dimensijās bieži novērojamas būtiskas atšķirības starp to uztverto nozīmīgumu un faktiskā īstenošanu. Pētījums parāda, ka konkurētspēju nenosaka digitālo tehnoloģiju intensitāte pati par sevi, bet gan identitātē balstīta saskaņotība starp uzņēmuma pozicionējumu, tehnoloģiskajām izvēlēm un vērtības piedāvājumu tirgū.

Pētījuma rezultātā izstrādātas strukturētas vadlīnijas, kas palīdz MVU vadītājiem un konsultantiem sistemātiski izvērtēt uzņēmuma identitāti, mārketinga pozicionējumu, digitālo transformāciju un ilgtspējas prakses vienotā stratēģiskā sistēmā.

Pētījuma ieguldījums ir divējāds: teorētiski tas sniedz empīriski validētu integrētu modeli, savukārt, praktiski – piedāvā izmantojamu instrumentu un vadlīnijas MVU konkurētspējas un ilgtspējīgas attīstības stiprināšanai dinamiskā tirgus vidē.

Atslēgvārdi: korporatīvā identitāte; digitālā transformācija; mārketinga stratēģija; MVU; konkurētspēja; ilgtspēja.

PRIVĀTO ZĪMOLU ATTĪSTĪBAS DINAMIKA MAZUMTIRDZNIECĪBĀ: PATĒRĒTĀJU ATTIEKSMES DIMENSIJA (LATVIJAS PIEMĒRA SALĪDZINOŠĀ ANALĪZE)

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Mazumtirdzniecības uzņēmumu privātie preču zīmoli (*private label*) Eiropā vēsturiski plašāk attīstījušies pēc 2.pasaules kara, to izplatība vairāk tikusi saistīta ar ekonomisko krīžu ietekmi. Taču pēdējās desmitgades laikā, kā liecina vadošo mārketinga un tirgus izpētes uzņēmumu pētījumu rezultāti, privāto zīmolu dinamika ir piedzīvojusi būtiskas pārmaiņas, ko ievērojami ietekmē patērētāju attieksmes maiņa. Ja agrāk privātie zīmoli tika uztverti galvenokārt kā zemākas cenas alternatīva, tad mūsdienās tie kļuvuši par kvalitatīvu un uzticamu izvēli, ko apliecina jaunākie patērētāju uzvedības pētījumi Eiropā un ASV. McKinsey dati liecina, ka gandrīz 75% ASV un 85% Eiropas patērētāju aktīvi pārorientējas uz izdevīgāku piedāvājumu, un apmēram ceturto daļu šajā izvēlē veido pāreja uz privātajiem zīmoliem, kas liecina par būtiskām strukturālām pārmaiņām mazumtirdzniecības tirgū. Šo tendenci pamatā ir ne vien ekonomiski apsvērumi, bet arī privāto zīmolu reputācijas uzlabošanās, no patērētāju puses novērtējot to kvalitāti. Privātie zīmoli arvien biežāk tiek uztverti kā līdzvērtīgi vai pat pārāki par nacionālajiem zīmoliem, kas veicina patērētāju lojalitāti un ilgtermiņa uzvedības maiņu.

Pētījumā analizēta privāto zīmolu attīstības dinamika no patērētāju attieksmes un tirgus struktūras perspektīvas, akcentējot zīmolu uztveri, kvalitātes ekspektācijas, uzticēšanos un izvēles motivāciju. Rezultāti parāda, ka privāto zīmolu izaugsme ir cieši saistīta ar divām dimensijām: (1) funkcionālo vērtību, ko nosaka cenas un kvalitātes attiecība, un (2) emocionālo vērtību, ko veicina zīmola uzticamība un mazumtirdzniecības uzņēmuma reputācija. Ekspertu intervijās secināts, ka privāto zīmolu turpmāko attīstību noteiks spēja saglabāt kvalitātes stabilitāti un diferencēts piedāvājums, atbilstība patērētāju prasībām pēc izsekojamības, inovācijām un vērtības piedāvājuma.

Atslēgvārdi: privātie zīmoli, mazumtirdzniecība, attieksme.

KONKURENCES STRUKTŪRA REGULĒTĀ TIRGŪ: CENU SIGNĀLU LOMA UN MĀRKETINGA RISKĀ FAKTORI APTIEKU MAZUMTIRDZNIECĪBĀ

Agnija Greizina

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Regulēti mazumtirdzniecības tirgi veido konkurences vidi, kur diferenciācijas iespējas ir ierobežotas un cenu signāli kļūst par nozīmīgu izvēles kritēriju. Šādos apstākļos cenu politika funkcionē ne tikai kā pārdošanas veicināšanas instruments, bet arī kā mehānisms, kas ietekmē pieprasījuma sadalījumu starp tirgus dalībniekiem un nosaka stratēģisko resursu izmantošanas efektivitāti.

Pētījuma mērķis ir analizēt konkurences struktūru regulētā tirgū, īpašu uzmanību pievēršot cenu intensitātes un mārketinga riska savstarpējai ietekmei. Situācijā, kur normatīvie ierobežojumi un maržas nosacījumi sašaurina diferenciācijas iespējas, mārketinga ieguldījumu rezultativitāte kļūst atkarīga no relatīvās cenu konfigurācijas tirgū.

Balstoties uz daudzkanālu mazumtirdzniecības empīriskajiem datiem Baltijas tirgū (cenu struktūra, sortimenta konfigurācija, darījumu plūsmas, akciju aktivitāte un pircēju pārejas rādītāji), tiek analizēta tirgus daļas pārdale un konversijas reakcija dažādos cenu intensitātes līmeņos. Analīze identificē robežsliekšņa efektu: pie noteikta cenu konkurences līmeņa nelielas cenu atšķirības rada būtisku klientu pārorientēšanos, vienlaikus samazinot citu konkurences instrumentu relatīvo ietekmi.

Tas norāda, ka regulētā tirgū mārketinga risks nav tikai operatīvs faktors, bet izriet no tirgus struktūras un cenu konkurences konfigurācijas. Konkurētspējas stiprināšana šādā vidē prasa integrētu pieeju, kur cenu politika, sortimenta izvēle un komunikācijas aktivitātes tiek analizētas kā savstarpēji saistīti stratēģiskie mainīgie.

Pētījums sniedz ieguldījumu konkurences izpētē regulētās nozarēs un piedāvā ietvaru mārketinga riska novērtēšanai ierobežotas diferenciācijas apstākļos.

Atslēgvārdi: konkurences struktūra mazumtirdzniecībā, mārketinga riski, regulēts tirgus, tirgus daļu pārdale, cenu konkurence.

4.6. sekcija. **UZNĒMĒJDARBĪBAS UN VADĪBAS
DAŽĀDI ASPEKTI GLOBĀLĀS
KONKURĒTSPĒJAS STIPRINĀŠANAI /**
KEY ASPECTS OF ENTREPRENEURSHIP
AND MANAGEMENT IN ENHANCING
GLOBAL COMPETITIVENESS

PRACTICE OF APPLYING ARTIFICIAL INTELLIGENCE MODELS IN RISK MANAGEMENT

Juris Uzulans

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As the possibilities offered by artificial intelligence solutions grow, the opportunities to use artificial intelligence solutions in various areas of management will increase. Various public services that use artificial intelligence are increasingly available, reducing the technical requirements for local solutions.

Risk management is characterised using large amounts of information, including historical information. Often, the resources required for quality management are limited and insufficient for processing large amounts of information.

A properly chosen artificial intelligence model, model application tool and model training are among the possible solutions. The study attempts to evaluate the use of several AI models and open source tools in the risk management process.

LITERATŪRAS APSKATS: EFEKTĪVAS LĪDERĪBAS PIEEJAS ATTĀLINĀTA UN ĢEOGRAFISKI IZKLIEDĒTA KOMANDAS DARBA FORMĀTĀ

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Globalizācijas un digitalizācijas ietekmē daudzveidīgas un ģeogrāfiski izkliedētas komandas ir kļuvušas par dominējošu darba organizācijas formu dažādās nozarēs. Lai gan attālinātas multikulturālas komandas pastāvēšana pati par sevi nav jauns fenomens, efektīva vadība attālinātā un ģeogrāfiski izkliedētā darba vidē joprojām rada nozīmīgus teorētiskus un praktiskus izaicinājumus. Šī pētījuma mērķis ir identificēt un analizēt efektīvas vadības pieejas attālinātās un ģeogrāfiski izkliedētās komandās, īpašu uzmanību pievēršot to ietekmei līderības ietekmi uz biznesa efektivitāti. Pētījumā tiek izmantots sistemātisks zinātniskās literatūras pārskats par līderību attālinātā darba kontekstā, analizējot dažādas līderības pieejas, stilus un vadības prakses, kā arī izvērtējot organizatoriskos faktorus, kas var ietekmēt līderības efektivitāti. Papildus tiek analizēta organizācijas loma kā starpfaktors līderības procesu īstenošanā attālinātā darba vidē.

Šajā pētījumā pamatā ir zinātniskās literatūras pārskats, kas ietver sevī sistemātisku jaunāko pētījumu pārskatu par līderības pieejām, praksēm un stiliem, kā arī organizatoriskos faktorus, kas ietekmē efektivitāti un darbinieku iesaisti ģeogrāfiski izkliedētās un daudzveidīgās komandās. Literatūras pārskatā izmantoti recenzēti avoti no *Scopus*, *ResearchGate* un *Google Scholar*, koncentrējoties uz publikācijām, kas izdoti laika posmā no 2020. līdz 2025. gadam, lai nodrošinātu konceptuālu aktualitāti.

Pētījuma rezultāti sniedz būtisku teorētisku ieguldījumu attālinātās līderības konceptualizācijā, piedāvājot daudzlīmeņu līderības modeli, kas paredzēts līderu darbības analīzei attālinātā darba kontekstā. Modelis ietver trīs savstarpēji saistītus līmeņus: mikro līmeni, kas fokusējas uz vadītāja ikdienas vadības aktivitātēm un tiešo mijiedarbību ar komandas locekļiem; mezo līmeni, kas aptver vidēja termiņa vadības prakses un strukturētas aktivitātes pusgada un gada griezumā; kā arī makro līmeni, kas akcentē organizatoriskā atbalsta mehānismu nozīmi līderības efektivitātes nodrošināšanā. Piedāvātais modelis integrē līderības prakses, kurām ir potenciāls pozitīvi ietekmēt galvenos komandas procesus, tostarp komunikācijas kvalitāti, komandas efektivitāti, konfliktu risināšanas spējas un darbinieku iesaistes līmeni attālinātā darba vidē.

Šis pētījums risina esošo nepilnību attālinātās līderības pētniecībā, koncentrējoties uz attālinātām komandām kas darbojas dažādās valstīs un reģionos (ģeogrāfiski izkliedēta komanda). Izpētot līderības pieejas, stilus un vadības aktivitātes, kā arī organizatoriskas iniciatīvas, pētījums sniedz strukturētas un mērķtiecīgas atziņas par līdz šim maz pētītu attālinātā darba, ģeogrāfiskās izkļiedes un komandu daudzveidības krustpunktu. Šie rezultāti paplašina teorētisko izpratni par efektīvas līderības un organizatoriskiem praksēm attālinātā un ģeogrāfiski izkliedētā darba formātā.

STRATEGIC MANAGEMENT COMPETENCIES AND THEIR IMPACT ON THE COMPETITIVENESS OF ORGANIZATIONS

Monta Anšica, Una Libkovska, Zane Zonberga

Ventspils Augstskola

In today's dynamic business environment, the competitiveness of an organization is significantly increased by the requirements for management quality. Strategic management competencies, including strategic thinking, quality of decision-making, change management, become essential prerequisites for long-term competitiveness. The understanding of the mechanisms by which these competences affect the competitiveness of organisations remains insufficiently systematised. The importance of these competences is manifested in the ability of the organization to define the direction of development, ensure the coherence of goals and adapt to changes in the external environment, thereby forming a lasting competitive advantage.

In this article, the data obtained from the study will be reflected. The study uses a combined methodological approach, combining quantitative and qualitative methods. Empirical data are obtained by analyzing assessments of management competencies and their relationship with human resource development indicators in organizations. Data analysis uses statistical analysis methods and content analysis to identify the most important aspects of competences and their interaction with each other.

The results of empirical analysis confirm a statistically significant relationship between the level of strategic management competencies and indicators of the competitiveness of organizations. The study found a positive correlation between strategic thinking and the organization's ability to achieve the set goals, which in turn contributes to strengthening competitiveness. In addition, the analysis shows that a higher level of development of managerial competencies is associated with greater coherence of goals in the organization, lower employee turnover and higher internal quality of communication.

The conclusions demonstrate that strategic management competencies function as a strategic resource that provides a sustainable competitive advantage. The study expands the understanding of the role of strategic management competencies in the development of organizations and provides practical recommendations for the improvement of management development systems.

Keywords: Strategic management competencies; competitiveness of organizations; strengthening competitiveness; development of human resources; development of organizations

MODELLING HUMAN RESOURCE COMPETENCE ALIGNMENT WITH ORGANIZATIONAL CAPABILITY REQUIREMENTS IN THE ENERGY SECTOR

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Organizational competitiveness in knowledge-intensive sectors is increasingly associated with the ability to systematically align available human resource competences with organizational capability requirements. In such contexts, competitive positioning depends not only on technological or financial assets but also on how precisely organizations structure and utilize their human resources in relation to defined operational and strategic capability demands. However, existing approaches to workforce analysis often describe competences or training outcomes without providing analytical mechanisms for evaluating their correspondence to capability requirements. This creates a methodological gap between competence development investments and competitiveness-relevant organizational outcomes. The present study addresses this gap by developing a modelling framework designed to assess the alignment between human resource competences and organizational capability requirements. The framework operationalizes competence–capability correspondence through a structured analytical mechanism that integrates competence mapping, and role-level productivity contribution assessment. The study employs quantitative research methods, integrating analytical modelling and structured cost–utility assessment to operationalize competence–capability alignment at the role level. As a result, the framework produces a role-specific analytical overview that supports evidence-based decision-making regarding professional development investments within energy sector organizations. The modelling results reveal measurable variations in competence–capability alignment across organizational roles, indicating the presence of both competence deficits and competence surpluses. The cost–utility assessment demonstrates that higher qualification investment does not necessarily correspond to proportional productivity contribution, highlighting structural imbalances between human capital expenditure and capability realization. These findings provide empirical support for the necessity of alignment-based workforce structuring rather than qualification accumulation alone. The findings reinforce the argument that organizational competitiveness in knowledge-intensive sectors depends not merely on the existence of qualified personnel, but on the structured alignment between human resource competences and clearly defined organizational capability requirements.

Keywords: Human Resource Competence Alignment, Skill Productivity Modelling, Human Resource Efficiency, Skill–Role Alignment Analysis, Sustainable Organizational Management

NEFINANŠU SABIEDRĪBU KREDITĒŠANAS TENDENČU ANALĪZE EIROZONĀ UN LATVIJĀ NO 2019. LĪDZ 2024. GADAM

Daniils Prohorovs

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Kreditēšanas apjomu un aizdevumu izsniegšanas nosacījumu izmaiņas laika posmā no 2019. līdz 2024. gadam rādīja papildus izaicinājumus Latvijas uzņēmumiem, samazinot to spēju piesaistīt banku finansējumu un konkurēt globālajos tirgos, un ne vienmēr šīs izmaiņas var būt pamatotas tikai ar ECB īstenoto monetāro politiku.

Pētījuma mērķis ir, pamatojoties uz ECB monetārās politikas analīzi un, izvērtējot nefinanšu sabiedrību kreditēšanas tendences eirozonā un Latvijā, izdarīt secinājumus un izstrādāt priekšlikumus nefinanšu sabiedrību kreditēšanas veicināšanai Latvijā.

Izvirzīta mērķa sasniegšanai, darba izstrādē tika izmantotā monogrāfiskā metode, ekonomiskā analīzes metode, salīdzināšanas metode un grafiski attēlošanas metode.

Pētījuma rezultāti norāda uz zemiem nefinanšu sabiedrību kreditēšanas apjomiem Latvijā pret IKP, kas ir zemāki par eirozonas vidējiem rādītājiem. Rezultāti norāda uz strukturālām atšķirībām kreditēšanas tendencēs un uzņēmējdarbības kreditēšanas nosacījumos eirozonā un Latvijā. Starpība var liecināt par ierobežotu pieeju finanšu resursiem Latvijā un uzņēmumu piesardzību attiecībā uz aizņēmumiem, kas ilgtermiņā var samazināt to konkurētspēju. Nefinanšu sabiedrību kreditēšanas dinamika Latvijā laika posmā no 2019. līdz 2024. gadam var liecināt par Latvijas ekonomikas un finanšu sistēmas lielāku jutīgumu pret ārējiem šokiem un ECB monetārās politikas izmaiņām un norāda uz nepieciešamību veikt aktīvus un koordinētus pasākumus, lai mainītu negatīvas tendences.

STRATEGIC SCENARIOS FOR EXPORT DEVELOPMENT BETWEEN LATVIA AND WEST AFRICA

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The current study examines opportunities to expand Latvia's export to West African markets, specifically Senegal, Guinea, Ivory Coast, Cameroon, Togo, Benin, Gabon, DR Congo and Congo (Brazzaville). The exported products represent Latvia's metal industry sector and include high value-added machinery and equipment, manufactured domestically.

A key research method was qualitative interviewing, conducted with local West African experts to gather insights into their perceptions of Latvian metal industry products. These interviews also provided valuable information on regional West African business culture, communication practices, economic aspects and industrial conditions. Additional methods included synthesis and analysis, as well as a case study, examining transportation options from Latvian ports to Cameroon.

Based on the findings, two primary strategic scenarios were developed. The first recommends that Latvian entrepreneurs concentrate on offering online services, engineering services, and technical expertise to West African clients. The second proposes focusing on the export of physical products and material goods. Both scenarios were constructed, using PEST and SWOT methods along with the Analytic Hierarchy Process methodology.

Finally, Latvian export specialists were interviewed to evaluate and provide feedback on the proposed scenarios. And an expert from the Latvian Chamber of Commerce and Industry also offered a professional assessment from the perspective of Latvian entrepreneurs.

JOINT STUDY PROGRAMMES IN HIGHER EDUCATION AS AN OPPORTUNITY FOR SUSTAINABLE CAPACITY STRENGTHENING, RESEARCH AND INNOVATIONS DEVELOPMENT

Olga Šņucina

University of Latvia

Sustainable education tendencies, necessity of closer cooperation between industry, governmental bodies and higher education institutions, effective resource planning for better study quality and results achieving along with growing trends in the movement of young people and the workforce, increased demand for the level of internationalization of studies, the need of innovation, technology and research fundamental integration into the study process impose the additional challenging conditions for the development of study programmes and of higher education in general.

As one of the possible options for collaboration strengthening between higher education institutions, for partners and stakeholder's expectation satisfactory achievements is to explore and evaluate the opportunity of realization of jointly implemented or joint degree study programmes.

The joint study programmes, created between higher education institutions partners in the same country or in collaboration with international university partners, allow to use the efficient allocation of resources of the partners, including finance, materials, human resources, technical environment and technologies, to provide the exchange of academic experience for scientific research, innovative methods of teaching and learning, for improving of the methodology and tools with the best practices and proven approaches sharing. An important role and significance in the implementation of joint study programmes are assigned to expressed interdisciplinarity, innovative approach and the use of AI and digital solutions in the study process to ensure the actuality, relevance and sustainability of the joint study programmes.

The main topic of the presentation is to provide the introductive review into the joint study programmes idea and Riga Stradins university (RSU), Latvia, experience with implementing of joint study programmes, mentioning the main advantages and challenges, to invite the participants for strengthening of internationalization level, to encourage promoting of international cooperation and improving of the quality of scientific research in higher education motivated by joint study or joint degree study programmes creation.

PRECARIOUS EMPLOYMENT AMONG LATVIA'S AND THAILAND'S NEWEST LABOR MARKET ENTRANTS

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Indicators of precariousness can be determined by earnings, social and regulatory protection as well as job certainty (Evans, Gibb, 2009), including forms of work that, in some respects, offer less security than a full-time open-ended employment contract. Examples of precarious labour include part-time work, shorter fixed-term contracts, self-employment, and positions within micro enterprises. Precarious work increases employee uncertainty due to its unpredictability and lack of social guarantees.

One of the statistical indicators available for analyses is informal employment. In Latvia, informal employment rates were 2.2 percent in 2024 (ILO, 2025), while precarious labour was just 0.3 percent, calculated based on the percentage of employees with short-term contracts of up to three months (Eurostat). According to Thailand's 2024 Informal Employment Survey, around half of employees were in informal employment, performing formal roles and lacking social protection contributions.

Some young people, including local and international students, work in the gig economy and hospitality sectors, which are characterised by lower pay and a lack of social protections. Comparative research based on survey analyses studies the current situation among young people in Latvia and Thailand.

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FROM DOCTOR MOBILITY TO GLOBAL COMPETITIVENESS: ENTREPRENEURIAL MANAGEMENT OF LATVIA'S HUMAN RESOURCES FOR HEALTH

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Rīga Stradiņš University

Healthcare systems across Europe face increasingly complex challenges that demand innovative responses. Public health is now widely acknowledged as a determinant of population well-being and as a productive factor contributing significantly to national economies. In Latvia, the large-scale out-migration of healthcare practitioners represents one of the most pressing issues confronting the national health sector. This trend has intensified since the country's accession to the European Union in 2004, as doctors and nurses leave in search of better working conditions and higher wages abroad. The resulting shortage of medical professionals threatens the stability of the healthcare system as well as the wider economy. The particular emphasis is on the situation of young doctors, who are vital to the sustainability of the Latvian healthcare system. The authors examine the legal framework that obliges medical graduates to serve in the public sector for three years following residency and assesses its compatibility with constitutional rights and EU regulations. The discussion considers potential mechanisms for recovering financial resources when this service obligation is not fulfilled, as well as the possibility of introducing alternative models. In addition to legal measures, the authors explore the role of technological innovation, particularly telemedicine, as a potential means of mitigating doctor shortages and expanding access to care. The research concludes that the continued emigration of healthcare professionals poses a serious threat to the effective functioning of the healthcare system. Without timely and effective interventions, the country risks being unable to ensure adequate and timely healthcare services, especially in specialised fields, which negatively impact competitiveness of this industry in Latvia.

BRIDGING INDUSTRIAL POLICY AND SUSTAINABLE COMPETITIVENESS

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Sustainable competitiveness has become a key priority for the European Union to address challenges to its traditional comparative advantages. Business, governmental and institutional authorities responsible for creating, enforcing, and updating economic regulations are re-evaluating existing mechanisms to promote investments in the EU's green and digital transitions. Their focus is particularly on updating standards to replace those of EU Member States, ensuring a consistent and cohesive approach across the Union. Updating standards is crucial; however, a comprehensive approach requires multiple steps and considerations. This is essential to ensure that Industrial Policy within the EU effectively aligns with its geo-economic and geo-strategic interests.

This process aims not only to address current challenges, such as unfair competition from lower-cost suppliers, but also to reinforce defences against emerging threats. Moreover, IP is vital for fostering sustainable competitiveness based on comparative advantages of

European industries, encouraging industrial sectors to adopt practices that prioritise environmental, social, and economic sustainability.

COOPERATION IN VOCATIONAL EDUCATION INSTITUTIONS TOWARDS EXCELLENCE, ENSURING THE ECONOMIC GROWTH, DEVELOPMENT OF THE NATIONAL ECONOMY AND INTERNATIONAL COMPETITIVENESS OF LATVIA

Ilze Brante, Biruta Sloka

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In Latvia, vocational education institutions have been modernized, an infrastructure has been created that meets modern requirements, equipment has been purchased that meets modern technological requirements, high-level vocational education institutions (tehnikums) are established, the functions of which include the preparation of qualified and competitive specialists for the labour market. Those aspects are on importance of academic researchers I many countries.

Aim of the current research is to investigate views of vocational education providers on aspects of quality of vocational education and its correspondence with labour market needs.

Research methods applied: analysis of scientific publications and analysis of survey results of vocational education providers. Survey was created, tested in the respective target group and than finalised in acceptable by experts survey questions. Evaluations of respondents were collected by use of survey platform QuestionPro, survey data were exported in SPSS to realise deeper analysis of survey data.

Research results indicated that the vocational education establishments are on right path and many important achievements have reached to increase prestige of vocational education in Latvia.

Keywords: prestige of vocational education, cooperation, center of excellence.

THE ROLE OF MANAGEMENT CONSULTING IN STRATEGY CRAFTING AND DIGITAL TRANSFORMATION OF SMES: QUANTITATIVE EVIDENCE FROM LATVIA

Eduards Aksjoņenko

Latvijas Universitātes Banku augstskola

Small and medium-sized enterprises (SMEs) operate under increasing pressure to enhance competitiveness through strategic clarity, digital transformation and efficient resource allocation. While management consulting is frequently promoted as a catalyst for SME development, empirical evidence on its measurable impact remains fragmented and often methodologically limited. This empirical study examines the role of management consulting in shaping strategic outcomes and digital transformation within SMEs, based on quantitative empirical research conducted as part of an ongoing doctoral dissertation.

The research draws on a structured survey of 224 Latvian SMEs, including firms that have used management consulting services and those that have not. The study applies construct validation procedures (Cronbach's alpha), tests for common method bias, employs regression analysis and mediation testing to evaluate the relationships between consulting use, digital maturity, strategic clarity, dynamic capabilities and strategic outcomes.

The findings indicate that consulting use does not uniformly improve all strategic constructs. No significant direct differences were found in dynamic capabilities or strategic clarity between consulting users and non-users. However, regression analysis reveals a statistically significant positive association between consulting use and cost efficiency (0.92-point increase on a 1–6 scale, controlling for firm size and digital maturity), suggesting measurable financial benefits. Furthermore, digital maturity demonstrates a strong main effect on strategic outcomes, and interaction analysis shows that consulting impact diminishes as digital maturity increases. Small and younger firms appear to benefit more from consulting in practical terms, although statistical significance is constrained by sample size in certain subgroups.

Mediation analysis confirms that strategic clarity and related managerial constructs strongly predict strategic outcomes. However, consulting use does not independently drive these mediators once demographic controls are introduced.

The study contributes to the entrepreneurship and management literature by providing structured empirical evidence on the conditional effectiveness of management consulting in SMEs. It also offers practical implications for policymakers, SME managers, and consultants regarding when and under what organizational conditions management consulting services are most likely to enhance competitiveness and strategic performance.

Keywords: Management Consulting, SMEs, Digital Transformation, Strategic Clarity, Competitiveness.

ETHICAL ASPECTS IN THE APPLICATION OF GAIT IN STUDIES AND RESEARCH IN SOCIAL SCIENCES

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Recent technology development and AI application in different fields including studies and research in social sciences has created serious concerns about ethical aspects which are under research world-wide by many academic researchers and are applied many policy-maker discussions on regulations on several levels.

Aim of the current research is to investigate evaluations of ethical aspects in GAIT application in research and studies in social sciences by researchers, teaching staff and students. The analysed aspects were: “I am aware of privacy when I use GAIT”; “I am aware of information security issues when I use GAIT”; “I am aware of abuse of using GAIT”; “I comply with ethical principles when I use GAIT”; “When use GAIT for text/image creation, I provide a reference”.

Research methods applied: analysis of scientific publications, analysis of survey data obtained from the authors’ survey of researchers, teaching staff, and students. Evaluations are analysed using descriptive statistics, including indicators of central tendency or location, indicators of dispersion, and statistical tests, such as the t-test, analysis of variance (ANOVA), the chi-square test, and correlation analysis. It was also analysed with expert views.

Research results have indicated no statistically significant differences in the views and positions of academic staff by gender. There was a statistically significant difference by age groups for several aspects analysed.

Keywords: GAIT, ethical aspects of AI application, references on AI application

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4.7. sekcija. **APRITES EKONOMIKA UN ILGTSPĒJĪGA
ATTĪSTĪBA: IZAICINĀJUMI UN
NĀKOTNES IESPĒJAS /**

**CIRCULAR ECONOMY AND
SUSTAINABLE DEVELOPMENT:
CHALLENGES AND FUTURE
OPPORTUNITIES**

FROM COMPLIANCE TO COMPETITIVE PERFORMANCE: BUSINESS ASSURANCE AS A STRATEGIC DRIVER OF PROFITABILITY AND SUSTAINABLE GROWTH IN DEVELOPING ECONOMIES

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Despite its widespread adoption, Quality Management (QM) in many developing economies remains compliance-driven and insufficiently connected to competitive performance, profitability, and long-term growth. This disconnect contributes to short-termism, inefficiencies, and systemic waste, limiting quality's strategic value. This paper identifies three root causes: the misperception of quality as a standalone function, rigid framework implementation, and insufficient executive-level quality education. It proposes a shift from traditional Quality Assurance (QA) to Business Assurance (BA), aligning quality with financial performance, strategic objectives, and sustainable growth. Quality is reframed as the degree to which each process meets its defined requirements, an outcome assured within the process itself.

A qualitative multi-method approach was employed, combining literature review, root cause analysis (RCA), executive interviews, comparative case analysis, and a pilot survey. Data from Azerbaijan, Georgia, Kazakhstan, and Turkey, alongside insights from CQI Quality Week and ISO 9001 statistics, were analysed to compare symbolic certification practices with performance-embedded systems. The study evaluates how quality systems influence operational effectiveness and strategic alignment. Findings support the Business Assurance Model of Excellence (BAME) as a scalable framework for integrating quality into financial governance, leadership accountability, and competitive performance management.

QM is widely misunderstood and narrowly interpreted as a compliance requirement rather than a strategic performance driver.

- Compliance-focused systems contribute to inefficiency, rework, resource waste, and weakened competitive positioning.
- Quality is rarely embedded in financial planning, KPIs, or executive decision-making.
- Executive education in quality leadership remains limited.
- Traditional frameworks are often applied rigidly, reducing adaptability and performance impact.

These results highlight that when quality is repositioned as process-owned and strategically aligned, it strengthens operational efficiency, financial visibility, cross-functional accountability, and long-term competitiveness. The proposed BAME framework enables each process to define and assure its own quality in direct alignment with business strategy.

This study positions QM as a strategic lever for competitive performance and sustainable growth. It recommends embedding quality within governance structures, financial management systems, and executive accountability frameworks. Practical implications

include reducing the cost of non-quality, improving resource utilization, enhancing stakeholder confidence, and enabling scalable growth for SMEs and larger enterprises alike. Research implications include further empirical assessment of quality's impact on profitability, operational resilience, and competitive advantage. BAME offers a structured pathway for transforming audit-oriented systems into performance-driven Business Assurance models.

This paper advances quality management scholarship by reframing Business Assurance as a strategic driver of competitive performance rather than a compliance mechanism. It challenges the perception of quality as a separate function and conceptualizes it as the measurable degree to which processes achieve business-aligned outcomes. Drawing on cross-country case evidence and systemic analysis, BAME provides a scalable, context-sensitive model that converts certification-focused systems into engines of profitability, resilience, and sustainable growth in developing economies.

Keywords: Business Assurance, Competitive Performance, Quality Management, Profitability, Sustainable Growth, Strategic Governance.

METĀLU RŪDU POTENCIĀLA IZVĒRTĒJUMS DZIĻI IEGULOŠAJĀ PAMATKLINTĀJĀ LATVIJĀ

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Eiropas Savienības stratēģisko un kritiski svarīgo izejvielu sarakstā (Grohol, Veeh 2023) ir vairāk nekā 20 metālu un metālu grupu. Metāli ietilpst, galvenokārt, oksīdu un sulfīdu minerālu sastāvā, bet daži no tiem veido tīrradņus. Pasaules nozīmīgākās dzelzsrūdas un mangāna rūdas ir vairāk nekā miljardu gadu senos nogulumiežos, kuri ir pārveidoti metamorfisma procesos (Aftabi et al. 2021). Vara, niķeļa, hroma, platīna un daudzu citu metālu rūdas ir veidojušās no magmas un karstajiem šķīdumiem. Tās parasti ir atrodamas senos un jaunos tektonisko aktīvos apgabalos, piemēram, kalnu masīvos (Evans 1993).

Latvijā derīgos izrakteņus iegūst tikai no nogulumiežu segas virsējās daļas, un mūsu valsts teritoriju nemēdz asociēt ar kalniem, magmatismu, metamorfismu un vulkānismu. Tomēr šī situācija bija krasi atšķirīga pirms 1,8-1,5 miljardiem gadu, kad aktīvu Zemes garozas kustību rezultātā izveidojās kristāliskā pamatklintāja ieži. Latvijā pamatklintājs ir 300–1900 m dziļumā, bet ziemeļu virzienā tas ieguļ aizvien seklāk, un Baltijas jūras akvatorijā, Somijā un Zviedrijā atsedzas Zemes virspusē. Somijā un Skandināvijā pamatklintājā ir daudz vērtīgu metālu atradņu, kas rada pamatu praktiskai interesei arī par mūsu dziļi iegulošajiem iežiem.

Dziļi iegulošā pamatklintāja pētījumiem Latvijā jau kopš 20. gs. sākuma tiek kartētas magnētiskā un gravitācijas lauka anomālijas, kuras potenciāli liecina par metālu koncentrācijām iežos. 1960.-1990. gados tika veikti padziļināti anomāliju ģeofizikālie pētījumi, kā arī vairākās no tām veikti dziļurbumi un atklātas dzelzsrūdas. Kā nozīmīgākās tika atzīta Staicele un Gārsene (Vetrenņikovs 1991), taču ir maz pieejamas informācijas par citām iegulām. Kopš 2024. gada LU un Tartu Universitātes ģeologu un ķīmiķu pētnieku grupa ir atjaunojusi magnētisko anomāliju pētījumus, kombinējot ģeofizikālās, mineraloģiski petrogrāfiskās un ģeokīmiskās metodes. Pētījumu mērķis ir noskaidrot rūdu potenciālu un novērtēt iespējamo rūdu resursus Staiceles, Gārsenes, Strenču un Inčukalna magnētisko anomāliju teritorijā.

Šobrīd, pamatojoties uz urbumu seržu paraugu mineraloģiski petrogrāfiskiem pētījumiem un ķīmisko analīžu datiem, ir noskaidrots, ka Staiceles iegulā dzelzs oksīda saturs ir 7–59% un mangāna oksīda saturs 1-19%. Dzelzs minerālā magnetītā mangāna vidējais saturs ir 3,1%, kas palielina dzelzsrūdu kvalitāti. Gārsenes iegulā dzelzs oksīda saturs ir 21–58%, bet kobalta oksīda saturs 0,03-0,08%. Rūdās ir arī titāns, cinks un daudzi citi metāli, ieskaitot retzemju elementus. Jāpiebilst, ka mangāns un kobalts pieder Eiropas Savienības stratēģiskajām un kritiski svarīgajām izejvielām. Mangāna saturs Staicelē un kobalta saturs Gārsenē pēc šī brīža datiem ir nedaudz zem rūpnieciski iegūstamo rūdu koncentrāciju sliekšņa, tomēr dati ir balstīti tikai uz pāris urbumiem, kas neraksturo visu iegulu. Pētījumi turpinās, taču pašreizējās prognozes norāda, ka dzelzsrūdu resursi Staiceles un Gārsenes iegulā varētu pārsniegt 100 miljonus kubikmetru. Izvērtējot Latvijas pamatklintāja metālu resursu nākotnes perspektīvas, jāņem vērā arī metālu cenu kāpums un prasību pret rūdu koncentrāciju pazemināšanās, kā arī rūdu bagātināšanas tehnoloģiju attīstība.

LATVIJAS MEŽA NOZARES ATTĪSTĪBAS IESPĒJU EKONOMISKĀ DIMENSIJA

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Šobrīd aptuveni 14% Latvijas mežu ir dažāda līmeņa aizsardzībā, no tiem 7% ir stingri aizsargāti, kur saimnieciskā darbība gandrīz nav atļauta. Taču, ņemot vērā Eiropas Zaļā kursa (Zaļā darījuma) virzību, tiek apsvērta šo aizsargājamo teritoriju būtisks paplašinājums līdz 30%, tostarp 10% stingri aizsargātu teritoriju. Pētījumā veiktās sociālekonomiskās modelēšanas rezultātos secināms, ka iespējamais formālais “70–20–10” sadalījums bez korekcijām nenodrošina maksimālu sabiedrisko labumu – tīrā tagadnes vērtība (NPV) ir zemāka, nekā tā būtu ar mērķtiecīgi intensīvāku un modernizētu saimniecisko darbību 70% teritorijā. Formāla stratifikācija vien nav pietiekama – jāuzlabo gan rekreācijas, gan aizsardzības, gan saimniecisko zonu efektivitāte.

Pašreizējā situācija liecina, ka Latvijas saimnieciskās mežsaimniecības daļa nespēj pilnībā izmantot pieejamo potenciālu – ierobežota koku augšanas intensitāte, salīdzinoši zema ražība un novecojusi infrastruktūra kavē ne tikai koksnes ieguvu, bet arī ierobežo iespējas oglekļa piesaistei, atjaunošanai un inovācijām (piemēram, bioekonomikā). Pētījumā, balsoties uz esošiem bioloģiskiem modeļiem, tiek veikta ekonomiskā ieguvuma analīze dažādiem mežu nozares attīstības scenārijiem vairākiem gadu desmitiem. Tiek izvērtēts tautsaimniecības ieguvums gan tiešā, gan netiešā formā.

ŠĶĒRŠĻI UN VEICINOŠIE FAKTORI PĀREJAI UZ APRITES UN DALĪŠANĀS EKONOMIKU BŪVNICĪBAS SEKTORĀ

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Pāreja uz aprites un dalīšanās ekonomiku arvien plašāk tiek atzīta par būtisku priekšnoteikumu ilgtspējīgai resursu apsaimniekošanai un būvniecības sektora dekarbonizācijai. Tomēr šīs pieejas ieviešana dažādās valstīs norit nevienmērīgi, un to ietekmē specifiski institucionāli, ekonomiski un sociāli faktori. Šī pētījuma mērķis ir identificēt un analizēt galvenos šķēršļus un veicinošos faktoros, kas ietekmē pāreju uz aprites un dalīšanās ekonomiku Latvijas būvniecības un būvmateriālu apritīguma kontekstā. Pētījumā sistematizēti strukturālie, ekonomiskie, sociālie, tehnoloģiskie un regulatīvie faktori, kas Latvijā veicina vai kavē aprites un dalīšanās ekonomikas iniciatīvu attīstību un mērogošanu.

Empiriskā analīze balstās kvalitatīvā gadījumu izpētes pieejā, izmantojot daļēji strukturētas ekspertintervijas, Latvijas aprites un dalīšanās ekonomikas iniciatīvu (īpaši būvmateriālu koplietošanas un atkārtotas izmantošanas jomā) analīzi, kā arī nacionālo politikas dokumentu un zinātniskās literatūras padziļinātu pārskatu. Identificēto faktoru strukturēšanai izmantota sistēmiska analītiskā pieeja, kas ļauj izvērtēt pārejas procesus un to savstarpējās mijiedarbības.

Rezultāti liecina, ka būtiskākie šķēršļi ir ilgtermiņa nacionālo un pašvaldību stratēģiju trūkums un to nepietiekama savstarpējā koordinācija, normatīvā regulējuma neskaidrība, nepietiekami attīstīti finansēšanas instrumenti un biznesa modeļi, zema sabiedrības informētība, augsta cenu jutība, kā arī noturīgi lineāra patēriņa paradumi un ar tiem saistītās kultūras normas. Savukārt nozīmīgākie veicinošie faktori ietver mērķētus nodokļus un finanšu stimulus, ES un nacionālos atbalsta instrumentus, uzlabotu datu pieejamību un monitoringu, digitālās platformas materiālu koplietošanai un atkārtotai izmantošanai, kopienu iniciatīvas, kā arī pieaugošu ilgtspējas apziņu jaunākajās paaudzēs.

Pētījums secina, ka pārejai uz būvniecības un būvmateriālu apritīgumu Latvijā nepieciešama koordinēta un integrēta politikas pieeja, kas apvieno regulatīvo skaidrību, ekonomiskos stimulus, digitālos risinājumus un ieinteresēto pušu līdzdalību. Veicinošo faktoru stiprināšana var būtiski paātrināt uzvedības maiņu, uzlabot resursu efektivitāti un sekmēt ilgtspējīgas attīstības mērķu sasniegšanu ilgtermiņā.

MĀKSLĪGĀ INTELEKTA PIELIETOJUMA DIGITĀLAJĀ REKLĀMĀ PROBLEMĀTIKA SOCIĀLĀS ATBILDĪBAS UN LABKLĀJĪBAS KONTEKSTĀ

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Arvien vairāk zinātniskajā literatūrā un praksē tiek diskutēts par pieaugošo mākslīgā intelekta izmantošanas potenciālu dažādās nozarēs un jomās. Ieguvumi tiek saistīti, piemēram, ar vienkāršotu lielu datu apjoma apstrādi un analīzi, tā nepārtrauktu darbību, laika un finanšu resursu ietaupījumu u.tml. Tomēr mākslīgā intelekta pielietojums var veicināt arī negatīvus aspektus, kas saistīti ar tehnoloģiskiem, sociāliem, ētiskiem un cita veida riskiem.

Sabiedrības informatīvā drošība, sociālā iekļaušanās, kā arī savstarpēja uzticēšanās starp indivīdiem un institūcijām veicina sociālo atbildību un labklājību, tāpēc ir nepieciešams aktualizēt mākslīgā intelekta izmantošanas problemātiku sociālās atbildības un labklājības kontekstā, jo tā rada izaicinājumus saistībā ar datu manipulāciju, nevienlīdzīgu attieksmi pret atsevišķām sabiedrības grupām, [t.sk.](#) to kritiskās domāšanas prasmju samazināšanos un spēju patstāvīgi pieņemt lēmumus.

Pētījuma mērķis: aktualizēt problemātiku, kas saistīta ar mākslīgā intelekta pielietojumu digitālajā reklāmā. Mērķa sasniegšanai izmantotas sekojošas pētījuma metodes: bibliometriskā analīze, sekundāro datu analīze, dokumentu analīze un gadījuma analīze.

Galvenie rezultāti un secinājumi. Pētījuma rezultātā izstrādāts konceptuāls mākslīgā intelekta pārvaldības ietvars, kas vērsts uz risku mazināšanu, kā arī identificēti un klasificēti riski, kas saistīti ar sociālo atbildību un labklājību – pārredzamības trūkums, diskriminācija un manipulācija ar patērētājiem.

Atslēgvārdi: digitālā reklāma, mākslīgais intelekts, mākslīgā intelekta pārvaldība, mākslīgā intelekta riski, sociālā atbildība, sociālā labklājība.

DEZINFORMĀCIJAS UN MALDINOŠAS INFORMĀCIJAS IETEKME UZ SABIEDRĪBAS VESELĪBPATĪBU ILGTSPĒJĪGAS UZŅĒMĒJDARBĪBAS KONTEKSTĀ: SOCIĀLĀ ATBILDĪBA UN MĀRKETINGA ĒTIKA DIGITĀLAJĀ VIDĒ

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Digitalā vide mūsdienās ir kļuvusi par sabiedrības primāro informācijas avotu veselības jautājumos. Vienlaikus tā ir arī vide, kurā strauji izplatās dezinformācija un maldinoša komerciālā informācija. Ilgtspējīgas uzņēmējdarbības kontekstā tas rada būtisku izaicinājumu – kā sabalansēt uzņēmuma komerciālās intereses ar sociālo atbildību un sabiedrības veselībpārtības stiprināšanu.

Dezinformācija un daļēji patiesi, kontekstuāli sagrozīti veselīguma apgalvojumi, kā arī maldinoša informācija (*t.sk.* healthwashing jeb nepatīss veselīguma marķējums, neapstiprināti veselības apgalvojumi, nepilnīgi uzturvērtības salīdzinājumi) ietekmē patērētāju uztveri un lēmumu pieņemšanu. Īpaši ievainojamas grupas ir bērni un jaunieši, kuru kritiskās izvērtēšanas prasmes digitālajā vidē vēl attīstās.

Ilgtspējīga uzņēmējdarbība nav tikai vides jautājums – tā ietver arī sociālo dimensiju, tostarp atbildību par sabiedrības veselību un informācijas kvalitāti. Dezinformācija un maldinoša komerciālā informācija var: 1) vājināt sabiedrības veselībpārtību, 2) veicināt neveselīgu patēriņu, 3) palielināt ilgtermiņa slogu veselības aprūpes sistēmai, 4) graut uzticēšanos uzņēmumiem un institūcijām. Tādējādi dezinformācijas un maldinošas informācijas mazināšana un ētiska mārketinga prakse kļūst par būtisku ilgtspējīgas uzņēmējdarbības sastāvdaļu.

Pētījuma mērķis ir aktualizēt dezinformācijas un maldinošas komerciālās informācijas nozīmi ietekmi uz sabiedrības veselībpārtību ilgtspējīgas uzņēmējdarbības kontekstā, identificējot galvenos ietekmējošos faktorus.

Metodes: zinātniskās literatūras bibliometriskā analīze, sekundāro datu analīze, normatīvo dokumentu analīze, kā arī piemēripēte.

Analizējot pētījumā identificētos faktorus, secināts, ka dezinformācijas un maldinošas komerciālās informācijas uztvere nav reducējama tikai uz nepietiekamām zināšanām vai zemu digitālās veselībpārtības līmeni. Tā veidojas daudzlīmeņu sistēmā, kur savstarpēji mijiedarbojas pieci sistēmiskie līmeņi.

Augstāks digitālās veselībpārtības līmenis samazina risku tikt pakļautam maldinošas informācijas ietekmei, tomēr tas nav vienīgais aizsargfaktors. Pat indivīdi ar pietiekamām zināšanām var kļūt ievainojami, ja informācija sakrīt ar viņu vērtībām, emocijām vai sociālās piederības identitāti. No ilgtspējīgas uzņēmējdarbības perspektīvas tas nozīmē, ka: 1) atbildīga komunikācija nevar balstīties tikai uz formālu normatīvo prasību ievērošanu; 2) uzņēmumiem jāapzinās, ka emocionāli manipulējoša vai kontekstuāli nepilnīga informācija var pastiprināt riskus sabiedrības veselībai; 3) dezinformācija un maldinoša informācija rada ne tikai reputācijas riskus, bet arī ilgtermiņa sociālos un ekonomiskos zaudējumus, kas ir pretrunā ar ilgtspējīgas attīstības principiem.

Atslēgvārdi: dezinformācija, digitālā veselībpārtība, ilgtspējīga uzņēmējdarbība, maldinoša informācija, mārketings, patērētāju uzvedība, sociālā atbildība.

ASSESSING SUSTAINABILITY PERFORMANCE IN SMES: A QUALITATIVE INDICATOR APPROACH

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Small and medium enterprises (SMEs) are the largest group of economically active businesses that manage the majority of global resources; however, the sustainability impact and performance remain largely uncovered. The present measures that have previously confirmed the theoretical application for large corporations are not practically viable for SMEs due to their limited ability to gather the necessary data. As a result, the sustainability impact of SMEs cannot be determined. This problem causes not only the inability to fully evaluate SME performance but also the lack of critical feedback on their sustainability orientation limitations. The presented issue provides a necessity to establish a viable measure that could be used to practically evaluate the sustainability performance of SMEs. Thus, the purpose of this research was to develop and empirically validate a set of indicators for SE. The authors employed various research methods. First, a systematic literature review to collect all available scales for the measurement of SE. Then, using the qualitative content analysis method, the scales were refined to avoid redundancy of items, which were further grouped into 4 SE dimensions – environmental, social, economic, and governance. Second, a questionnaire was administered to Latvian SMEs to develop a minimal viable indicator set. The data was gathered and analyzed via SPSS. Variation and exploratory factor analyses were conducted to eliminate and refine indicators for sustainability performance. At last, factor loading was carried out to determine the minimal viable set of indicators for sustainability performance measure in SMEs among different business types, models, and industries. The authors concluded that in most cases, Latvian SMEs were unable to provide quantitative data. As a result, a set of qualitative sustainability performance indicators was developed. Although the indicator set is limited to a single empirical validation, it has wide application capabilities in further research due to its adaptability to industrial settings with reduced ability to gather quantitative data.

ILGTSPĒJĪGA MĀRKETINGA IZAICINĀJUMI AUGU BĀZES DZĒRIENU VIRZĪŠANĀ TIRGŪ UN PATĒRĒTĀJU PIRKŠANAS LĒMUMU IETEKMĒŠANĀ

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Uzņēmumi darbojas intensīvas konkurences apstākļos, kur patērētāju uzmanības piesaiste un pirkuma lēmumu ietekmēšana kļūst arvien sarežģītāka. Šādos apstākļos īpaši nozīmīgi ir izprast patērētāju uzvedību noteicošos faktorus un stimulus, kas ietekmē lēmumu pieņemšanas procesu.

Pieaugot konkurencei augu izcelsmes dzērienu segmentā, zīmoli ir spiesti meklēt diferenciācijas iespējas, integrējot ilgtspējīga mārketinga elementus savās komunikācijas un produktu attīstības stratēģijās, lai veicinātu patērētāju izvēli par labu ilgtspējīgām alternatīvām. Vienlaikus sabiedrības patēriņa paradumi pakāpeniski mainās, un pieaug pieprasījums pēc videi draudzīgiem produktiem, tostarp augu izcelsmes alternatīvām. Augu bāzes dzērienu kategorija pēdējos gados ir kļuvusi par vienu no straujāk augošajiem segmentiem pārtikas nozarē globālā mērogā.

Sabiedrības pieaugošā interese par veselīgu uzturu un vides aizsardzību mudina ražotājus, pārstrādātājus un tirgotājus pielāgoties jaunajām tirgus tendencēm. Aizvien biežāk tiek veidoti bioloģisko produktu apakšzīmoli un attīstīta sadarbība ar sertificētām saimniecībām, lai mazinātu negatīvo ietekmi uz vidi un stiprinātu ilgtspējas reputāciju. Ilgtspējas jautājumi ir kļuvuši par stratēģisku prioritāti lielākajai daļai uzņēmumu.

Tomēr mainīgie tirgus apstākļi un pieaugošā konkurence prasa uzņēmumiem ne vien reaģēt uz patērētāju vērtību, problēmu un vajadzību izmaiņām, bet arī sistemātiski prognozēt un modelēt viņu nākotnes uzvedību.

Pētījuma mērķis ir identificēt ilgtspējīga mārketinga elementus, kas veicina patērētāju lēmumus iegādāties un patērēt augu bāzes dzērienus.

Pētījuma metodes: monogrāfiskā metode, sekundāro datu analīzes metode, strukturētās ekspertu intervijas, pilotaptauja.

Pētījuma rezultāti liecina, ka uzņēmumi, iekļaujot mārketinga aktivitātēs un materiālos tādus elementus kā sertifikāti, ekomarķējums, izmantotās ilgtspējības prakses apliecinājumi u. c. var ne tikai uzlabot patērētāju izpratni par ilgtspējību, zināšanas par vides jautājumiem un videi draudzīgiem produktiem, bet arī iesaistīt patērētājus ilgtspējīgas prakses popularizēšanā.

Kopumā var secināt, ka pastāv atšķirības respondentu grupās, proti, sievietes, gados jaunāka auditorija un vegāni piešķir lielāku nozīmi ilgtspējīga mārketinga elementiem pirms lēmuma par pirkumu un pirkšanas procesā.

Atslēgvārdi: ilgtspējīga attīstība, ilgtspējīgs mārketingš, patērētāju uzvedība, pārtikas patēriņš, pirkšanas lēmumu pieņemšanas process.

5. **Inovāciju kapacitātes palielināšana /** ▪ **Increasing innovation capacity**

5.1. sekcija. **TOPOŠĀ ZINĀTNE: CEĻĀ UZ NĀKOTNES
TEHNOLOĢIJĀM /**

**EMERGING SCIENCE: SHAPING
TOMORROW'S TECHNOLOGIES**

DECODING ENVIRONMENTAL DRIVERS OF FIBER DISSOLUTION: TOWARD PREDICTIVE TOOLS FOR DURABLE COMPOSITE TECHNOLOGIES

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Fiber-reinforced composites are central to next-generation lightweight structures in energy, mobility, and infrastructure systems. However, environmental degradation – particularly fiber dissolution, stress-corrosion-driven damage, and interphase weakening under aqueous and chemically aggressive conditions – remains a critical limitation for long-term reliability and broader industrial deployment.

This work presents an integrated experimental–analytical framework to decode the environmental drivers governing fiber dissolution and stress corrosion in composite systems. Using high-resolution ICP-MS monitoring combined with micromechanical characterization, we quantify temperature- and pH-dependent kinetic regimes controlling ion release, surface alteration, and environmentally assisted crack initiation. The results reveal two distinct stages of dissolution: an initial rapid ion-exchange phase followed by a quasi-steady-state regime dominated by diffusion-controlled reactions. Under sustained mechanical loading, these chemical processes promote stress-corrosion cracking, accelerating interphase degradation and progressive strength loss.

By directly linking chemical evolution to mechanical performance reduction, the study establishes structure–environment–stress–property relationships that form the basis for predictive durability modelling. The proposed methodology provides a transferable platform for accelerated testing, lifetime assessment, and the development of data-informed durability tools for composite qualification.

Aligned with Latvia's Smart Specialisation priorities in smart materials and engineering systems, this research translates degradation science into predictive, innovation-ready solutions, opening pathways for industry collaboration in advanced composites and sustainable structural applications.

Keywords: fibers; composites; durability; environmental degradation; predictive modelling

DYNAMIC CROSSLINKING OF PBAT WITH EPOXIDIZED LINSEED OIL: ASSESSING NETWORK FORMATION AND THERMAL STABILITY TRADE-OFFS

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In recent years, PBAT has attracted increasing attention as a more sustainable alternative to conventional petroleum-based plastics. However, although PBAT is biodegradable under controlled industrial composting conditions, biodegradation represents a terminal pathway that leads to complete loss of material value. From a resource-efficiency perspective, extending material lifetime through reprocessing and recycling is therefore highly desirable, as it reduces raw material consumption and improves circularity. Consequently, enabling the recyclability of PBAT without significant loss of properties has become an important research objective.

Strategies that provide structural reinforcement while preserving processability and recyclability are of considerable interest. One promising approach is the preparation of vitrimers. Vitrimers are covalent adaptable networks characterized by associative bond exchange reactions, which maintain the overall crosslink density while enabling network topology rearrangement under thermal activation. This dynamic crosslinking concept combines the dimensional stability of thermosets with the reprocessability of thermoplastics, allowing reshaping and recycling without the need for depolymerization.

In this study, PBAT was dynamically crosslinked using regionally abundant bio-based epoxidized linseed oil as a multifunctional epoxy crosslinker via reactive melt blending. Bio-based itaconic anhydride was first grafted onto the PBAT backbone through peroxide initiation, followed by epoxy-acid coupling and zinc (II) acetylacetonate-catalyzed transesterification to form a dynamically rearrangeable network. Particular emphasis was placed on evaluating the influence of crosslinking time and reactant concentration on network development, as quantified by gel fraction, crystallization characteristics, rheological response, and stress relaxation behavior. Importantly, this work systematically investigates the interplay between network formation and thermal stability as well as provides insight into the trade-offs inherent in dynamically crosslinked PBAT systems and contributes to the rational design of reprocessable polyester networks with controlled stability.

A total of 8 compositions were made with varying concentrations of crosslinking agents and the time of crosslinking reactions. FTIR and gel fraction approved of the chemical structure, and viscosity and stress relaxation measurements proved the dynamic behaviour of covalent bonding. Thermal and mechanical properties showed the influence of reaction time on the thermo oxidative degradation and effects caused by varying crosslinking density. TGA results processed by Friedman and Ozawa-Flynn-Wall methods indicated that increased crosslinking density affects thermal degradation requiring lower activation energy for the breaking of dynamically crosslinked network.

CARBON NANOTUBE-G-Fe₃O₄ AND POLY(BUTYLENE SUCCINATE-CO-ADIPATE) COMPOSITES WITH ENHANCED FUNCTIONAL PROPERTIES.

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The rapid growth in demand for smart, compact, and wireless communication devices has led to an increase of electromagnetic interference (EMI), a form of EM pollution that negatively affects the durability and efficiency of electronic devices, thus reducing their lifespan. As a result, EMI shielding has become essential, with current research focusing on lightweight, flexible, cost-effective, and highly efficient materials to prevent EMI from disrupting performance, reliability, and efficiency of electronic devices.

To achieve the required electrical properties, conductive and magnetic nanofillers have been extensively investigated. The high aspect ratios of nanotubes (CNTs) enable them to form percolated networks at very low concentrations, resulting in highly conductive composites. Iron (II,III) oxide, a spinel ferrite, is commonly used as a ferrimagnetic filler. The combination of CNTs and ferrites provides a hybrid strategy that enhances both dielectric and magnetic loss mechanisms, making such systems particularly suitable for EMI shielding applications.

We selected poly(butylene succinate-co-adipate) (PBSA) as a matrix for composites due to it being partially biologically sourced and its ability to biodegrade in the soil. Furthermore, PBSA exhibits mechanical properties comparable to those of conventional commodity plastics, supporting its suitability for packaging applications.

Despite these advantages, the application of PBSA in EMI shielding materials remains relatively underexplored. In contrast, within the family of biopolyesters, poly(lactic acid) and its composites have been more extensively studied. Existing research on PBSA has primarily focused on single- filler systems and multiphase composites with varying structural complexity.

In this work, a total of 36 composite materials were developed using a PBSA matrix filled with nanofillers (multi-walled carbon nanotubes (MWCNT) and single-walled carbon nanotubes (SWCNT), as well as MWCNT-g-Fe₃O₄, and SWCNT-g-Fe₃O₄). The objective was to synergistically combine electrical conductivity and magnetic functionality for dielectric and electromagnetic applications. The hybrid nanoparticles were synthesized via a co- precipitation method, and composite films were fabricated using solvent casting. The materials were subsequently characterized in terms of broadband AC electrical conductivity, surface electrical resistivity, and mechanical properties to evaluate their potential for EMI shielding applications.

Keywords: EMI shielding; carbon nanotubes; conductive composites; biodegradable polymers

SUSTAINABLE LINEN FIBRE-REINFORCED THERMOSET COMPOSITES: PROCESSING AND MECHANICAL PERFORMANCE

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The growing demand for sustainable engineering materials has stimulated increasing interest in bio-based thermoset polymer composites. These multifunctional materials consist of a polymer matrix and a reinforcing phase, whose synergistic interaction enables mechanical and functional properties that exceed those of the individual constituents. In such systems, the matrix ensures structural integrity and stress transfer, while the reinforcement primarily bears the applied load, making fibre–matrix interactions and laminate design critical factors in achieving enhanced performance.

This work focuses on the processing methodology and subsequent mechanical characterization of bio-based linen fibre reinforced thermoset composites fabricated from a renewable epoxidized vegetable oil-derived resin cured with an anhydride-type hardener. The resin was impregnated into linen fabric via roller-assisted lay-up, followed by consolidation between steel moulds and hot-press curing to ensure effective interlayer bonding and complete crosslinking.

Two composite configurations were produced, reinforced with unidirectional and twill weave linen fabrics, respectively. Mechanical characterization was conducted to evaluate tensile and flexural properties of both laminate types, enabling comparison of stiffness and strength as a function of fibre architecture. The obtained results provide insight into the influence of reinforcement configuration on the mechanical performance of bio-based thermoset composites. The developed materials demonstrate promising potential as sustainable alternatives to conventional fibre-reinforced systems for structural applications.

APPLICATION OF ELECTROMAGNETIC INDUCTION CURING FOR MANUFACTURING OF HYBRID CARBON/GLASS FIBER COMPOSITES

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Electromagnetic induction curing has emerged as one of the most energy-efficient innovative manufacturing methods for polymer composites. Additional advantages of induction curing are rapid heating rates, volumetric heating and the ability to perform curing in local regions of a composite part. In the present study, induction curing of hybrid carbon/glass fiber composites was performed using a custom-made high-frequency induction heating system. General applicability limits for hybrid composites were assessed. Various carbon/glass fiber woven dry fabrics and pre-pregs were used. Mechanical and physical properties of the manufactured composites were experimentally measured such as elastic modulus, tensile strength and degree-of-cure.

A HYBRID WIRED/WIRELESS TM/TC PLATFORM WITH MICROSECOND TIMING FOR SCIENTIFIC INSTRUMENTATION

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Telemetry and telecontrol (TM/TC) systems have long been used for remote monitoring and control of technical processes. In recent years, these concepts have evolved into the paradigm of the Internet of Things (IoT), which leverages modern communication protocols and affordable embedded hardware to interconnect distributed devices.

However, many IoT solutions rely on unidirectional, event-driven, or asynchronous communication models and may suffer from unpredictable latency, particularly in wireless networks. This limits their applicability in systems that require deterministic timing, such as industrial automation and precision experimental control.

Applications with strict timing requirements typically rely on wired communication and specialized infrastructure, such as networks supporting Precision Time Protocol (PTP, IEEE 1588) or external timing sources such as Global Navigation Satellite System receivers. While these solutions can provide high-precision synchronization, they often require costly hardware and complex configuration, making them impractical in many experimental or laboratory environments. Furthermore, integrating such infrastructure with scientific instruments can be challenging, as many devices expose limited or legacy interfaces for remote operation and control.

To address these challenges, we are developing a hybrid wired/wireless TM/TC electronics and software platform designed for functional nanostructure characterization at low temperatures in quantum device experiments, with microsecond-level timing accuracy. The system acts as a “black box,” recording every measurement and control event with precise timestamps while enabling simultaneous actuation with minimal latency.

The clocks of wireless devices are disciplined during idle periods using a PTP grandmaster clock to compensate for communication delay, jitter, and oscillator drift. The wireless controllers provide industry-standard interfaces (USB, RS-232, I²C, SPI) for connectivity with scientific instruments and implement software that mimics the LAN eXtensions for Instrumentation communication model for integration into SCADA-type control systems. The system operates within standard IEEE 802.11 Wi-Fi networks, significantly reducing infrastructure costs.

In battery-powered operation, the wireless devices provide galvanic isolation and allow the radio transmitter to be disabled during sensitive measurements to reduce electromagnetic interference while maintaining timing using a disciplined local oscillator. We demonstrate the system using a Physical Property Measurement System (PPMS) from Quantum Design and show integration with Dynacool control software to synchronize PPMS measurements with external instrumentation.

This research is supported by the Latvian Quantum Initiative under European Union Recovery and Resilience Facility project No. 2.3.1.1.i.0/1/22/I/CFLA/001.

DETERRENCE BY PUNISHMENT THROUGH MILITARY INNOVATION: THE CASE OF LATVIA (Poster)

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In the face of Russia's looming threat, the Baltic states are rapidly expanding their military capabilities. Drawing lessons from Ukraine's resistance to Russia's war crimes, while remaining concerned about their limited strategic depth, the Baltic states are preparing to defend their territory "from the first inch". To this end, the traditional focus on purely defensive capabilities has gradually been complemented with the acquisition of offensive systems that enable strikes against the enemy's deep rear.

Nevertheless, recent developments in domestic military innovation remain predominantly defensive and reactive, as illustrated by the Latvian MoD signing four R&D agreements with defense industry for the development of counter-UAS solutions in response to Russian military drone crashing on Latvian territory in September 2024. This approach aligns with deterrence by denial, as it aims to persuade Russia that any attack would fail due to superior defensive capabilities. However, deterrence by denial alone may be insufficient to discourage further incidents and attacks, given that the threat is constantly evolving as Russia adapts to lessons learned from its war against Ukraine. Meanwhile, Russia itself continues to struggle to defend its cities and critical infrastructure, like oil refineries, from drone attacks. Therefore, deterrence by punishment, i.e. discouraging attacks by threatening retaliatory measures against the enemy, deserves greater attention in military innovation support ecosystem.

By analyzing the outputs of Latvia's military innovation support mechanisms through the lens of deterrence theory, this article will seek to explore the prospects and limits of a strategic shift towards deterrence by punishment in drone-related military innovation.

Keywords: military innovation, deterrence by punishment, Baltic states

NEURAL-NETWORK-BASED ELECTRICAL IMPEDANCE TOMOGRAPHY FOR DAMAGE DETECTION IN MXENE COATINGS (Poster)

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Electrical Impedance Tomography (EIT) is an effective approach for structural health monitoring of electrically conductive materials and coatings. Earlier investigations of nanomodified electrically conductive glass fibre-reinforced plastics demonstrated the feasibility of voltage-distribution-based damage detection; however, reconstruction accuracy remained limited by conventional inverse algorithms [1]. Recent advances in neural-network-based reconstruction, particularly Res2Net architectures, have significantly improved the localisation and geometric identification of defects, including cases with multiple damage sites [2].

In the present study, neural-network-enhanced EIT methodology was applied to MXene ($\text{Ti}_3\text{C}_2\text{T}_x$; synthesised at Kaunas University of Technology, Lithuania) coatings deposited onto non-conductive glass fibre-reinforced epoxy laminates. The MXene layer functioned as a thin conductive sensing medium in which damage-induced conductivity perturbations were monitored. A homogeneous conductive layer was formed by spray-coating an aqueous MXene dispersion, following a scalable deposition approach previously demonstrated for multifunctional coatings [3]. The number of deposited layers was experimentally optimised to determine the minimal coating thickness ensuring stable in-plane conductivity and sufficient sensitivity to mechanically induced disruptions of the conductive network. For experimental data acquisition, a 32-electrode measurement cell was developed to provide controlled current injection and accurate surface potential recording, while the reconstruction procedure itself was performed offline using a neural-network framework.

The proposed approach was experimentally validated on MXene-coated composite plates with artificially introduced surface defects affecting the conductive layer. Boundary voltage datasets were processed using a PCA-Res2Net-based reconstruction model. The results confirmed accurate localisation and high-fidelity geometric reconstruction of conductivity disturbances within the MXene coating. The study demonstrates that MXene coatings can serve as conductive platforms enabling EIT diagnostics.

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VALORIZATION OF RESEARCH RESULTS AND OBSTACLES IN LATVIA: PROBLEM ANALYSIS AND POSSIBLE SOLUTIONS (Poster)

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The issue of research results valorisation in Latvia has become increasingly important within national development and innovation policy. Strategic documents emphasise the need to strengthen the contribution of science to economic competitiveness and societal well-being. However, the practical transformation of research outcomes into marketable products, services, or socially impactful solutions remains limited. This suggests a persistent gap between policy intentions and the actual functioning of the research and innovation ecosystem.

In this study, research valorisation is understood as the process of creating economic and societal value from knowledge, extending beyond narrow commercialisation activities. Recent scholarship on technology transfer highlights a shift from an institutional focus – centred on formal structures such as technology transfer offices – towards a process-oriented perspective. Valorisation is increasingly viewed as a dynamic and multi-actor process involving researchers, industry, public institutions, intermediaries, and society. Its success depends not only on regulatory frameworks and funding instruments, but also on incentives, competencies, cooperation practices, and trust among stakeholders.

The study is currently at its initial stage. A review of key academic literature has been conducted, including a conceptual analysis of the term “valorisation.” The literature indicates that barriers to effective knowledge transfer frequently include fragmented policy instruments, limited entrepreneurial skills among researchers, weak university–industry collaboration, administrative complexity, and insufficient coordination between institutions.

The research is designed as a qualitative study aimed at generating empirically grounded and policy-relevant insights. The planned empirical phase will include semi-structured interviews with representatives of universities, research institutes, technology transfer units, policy-makers, and industry stakeholders in Latvia. In addition, national policy documents and institutional strategies will be analysed to assess the coherence and practical implementation of existing support mechanisms. Selected international practices in research valorisation will also be examined in order to identify approaches that could be realistically adapted to the Latvian context.

The main objective of the study is to identify key systemic and practical barriers to research valorisation in Latvia and to formulate feasible, context-sensitive recommendations for improving support mechanisms and strengthening collaboration between academia, industry, and public administration. By combining theoretical insights with stakeholder perspectives, the study seeks to contribute to more coordinated and practically applicable policy solutions that enhance the impact of research on economic and societal development.

MXENE-BASED TARGETED ANTICANCER THERAPY (Poster)

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MXenes are a rapidly expanding class of two-dimensional transition-metal carbides/nitrides with strong near-infrared (NIR) absorbance, high photothermal conversion efficiency, and surface chemistries that can be engineered for biomedical use. However, clinical translation of MXene-enabled anticancer photothermal therapy (PTT) is constrained by insufficient tumor selectivity and off-target accumulation in clearance organs after systemic administration. To address these barriers, we propose an actively targeted MXene nanoplatfrom that combines (i) a biocompatible Ti_3C_2 -based photothermal core, (ii) a polydopamine (PDA) interfacial layer for robust bioconjugation, and (iii) tumor-antigen recognition via monoclonal antibodies against CEACAM1 – an established melanoma-associated surface marker. In vitro, $\text{Ti}_3\text{C}_2\text{Tx}$ -PDA-anti-CEACAM1 constructs preserve cytocompatibility across relevant cell types and retain antigen-binding performance without detectable cross-reactivity toward other CEACAM family members, enabling selective engagement of CEACAM1-positive melanoma cells. Under NIR irradiation, antibody-mediated binding increases local MXene retention at the cancer cell membrane and supports highly selective photothermal ablation of CEACAM1-positive cells while sparing CEACAM1-negative controls. In vivo, antibody functionalization reshapes biodistribution in murine melanoma models bearing CEACAM1-positive and CEACAM1-negative tumors. Quantification of titanium by ICP-based elemental analysis, complemented by histology/immunohistochemistry, demonstrates preferential accumulation of targeted conjugates in CEACAM1-positive tumors and reduced nonspecific uptake in major clearance organs (notably liver, lungs, and spleen) compared with non-targeted MXene controls. Intratumoral delivery further maximizes tumor confinement with negligible systemic redistribution. Collectively, these findings establish a modular strategy for MXene-based targeted anticancer therapy that couples potent photothermal performance with antigen-dependent tumor homing, improving tumor-to-organ exposure ratios and supporting a safer, more precise framework for MXene-driven theranostics and PTT in biomarker-defined cancers.

Acknowledgements: This project was supported by LRC Project (#lzp2023/1- 0243)

ADVANCED BIODEGRADABLE ELECTROSPUN CHITOSAN-BASED HEMOSTATIC DRESSINGS FOR DUAL-USE TRAUMA AND SURGERY (Poster)

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Electrospun fibrous scaffolds are attractive for wound healing and regenerative medicine because they can mimic extracellular matrix architecture while enabling rapid fluid transport and cell-material interactions. However, processing chitosan into stable, highly porous fibrous constructs remains challenging due to its polyelectrolyte nature and limited spinnability, and blending strategies are often required to balance bioactivity and mechanical integrity. Here we report the successful fabrication of electrospun chitosan and chitosan-PLA scaffolds and a comprehensive assessment of their structure and in vitro biocompatibility.

Chitosan-only and chitosan-PLA fibrous mats were produced by electrospinning under optimized solution and process conditions to obtain uniform, defect-minimized fibers and mechanically handleable constructs. Scaffold morphology and architecture were evaluated by microscopy-based imaging, confirming an interconnected fibrous network with pronounced open porosity. The resulting structures exhibited high apparent porosity and a large specific surface area typical of electrospun materials, indicating suitability for oxygen/nutrient diffusion and cell infiltration. Physicochemical characterization verified the presence of chitosan in both material types and supported the formation of composite scaffolds in the chitosan-PLA system.

Biocompatibility was assessed using standard in vitro cytocompatibility workflows with mammalian cells relevant to soft-tissue repair. Both scaffold types supported cell viability and attachment without evidence of acute cytotoxicity, demonstrating that the fabrication and post-processing steps yield cell-friendly surfaces. Notably, incorporation of PLA provided an effective route to reinforce scaffold integrity while preserving chitosan-associated biological compatibility, offering a tunable platform where mechanical/handling properties can be improved without sacrificing cytocompatibility.

Overall, these results establish electrospun chitosan and chitosan-PLA scaffolds as structurally robust, highly porous, and biocompatible materials, supporting their further development for wound dressings and tissue-regenerative interfaces.

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CORE–SHELL ELECTROSPUN MEMBRANE FOR LOCAL DELIVERY OF VEGF-LOADED LIPOSOMES (Poster)

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In addition to conventional treatment strategies, tissue engineering is a promising, rapidly evolving field focused on replacing organ parts and restoring organ function. Several promising data demonstrate that this approach can also be used to develop novel strategies for diabetes management. Currently, it is possible to restore insulin secretion function through cell therapy, β -cells islets, or the transplantation of tissue-engineered grafts. One important factor for the survival of allogeneic cells in the scaffold is rapid vascularization.

Our study aimed to develop a biocompatible polymer graft with controlled biodegradation that can support allogeneic cells over a long period. With this purpose, a complex membrane from Poly(ϵ -caprolactone) (PCL) and gelatine fibers that penetrate throughout the entire thickness and contain liposomes with vascular endothelial growth factor (VEGF), which are randomly threaded through the membrane. To efficiently and safely pack liposomes into gelatin fibers, we used the Core-shell electrospinning method.

We demonstrated the development of a homogeneous membrane approximately 300 μm thick, transparent to gases and culture medium. The new membranes are made of randomly oriented fibers with diameters ranging from 200 to 900 nm. Gelatin fibers degraded over 5 to 14 days, gradually releasing liposomes and VEGF, while PCL fibers retained their scaffold function. The VEGF release effect persisted for up to 21 days, resulting in increased proliferation of human endothelial cell cultures HMEC-1.

Building on these promising initial results, the next step will be to assess the duration of the secretory function by long-term incubation of β -cells within a graft prepared from an electrospun scaffold, while monitoring their insulin production.

Presented core-shell electrospinning technology enables the tailored, local delivery of growth factors and other essential substances to enhance the survival of allogeneic cells within a tissue-engineered scaffold.

5.2. sekcija. **NO LABORATORIJAS LĪDZ
IKDIENAI: INDUSTRIJAS ROSINĀTAS
INOVĀCIJAS /**

**FROM LAB TO LIFE: INDUSTRY-
DRIVEN INNOVATION**

BUILDING BRIDGES BETWEEN RESEARCH, INDUSTRY, AND CLINICS: A COLLABORATIVE APPROACH TO LUNG CANCER ANALYSIS COMBINING CLINICAL, HISTOPATHOLOGICAL, AND BIOPHYSICAL FEATURES

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Lung cancer remains one of the leading causes of cancer-related mortality worldwide, with non-small cell lung cancer (NSCLC) accounting for the majority of cases [1]. Despite advances in treatment, there is still a need for improved analytical approaches and tools that can support diagnosis, classification, and treatment decision-making.

This contribution presents an academia-industry collaboration between the University of Latvia and SIA “APPLY” and its daughter company SIA “Aitomic”, with involvement of clinical partners, aimed at developing a novel artificial intelligence (AI)-based solution for biomedical data integration and prediction. The primary objective of the collaboration is to create a reliable, individualized prediction technology that could facilitate the work of medicine professionals.

From the industry perspective, the project is focused on transforming experimental and clinical data into a scalable and applicable solution. This includes the development of machine learning approaches capable of integrating heterogeneous datasets – clinical, histopathological, and biophysical – to enable predictive modeling and decision-support tools. The collaboration is structured as a project-driven effort, where the company defines the concept, coordinates interdisciplinary activities, and manages resources and funding to support development. The long-term goal is to translate this integrated approach into a practical technology with potential for real-world clinical implementation.

From the academic perspective, the research contributes by developing and validating atomic force microscopy (AFM) as a source of quantitative and qualitative biophysical data for human lung cancer analysis. Initial work focused on development of appropriate tissue sample preparation protocols to ensure that biopsy samples could be reproducibly analyzed using AFM, followed by testing of samples prepared under different conditions. The subsequent phase focused on evaluating the repeatability and robustness of AFM measurements, including morphological and structural characterization of tumor cell regions, stromal areas, and nuclear regions, as well as surface roughness measurements and collagen-related assessments [2]. In parallel, AFM-derived data were integrated with clinical and histopathological parameters, enabling the development of neural network models for classification of cancer types and disease stages [3].

The collaboration has evolved through iterative stages, progressing from methodological development toward integrated data analysis and predictive modeling. Current work focuses

on improving biological relevance of measurements and strengthening multimodal data integration to enhance model performance. Overall, this work demonstrates how combining advanced experimental techniques with data-driven approaches enables the development of clinically relevant technologies. It highlights a pathway from laboratory-based research toward AI-driven solutions with potential application in personalized medicine and decision support.

All research involving patient material was conducted with appropriate ethical approval.

Keywords: non-small cell lung cancer (NSCLC); biomedical data integration; biophysical properties; atomic force microscopy (AFM); machine learning

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6. Valsts finanšu sistēmas un kapitāla tirgus attīstība. Nodokļu sistēma un tās principi /

Development of the state financial system and capital market. Tax system and its principles

6.1. sekcija. **DIGITĀLĀS FINANSES UN FINTECH
EKOSISTĒMA: INOVĀCIJAS
UN ILGTSPĒJA STRATĒGISKAS
NENOTEIKTĪBAS APSTĀKĻOS /**

**DIGITAL FINANCE AND THE FINTECH
ECOSYSTEM: INNOVATION
AND SUSTAINABILITY UNDER
STRATEGIC UNCERTAINTY**

WHEN SAVING FOR RETIREMENT DEPENDS ON WHO YOU ARE

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Voluntary private pensions are increasingly promoted to complement public retirement systems, yet participation remains uneven and socially stratified. While prior research has emphasized behavioral and informational explanations, this study adopts a structural perspective grounded in social stratification theory to examine who participates in voluntary pension schemes in the Baltic States. Using harmonized microdata from the OECD/INFE 2023 International Survey of Adult Financial Literacy, we analyze Estonia, Latvia, and Lithuania – three post socialist EU countries with shared legacies but divergent pension reform paths.

To isolate structural exclusion from informational deficits, the analysis focuses on individuals who report awareness of retirement planning. Logistic regression results show that higher income, higher education, urban residence, and self employment significantly increase the likelihood of voluntary pension participation. In contrast, unemployment, economic inactivity, student status, and retirement substantially reduce participation. Income emerges as the strongest predictor, revealing a clear socio economic gradient in access to supplementary retirement saving. Demographic characteristics such as gender, household composition, and the presence of children do not exhibit independent effects once structural factors are controlled for. Significant cross country differences persist, with participation markedly lower in Latvia and Lithuania compared to Estonia.

These findings demonstrate that voluntary pension participation remains embedded in enduring socio economic and spatial inequalities, even among financially informed individuals. The study extends stratification theory to retirement finance and highlights the need for pension policies that address structural barriers to ensure more inclusive and sustainable ageing outcomes in post transition welfare states.

THE ROLE OF MOBILE MONEY IN PROMOTING SUSTAINABLE DEVELOPMENT

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The development of information technologies has contributed rapid growth of financial technologies (FinTech). Innovative technologies in the financial industry, including blockchain technology, artificial intelligence (AI), machine learning, etc., help improve financial services, facilitate access to finance, etc. This development has enabled financing initiatives related to the SDGs, making them essential for promoting sustainable development. Research on the role of mobile money in connection with achieving UN SDGs is essential because of its influence on multiple SDG domains. By overcoming geographic barriers, lowering transaction costs and increasing liquidity, mobile money can promote household consumption smoothing, firm working capital cycles, and the efficiency of public and private transfers. The case of the Baltic countries is useful for analysis due to their substantial progress made towards financial sector development, digitalisation of the economy, and moving towards sustainable development. However, the digitalisation level of the financial industry is not sufficient yet. The results of the study show that the development of the countries is significantly affected by technological innovations in the financial sector. It is relevant for promoting inclusive and sustainable economic growth; important for strengthening resilient infrastructure, industrialisation, and innovation, as well as reducing inequality within and among countries.

COGNITIVE BIAS IN DIGITAL BIOMETRIC PAYMENT ADOPTION: DEVELOPING A FOMO-INTEGRATED FRAMEWORK FOR FACIAL RECOGNITION PAYMENT SYSTEMS

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This paper examines the adoption of facial recognition payment systems (FRPS) in China by developing an extended theoretical framework based on the Technology Acceptance Model (TAM). Specifically, it integrates TAM's core constructs (perceived usefulness, perceived ease of use, and attitude) with components of Fear of Missing Out (FOMO), namely anticipated regret, social comparison, and counterfactual thinking. Drawing on an extensive review of prior technology adoption literature, the study formulates hypotheses and proposes a conceptual framework illustrating how cognitive bias, particularly FOMO, influences users' behavioral intention to adopt FRPS. The model demonstrates the relationships among these constructs and identifies key determinants of user acceptance of this emerging mobile payment technology.

The findings highlight the significant role of FOMO (especially anticipated regret) in shaping behavioral intention, offering a novel contribution to technology acceptance research. By incorporating cognitive bias into TAM, the study provides a pioneering perspective applicable not only to FRPS but also to other digital biometric payment systems. Practically, the results suggest that mobile payment providers such as WeChat and Alipay can enhance adoption by emphasizing value, convenience, social usage cues, and potential regret associated with non-adoption. Overall, the framework advances understanding of how psychological and social factors interact with perceived utility and ease of use in influencing emerging technology adoption.

THE POLITICS OF GOVERNING AI IN SANCTIONS SCREENING: GRADUAL CHANGE IN LATVIAN BANKS

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This paper studies how banks are changing their sanctions screening work after 2020, when the use of artificial intelligence (AI) grew quickly and sanctions enforcement became more demanding. It focuses on Latvia, which is part of the European Union sanctions and has a strong political focus because of regional security concerns. The paper looks at AI as part of a broader organisational change in banks. Banks must now process sanctions updates faster, handle large amounts of data, and make timely decisions while still keeping clear records and legal justification.

The main research question asks which type of gradual institutional change best explains banks shift to AI in sanctions screening. The study uses institutional theory and Mahoney and Thelen's framework on gradual change. It examines whether banks are replacing old rules, adding new practices to old systems, allowing old rules to have new effects because the environment changed.

The study uses a qualitative comparative approach. First, it analyses publicly available documents from the five largest banks in Latvia by using a framework with 21 criteria. Second, it uses survey with 15 closed questions to examine operational effects such as speed of decisions, staffing changes, accuracy, governance, and controls.

Preliminary results show banks provide more information about general automation use, sanctions coverage, and some matching and ownership screening functions. However, they provide less information about human oversight, workflow automation, model and rule updates, explainability of automated outputs. The findings suggest that the most common pattern is layering, which means banks are adding AI tools and controls to existing compliance systems instead of fully replacing old governance structures. The paper offers a practical framework for evaluating sanctions screening automation and helps regulators and compliance leaders better understand where real organisational change is taking place.

DIGITAL TRUST ASSESSMENT CAPABILITIES AS A DRIVER OF THIRD-PARTY RISK MANAGEMENT MATURITY

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As financial institutions increasingly rely on ICT third-party service providers, third-party risk management (TPRM) has become an important component of non-financial risk governance. While regulatory frameworks such as the Digital Operational Resilience Act (DORA) formalise requirements for ICT third-party oversight, they primarily focus on compliance and control mechanisms. Less attention has been devoted to the organisational dynamic capabilities required to operationalise digital trust (DT) through structured due diligence practices and to embed these assessments into broader TPRM processes.

Grounded in organisational dynamic capabilities theory, this study conceptualises DT assessment capability as a higher-order construct comprising sensing, seizing, and reconfiguring activities embedded within thirdparty digital trustworthiness assessment and ongoing monitoring practices. The research examines whether the development of these capabilities contributes to the TPRM maturity of the organisation within the Baltic banking sector.

A mixed-method research design was employed. Quantitative data were collected through a survey of employees in Baltic banks and analysed using PLS-SEM. The quantitative findings were complemented by semistructured expert interviews to provide contextual interpretation.

The results confirm that organisational dynamic capabilities for DT assessment and management have a statistically significant and positive impact on TPRM maturity ($\beta = 0.377$, $p = 0.000$). This demonstrates a measurable link between the systematic development of DT assessment and management routines and the advancement of third-party risk governance. Institutions with more developed DT capabilities exhibit more structured, integrated, and proactively managed TPRM practices.

The study contributes by empirically linking dynamic capabilities theory with TPRM maturity in a regulated financial environment. From a practical perspective, the findings indicate that strengthening DT due diligence capabilities represents a strategic pathway towards higher organisational resilience and improved governance of ICT third-party risks.

SHORT TERM, DATA DRIVEN CASHFLOW PREDICTION FOR FINTECH LENDERS

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Fintech lending companies increasingly rely on vast amount of different data. Advanced digital technologies and analytical methods are utilized to manage not just lending companies' main (credit) risk but also other risk areas. Liquidity risk in fully digital operation environment is characterized by rapid transaction cycles, huge transaction data and volatile credit demand. Due to (usually) high cost of capital and large capital requirements for daily operations precise liquidity predictions is very important for FinTech lenders. This study introduces a predictive cashflow-forecasting method for online lending platforms where borrower activity shows strong cyclical and highly repetitive behavior patterns. Using high-frequency transaction data authors have identified strong short-horizon incoming payment forecasting method. Method has been verified in several countries and show similar consumer behavior patterns across all of them. Stability of this methodology that is identified across all tested countries enables finance practitioners to predict more accurate net cash inflows for the next 30 to 60 day period. The findings indicate that borrower behavior in online lending environment have similar patterns across different regions and companies can utilize similar approaches across different countries for incoming cashflow predictions.

This research is supported by UL High Impact ESZF and BA jointly implemented project "Financial literacy and AI-led digital finance as promoters of sustainable capital markets and population well-being" ZDA-LIP 2025/14

SUSTAINABILITY OF LATVIAN FINANCIAL TECHNOLOGY (FINTECH) COMPANIES IN THE DIGITAL ERA

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In the era of digital transformation, the development of financial technologies is characterised by high technological variability and dynamic innovation processes. These developments are clearly observable in Latvia, where they have contributed to the establishment and consolidation of a stable and growing FinTech sector. Companies in the industry evolve on the basis of digital solutions and technological progress, becoming a competitive alternative to traditional financial institutions. At the same time, Latvian FinTech companies are rapidly expanding in export markets, offering globally competitive and technologically advanced products.

The aim of the study is to evaluate the sustainability of Latvian FinTech companies in the digital era by analysing the economic, technological, and regulatory factors that influence their long-term viability and development prospects.

Latvia institutionally supports this development by continuously improving its regulatory environment and strategically positioning the country as a financial technology centre and innovation hub for emerging digital technologies.

INDUSTRIAL SYMBIOSIS IN SMALL OPEN ECONOMIES: A QUINTUPLE HELIX ASSESSMENT OF SYSTEMIC READINESS IN LATVIA

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Industrial symbiosis is widely recognised as a practical approach to advancing the principles of the circular economy. However, its successful implementation depends not only on technological capabilities, but also on the broader institutional context, stakeholder awareness, and the quality of cross-sectoral collaboration. This study examines Latvia's systemic readiness for industrial symbiosis using data from a representative survey ($n = 230$) conducted among stakeholders from the business sector, public administration, academia, and civil society. The findings point to a clear discrepancy between the strategic recognition of industrial symbiosis and the actual capacity to implement it in practice. Key barriers include limited stakeholder knowledge, insufficient availability of data on resource flows, low levels of trust between sectors, and a lack of effective economic incentives. At the same time, respondents acknowledge the significant potential of industrial symbiosis to reduce waste, improve resource efficiency, and foster innovation in business models, as well as to contribute to local resilience and competitiveness.

To further explore these systemic challenges, the study draws on the Industrial Symbiosis Sandbox simulation game, which applies a quintuple helix approach by dividing participants into five stakeholder groups. The simulation challenges participants to identify and operationalise industrial symbiosis opportunities under crisis conditions by aligning diverse stakeholder interests, matching resource flows, and evaluating solutions through multi-criteria performance indicators. The results of this approach highlight the complexity of balancing economic, environmental, and social objectives, while simultaneously addressing inter-sectoral conflicts and ensuring feasibility in a resource-constrained and uncertain environment. Building on the quintuple helix framework, the study argues that bridging the gap between policy ambition and practical implementation requires coordinated policy action, targeted economic instruments, the development of digital infrastructures, and systematic capacity building across stakeholder groups. By providing empirically grounded insights, the study contributes to a better understanding of how small open economies can strengthen their transition towards circular economic systems through collaborative resource optimisation.

Keywords: Circular economy, Industrial symbiosis, Quintuple helix model, Systemic readiness

6.2. sekcija. **FINANŠU VADĪBAS PROCESI
DIGITĀLAJĀ LAIKMETĀ: DATI,
TEHNOLOĢIJAS UN RISKU
IZAICINĀJUMI /**

**FINANCIAL MANAGEMENT
PROCESSES IN THE DIGITAL
AGE: DATA, TECHNOLOGY
AND RISK CHALLENGES**

ARTIFICIAL INTELLIGENCE IN SME FINANCIAL ANALYSIS: OPPORTUNITIES, RISKS, AND IMPLEMENTATION CHALLENGES

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Abstract. The aim of the paper is to analyze the possibilities for applying artificial intelligence (AI) in the financial analysis of small and medium-sized enterprises (SMEs), identifying the main benefits and challenges. The research problem is related to the fact that traditional financial analysis methods often fail to effectively process large and diverse volumes of data currently available to companies and do not ensure sufficiently fast and accurate forecasting in a dynamic business environment; moreover, SMEs in Latvia have so far made very limited use of AI capabilities. The article reviews scientific literature and applies a comparative approach to evaluate various AI solutions for financial data processing, forecasting, and risk assessment in the SME context. The author's contribution is a systematized overview of directions for using AI technologies in financial analysis, as well as the identification of practical prerequisites for successful AI implementation in SMEs. The research results and the author's proposals show that AI can significantly improve the accuracy, efficiency, and timeliness of financial analysis, while emphasizing the need for high-quality data, employee competencies, and appropriate digital infrastructure.

Keywords: Small and medium-sized enterprises (SMEs), artificial intelligence (AI), financial analysis.

CONCEPTUAL FOUNDATIONS FOR INTEGRATING ARTIFICIAL INTELLIGENCE INTO CORPORATE FINANCIAL MANAGEMENT

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The integration of artificial intelligence technologies into corporate financial management represents a structural transformation of the logic of financial management and decision-making, requiring a rethinking of the traditional theoretical foundations of financial control and corporate financial architecture. Despite the active development of applied solutions in the field of forecasting, automation, and data analytics, there remains a lack of a systematic conceptual framework in scientific literature explaining the role and place of artificial intelligence in the structure of an organization's financial management. The study aims to develop a conceptual framework for integrating artificial intelligence into corporate financial management based on an interdisciplinary approach. The paper proposes a comprehensive theoretical model of interaction between intelligent systems and key financial functions, including budgeting, liquidity management, investment analysis, risk assessment, and strategic planning. Artificial intelligence is viewed not as a tool for improving operational efficiency, but as a structural element of an adaptive financial system capable of learning and dynamically adjusting decisions. The conceptual framework reflects the transition from retrospective analysis to predictive and prescriptive management based on the processing of large data sets and the identification of nonlinear dependencies. The integration of artificial intelligence makes it possible to overcome the limitations of traditional financial models and create an adaptive management system in conditions of uncertainty. The paper also examines the institutional, regulatory, and ethical aspects of implementation, including the problem of algorithmic opacity and the transformation of financial managers' competencies. The study forms a theoretical basis for further empirical developments and practical management tools in the digital environment.

Keywords: artificial intelligence; corporate financial management; digital transformation.

ORGANIZATIONAL COMPLEXITY AND FINANCIAL PERFORMANCE IN MANUFACTURING: A STRUCTURED LITERATURE REVIEW

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Organizational complexity, shaped by interdependence, dynamic connections, ambiguity, and configurational diversity, is becoming ever more prevalent in the environments in which firms operate. With the ongoing acceleration of digital transformation, these complexity drivers intensify further, affecting how companies pursue innovation and navigate constantly evolving business interactions. This literature review examines the relationship between organizational complexity and financial performance in manufacturing companies. Manufacturing firms increasingly face complexity arising from servitization strategies, expanding productservice systems, process interdependencies, and evolving market conditions. The evidence reveals a dual nature of complexity: while increased configurational complexity is associated with declining firm profitability – particularly when process commoditization is low [2] – complexity can also serve as a strategic resource that enhances innovation capabilities when properly coordinated. Research on manufacturing firms indicates that rising complexity often drives managers toward short-term, risk-averse actions that may undermine long-term wealth creation. Effective complexity management requires balancing the information processing demands of complex operations with strategic coordination mechanisms that transform complexity from a performance liability into a competitive advantage. This review highlights the critical need for manufacturing organizations to develop sophisticated approaches to complexity governance that support both operational efficiency and strategic value creation.

Keywords: Financial Performance, Manufacturing Companies, Ressource Orchestration, Complexity Theory

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THE DILEMMA OF FISCAL CONVERGENCE: ASSESSING THE IMPACT OF UNIFORM ALCOHOL TAXATION ON DIVERGENT EUROPEAN ECONOMIES

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The ongoing process of tax harmonization within the European Union has reignited debates over the structure of alcohol excise duties. Recently, several Member States have advocated for legislative amendments to implement a uniform tax calculation based strictly on alcohol by volume (ABV) across all beverage categories, mirroring the post-Brexit approach adopted by the United Kingdom. However, this proposal faces staunch opposition from major wine producing nations, where wine frequently enjoys a zero-rate excise regime. Due to the severe threat it poses to the industry's survival and the risk of drastically shifting consumer preferences towards other types of alcohol. Furthermore, this friction is supported by states that utilize specific excise policies to support local agricultural and beverage production sectors.

This paper investigates the economic and fiscal consequences of implementing a uniform, ABV-based alcohol taxation system across the structurally divergent economies of the EU. Utilizing an econometric model, the study assesses the potential fallout of a mechanical approach to reducing alcohol consumption. The analysis demonstrates that blind tax equalization risks destroying established tax revenue streams, devastating traditional manufacturing sectors, and triggering rapid consumer migration and product substitution. These adverse effects parallel the market disruptions already documented in the tobacco and nicotine industries in Latvia and other states following similar mechanical tax adjustments. Ultimately, the research concludes that achieving sustainable fiscal convergence in alcohol taxation demands a holistic and politically nuanced policy approach, rather than a purely mechanical application of uniform rates, to successfully balance public health objectives with economic stability.

Keywords: Tax harmonization, alcohol excise duty, fiscal policy, econometric modeling, consumer migration, European Union.

TRANSITION TO A CIRCULAR AND SHARING ECONOMY: OBSTACLES, ENABLERS AND FINANCING OPPORTUNITIES IN LATVIA

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The transition to a circular and sharing economy (CSE) is becoming more widely acknowledged as a crucial step toward sustainable construction, even though its application is still uneven across European nations. The current study intends to investigate the primary obstacles and facilitators influencing Latvia's transition to a circular and sharing economy, a tiny nation with distinct socioeconomic features. The current study aims to identify and systematize the main economic, financing, technological, and regulatory elements that either facilitate or hinder the growth of CSE projects in Latvia.

The research synthesizes actual findings from Latvian circular and sharing economy activities, analyzes national policy reports, and performs a thorough literature analysis. It is based on a qualitative case-study technique and semi-structured expert interviews. The highlighted components are further arranged using a systematic view, allowing for a comprehensive evaluation of the shift to sustainability.

The results demonstrate that the main obstacles are the lack and poor connectivity of long-term national and local strategies, ambiguous regulations, inadequate funding and business models, low public awareness, price sensitivity, and persistent cultural and behavioral norms based on linear consumption patterns. Important enablers include targeted tax and financial incentives, EU and national financing instruments, enhanced data availability and monitoring, digital platforms for sharing and reuse, community-driven initiatives, and growing sustainability consciousness among younger generations.

The study is supported by TransScale project F-DUT-2022-0269.

AI'S ROI IN OIL & GAS: AN INTEGRATED FRAMEWORK LINKING TECHNOLOGY INVESTMENT, OPERATIONAL TRANSFORMATION, AND FINANCIAL PERFORMANCE

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Despite accelerating investments in Artificial Intelligence (AI) across the oil and gas (O&G) industry, establishing a definitive Return on Investment (ROI) remains elusive. Existing literature frequently isolates technological adoption from comprehensive financial metrics. This study addresses this gap by proposing and testing an integrated framework linking AI technology investment to financial outcomes through the mediating mechanism of operational transformation. The research employs a sequential explanatory mixed-method design and uses a survey of AI experts administered via QuestionPro and integrates measurement constructs for operational efficiency, safety, ESG/compliance, and financial contribution. Utilizing an explanatory sequential mixed-methods design deployed a global survey to O&G AI experts and executives (N = 47), triangulated with secondary financial data. Partial Least Squares Structural Equation Modeling (PLS-SEM) tested the full conceptual model, including moderating effects of organizational size, regulatory environment, and market dynamics. The quantitative results support the conceptual model: AI investment does not directly improve Return on Average Capital Employed (ROACE) but is fully mediated by operational efficiencies (e.g., downtime reduction, asset optimization). Organizational size negatively moderates initial transformation speed, while market volatility positively moderates the operational-financial link. Qualitative thematic analysis revealed that legacy system integration, change management, and a shift toward agentic AI dictate the speed of this operational transformation. Furthermore, operations optimized by AI directly enhance corporate financial performance and become a primary driver for attracting sustainable financing. The findings provide a comprehensive performance metric model for industry practitioners, proving that financial resilience in capitalintensive industries requires treating AI not as an isolated IT upgrade, but as a systemic operational enabler that unlocks liquidity and attracts global capital.

The research is financed by the Recovery and Resilience Facility project "Internal and External Consolidation of the University of Latvia" (No.5.2.1.1.i.0/2/24/I/CFLA/007).

FROM AI EXPOSURE TO PRODUCTIVITY GROWTH OR SOCIAL FRAGMENTATION

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Artificial intelligence (AI) is increasingly seen as a key factor in boosting future productivity. However, the important question now shifts from AI's general potential to its varying effects in different countries. Recent analyses by Moody's predict that AI could increase labor productivity by about 1.5% each year across a group of 106 nations, leading to a total growth of around 15% over ten years. However, these gains are not certain. They will not be shared equally, nor will they be socially neutral. The current research raises a crucial question: under what conditions does exposure to AI lead to real productivity gains at the national level? The argument focuses on the interaction of three main factors: the types of jobs in the workforce, demographic aspects, and the effectiveness of institutions. Countries with a large number of jobs that work well with AI are likely in a better position to take advantage of productivity benefits. Meanwhile, aging populations might see different results based on their labor market conditions and their ability to handle changes. The study will use a crosscountry panel dataset that includes about 80-120 economies, depending on data availability. It will combine AI-exposure metrics from IMF datasets with economic, demographic, and institutional indicators from the World Bank, OECD, and United Nations. The analysis will use regression methods to find the relationship between AI exposure and productivity growth. It will include interaction terms to see how factors like aging, social safety, education systems, and labor market conditions affect this relationship. The study aims to show that AI does not change economies in the same way for everyone; instead, it creates advantages based on specific conditions. Some countries may turn AI exposure into inclusive productivity growth, while others may face rising inequality, labor market disruptions, and increased social division.

RISK INTERVIEWS AS A TOOL FOR RISK IDENTIFICATION AND ORGANIZATIONAL RISK AWARENESS: EVIDENCE FROM A PUBLIC TRANSPORT COMPANY

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Risk identification represents one of the most critical stages of the risk management process. Many organizations rely on structured interviews with key managers to identify risks, assess their potential impact, and discuss mitigation strategies. Despite the widespread practical use of risk interviews within enterprise risk management systems, empirical research examining their effectiveness and broader organizational impact remains limited.

This paper presents findings from a three-year case study conducted in a public transport company, where structured risk interviews were implemented as part of the organization's risk management framework. Over the period 2022–2024, more than 30 interviews per year were conducted with key managers representing strategic and operational functions.

The study investigates two dimensions of the risk interview process: the direct outcomes, including the number and types of risks identified, their frequency, and assessed impact levels; and the indirect outcomes, specifically how repeated risk interviews influence managerial perceptions of risk management and its role in operational and strategic decision-making.

The findings suggest that risk interviews are an effective qualitative tool for identifying operational and emerging risks that may not be captured through quantitative monitoring systems.

Furthermore, repeated engagement in risk interviews appears to contribute to increased managerial awareness of risk considerations and supports the integration of risk thinking into strategic and operational management processes. The study contributes empirical insights into the practical implementation of risk interviews within enterprise risk management systems and highlights their potential role in strengthening organizational risk culture.

7. **Ārējās un iekšējās drošības stiprināšana /** **Strengthening international and national security**

7.1. sekcija. **DROŠUMSPĒJA, MIGRĀCIJA UN
SABIEDRĪBAS NOTURĪBA: SOCIĀLI UN
FILOZOFISKI SKATĪJUMI /**

**SECURITY, MIGRATION, AND
SOCIETAL RESILIENCE: SOCIAL AND
PHILOSOPHICAL PERSPECTIVES**

EKOLOĢIJA UN ONTOLOĢISKĀ DROŠĪBA: FENOMENOLOĢISKS SKATĪJUMS

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Ievads. Ekoloģiskās krīzes situācija, tās skaidrojumi un risinājumu meklējumi šodien atrodas sabiedrības un teju visu zinātņu, bet, jo īpaši tā saukto dzīvības un vides zinātņu – bioloģijas, ģeogrāfijas u. c. degpunktā. Ne mazāk nozīmīga ir arī sociālo zinātņu un filozofijas loma, lai veicinātu cilvēka un sabiedrības izpratni par notiekošajiem procesiem, kas ļautu veidot savu attieksmi un iesaisti.

Aktualitāte. Kā atzīst viens no mūsdienu ievērojamākajiem ekoteorētiķiem Bruno Latūrs, tad dabas izpratne pēdējos 20–40 gados nav mainījusies. Taču šodien ir vērojama zināšanu, konceptu, dažādu pieeju sprādziens jautājumos par ekoloģiju un dabu, kas rada cilvēkos zināmu epistemioloģisku nedrošību. Vēl viens no nedrošības cēloņiem ir mūsdienu paātrinātās laika kultūras radītā deontoloģizācijas situācija, kurā indivīdam pietrūkst stabili attiecību ar lietām, citiem cilvēkiem un sevi. Deontoloģizācija nozīmē arī jebkādu atbalsta punktu zaudēšanu kā piederību esamībai un Z(z)emei, gan reģionālajai un lokālajai vietai.

Pētījuma mērķis, izmantojot fenomenoloģijas metodi, ir izvērtēt pretrunīgās dabas un ekoloģijas izpratnes koncepcijas, atklājot gan dabas un dabiskās pasaules ontoloģisko, autopoētisko eksistences veidu, kas rodams Aristoteļa physis reinterpretācijā, gan matērijas kā meža daudzkārtaino izpratni, gan natūrfilozofijas atdzimšanas jēgu, gan pirmā asubjektīvās pieejas fenomenologa Jana Patočkas “pasaules mājas” ontoloģisko struktūru.

Secinājumi. Būtiskākais fenomenoloģijas pavērsiens un stabilitātes meklējumi mūsdienās ir vērojami ontoloģiju virzienā, pirmām kārtām, uz dabas ontoloģijām, kas parāda un pierāda dabas, matērijas, dzīves un dzīvības un visa dzīvā neatkarīgo, autopoētisko eksistenci, ko neveido pretstati: starp dabu un kultūru, dabu un sabiedrību, dabu un vēsturi, dabu un cilvēku, starp dzīvo un nedzīvo dabu. Tas ir pamats nevardarbīgās līdzāspastāvēšanas nosacījums.

Dabas izpratnes maiņa maina arī ekoloģijas un ekoloģiskās drošības izpratni.

Ekoloģiskās krīzes risinājumi nav saistāmi tikai ar dabas saglabāšanu un konservāciju, jo ekoloģija ir arī visu sociālo attiecību un aktoru tīkls, kas pastāvīgi jāatjauno.

LATVIJAS PAREIZTICĪGA BAZNĪCA – DROŠĪBAS VAI NESTABILITĀTES AVOTS?

Svetlana Kovaļčuka

Latvijas Universitāte, Humanitāro zinātņu fakultātes Filozofijas un socioloģijas institūts

Ievads. Pareizticīgajai Baznīcai Latvijā vēsturiski bijusi nozīmīga loma sabiedrības vienošanā un izglītošanā, kultūras attīstīšanā, sociālo jautājumu risināšanā, kā arī valstiskās apziņas veicināšanā. Demokrātiskas valsts normas aicina uz dialogu ne tikai ar Baznīcu kā sociāli garīgu institūciju, bet arī ar tradicionālās kristiešu konfesijas locekļiem.

Aktualitāte. Politiskie procesi gan valstī, gan pasaulē neapšaubāmi ietekmē Latvijas Pareizticīgās baznīcas un Latvijas valsts savstarpējās attiecības. Notikumi Ukrainā izraisīja Ukrainas Pareizticīgo Baznīcas attiecību pārtraukšanu ar Maskavas Patriarhātu un pāreju uz Konstantinopoles Patriarha jurisdikciju. No 2018. gada maija līdz šim brīdim politiskā vara un Maskavas Patriarhāta Igaunijas Pareizticīgā Baznīca atrodas pastāvīgas spriedzes stāvoklī.

Pētījuma mērķis bija izsekot, cik lielā mērā kaimiņvalstu baznīcas un valsts sarežģījumi ietekmēja notikumus Latvijā. Ietekmējoties no notikumiem Igaunijā un Ukrainā 2019. gadā, vairāki žurnālisti no laikraksta Neatkarīgā un Latvijas politiskā vadība sāka uztraukties ne tikai par priesteru pilsonību, bet arī provokatīvi izvirzīja jautājumu par iespējamu Latvijas Pareizticīgo baznīcas pāreju Konstantinopoles patriarha jurisdikcijā. Sākoties karam 2022. gada februārī, prezidents Egils Levits, manuprāt, rīkojās politiski vispareizāk, ierosinot Latvijas Pareizticīgo baznīcai veikt izmaiņas tās juridiskajā statusā. Prezidents paziņoja: “Baznīca var rēķināties ar valsts atbalstu autokefālas Baznīcas statusa nostiprināšanā”. Šis lēmums zināmā mērā gan mazināja politisko sašutumu par Patriarhu Kirilu, kurš atbalstīja Krievijas karu ar Ukrainu, gan iesaldēja materiālo jautājumu risināšanu ar Maskavas Patriarhātu, bet sarežģīja kadru jautājumu risināšanu un garīdznieku sagatavošanas kvalitāti.

Metodoloģija. Latvijas, Igaunijas, Ukrainas, Krievijas laikrakstu publikāciju analīze, Latvijas Saeimā pieņemto dokumentu analīze, Latvijas un Igaunijas pareizticīgo baznīcu tīmekļa vietnes. Autore izmantoja iekļautās novērošanas metodi.

Secinājumi. Krievu valodas radio apraides slēgšana, dievkalpojumu pārraides pārtraukšana televīzijā vairs nedod iespēju plaši izskaidrot Latvijas valsts nostāju attiecībā uz baznīcu. Demokrātiskā valstī ir jārūnā ar tautu, nevis jāuzliek daļai iedzīvotāju kolektīvās vainas slogs, atbildība par citas valsts politiku rīcību, nevis rīkoties ar aizliegumiem. Tādējādi neradīt ticīgajiem bažas par valsts iejaušanos pareizticīgajā ticībā un baznīcā.

HOLOKAUSTA KĀ TUMŠĀ MANTOJUMA INTERPRETĀCIJAS IZAICINĀJUMI BĒRNU UN JAUNIEŠU AUDITORIJĀM MUZEJOS LATVIJĀ

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Ievads/aktualitāte. Par tumšo mantojumu uzskatāms tāds vēsturiskais mantojums, kas vēsta par traģēdijām, ciešanām un bojāeju karos, genocīdos, humānās katastrofās un “ietver fiziska konflikta, iznīcināšanas vai cita nežēlīga nozieguma elementu” (Thomas et al., 2019, 3). Tumšā mantojuma pētniecība paplašina konvencionālās kultūrvēsturiskā mantojuma robežas un pievēršas diskusijai par strīdīga un sarežģīta mantojuma saglabāšanas un interpretācijas problēmām. Tas tiek uzskatīts par pieaugušo pārziņā esošu jomu, jo drūmie vēstījumi un atklātā vardarbības dokumentācija ir pretrunā ar vēlmi pēc iespējas ilgāk pasargāt bērnus un jauniešus no traumatiskām pieredzēm. Vienlaikus skolēni sastāda nozīmīgu muzeju mērķauditorijas daļu, kas šajās vietās nonāk izglītojošu ekskursiju laikā.

Holokausts ir viens no nozīmīgākajiem tumšā mantojuma piemēriem Latvijā, kura interpretācija muzejos saistīta ar īpašiem ētiskiem izaicinājumiem. Šī vēsturiskā mantojuma interpretācija prasa līdzsvaru starp vēsturiskās realitātes atklāšanu un auditorijas vecumam pielāgotu skaidrojumu. Muzeji cenšas nodot faktoloģiski precīzu informāciju par traģiskiem pagātnes notikumiem un veicināt empātiju, kritisko domāšanu un pilsoniskās vērtības jaunajām paaudzēm (Ballantyne et al., 2023; Silverman 2011; Wagner 2023). Tomēr praksē holokausta interpretācija skolēnu auditorijām rada virkni kuratoriālu, komunikatīvu un sociālu izaicinājumu.

Mērķis. Pētījuma mērķis ir analizēt galvenos izaicinājumus, ar kuriem saskaras muzeju speciālisti Latvijā, interpretējot holokausta vēsturi bērnu un jauniešu auditorijām.

Metodoloģija. Pētījums balstīts empīriskā izpētē, kas veikta trīs institūcijās, kuras Latvijā nodarbojas ar ebreju vēstures un holokausta interpretāciju: muzejā “Ebreji Latvijā”, Rīgas geto un Latvijas holokausta muzejā un Žaņa Lipkes memoriālā. Analīze balstās muzeju speciālistu pieredzē un novērojumos par muzejpedagoģisko darbu ar skolēnu grupām.

Svarīgākie secinājumi vai atklājumi. Pētījums rāda, ka būtiskākie izaicinājumi saistīti ar līdzsvara meklēšanu starp vēsturiskās realitātes atklāšanu un vecumam piemērotu satura pasniegšanu, attiecībā uz vardarbību un ciešanu atainojošu materiālu izmantošanu. Papildu grūtības rada skolēnu atšķirīgais priekšzināšanu līmenis, sensitīvi jautājumi par vietējo iedzīvotāju kolaborāciju, kā arī sabiedrībā pastāvošie stereotipi un aktuālā sociālpolitiskā konteksta ietekme uz vēsturisko notikumu izpratni. Muzeju darbinieki norāda arī uz auditorijas iesaistes problēmām un ierobežotām iespējām iegūt sistemātisku atgriezenisko saiti no skolēniem par muzeja apmeklējuma pieredzi.

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MNEMONISKĀ DROŠĪBA LATVIJĀ – ATMIŅAS POLITIKA STARPTAUTISKĀS ESKALĀCIJAS UN POST-PATIESĪBAS LAIKMETĀ

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Ievads. Laikmetā, ko raksturo starptautiska militāra eskalācija, post-patiesības politikas nostiprināšanās un informatīvo konfliktu intensifikācija, spēja saglabāt autentisku un vienotu atmiņas naratīvu ir vitāli svarīga valsts saliedētībai (Gudonis and Jones, 2022).

Mērķis. Referāts pievēršas mnemoniskai drošībai un tās pieaugošai nozīmībai kā vienai no valsts drošumspējas dimensijām (Mäklsoo, 2015; Koposov, 2017). Balstoties atmiņas studiju, drošības studiju un politikas teorijas atziņās, referāts aplūko to, kā kolektīvās atmiņas politika Latvijā sāk funkcionēt kā aizsargmehānisms, reaģējot uz ārējiem un iekšējiem mēģinājumiem politiski instrumentalizēt vēsturi.

Referāta teorētiskais ietvars balstās atšķirībā starp kosmopolītisko, agonisko un antagonisko atmiņu (Berger and Kansteiner, 2022). Agoniskā atmiņa paredz konfliktējošu pagātnes interpretāciju līdzaspastāvēšanu demokrātiskā diskusiju laukā, savukārt antagoniskā atmiņa konstruē bināru mēs/viņi loģiku un delegitimizē alternatīvas vēstures versijas. Referātā tiek parādīts, kā Krievijas īstenotā vēstures politika un tās naratīvi par Otro pasaules karu, padomju mantojumu un “atbrīvošanu” funkcionē antagoniskās atmiņas režīmā un kā šī prakse tieši ietekmē Latvijas publisko atmiņas telpu.

Secinājumi. Referātā tiek demonstrēts, ka post-patiesības laikmetā, kur emocionāli piesātināti naratīvi un stratēģiska dezinformācija aizstāj faktoloģisku vēsturisku diskusiju, agoniskās atmiņas telpa sašaurinās, radot pieprasījumu pēc mnemoniskās drošības politikas. Latvijas gadījumā tas izpaužas likumdošanas iniciatīvās, simboliskās telpas pārbūvē (pieminekļu demontāža, piemiņas prakses), izglītības un publiskās komunikācijas regulācijā, kā arī vēsturiskās atbildības artikulācijā. Vienlaikus referāts kritiski izvērtē mnemoniskās drošības risku, kad aizsardzības pasākumi var pāraugt diskursīvā noslēgtībā vai pārmērīgā atmiņas drošībošanā (Assmann and Conrad, 2010). Noslēgumā tiek secināts, ka demokrātiskai sabiedrībai arī apstākļos, kad informatīvās kampaņas un vēstures falsifikācijas kļūst par hibrīdkara instrumentiem, ir jāspēj uzturēt līdzsvars starp atmiņas aizsardzību un agonisku plurālismu, definējot mnemonisko drošību nevis kā cenzūru, bet kā stratēģisku noturību pret antagoniskiem un “apbruņotiem” (Krieg, 2023) vēstures naratīviem.

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DARBA DEVĒJU VIEDOKĻI PAR DAŽĀDU MIGRANTU GRUPU NODARBINĀTĪBU: VAI LATVIJĀ PASTĀV ETNISKĀ HIERARHIJA DARBA TIRGŪ?

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Ievads/aktualitāte. Ikdienā mēs sastopamies ar daudziem dažādiem etniskiem stereotipiem, šādi stereotipi ir sastopami arī darba tirgū, un tiem ir nozīme darba devēju lēmumos, izvēloties savus darbiniekus. Etniskie stereotipi arī rada noteiktas nodarbināto migrantu hierarhijas, kuru pamatā ir stereotipi par to, cik labi noteiktu etnisko grupu pārstāvji veic savus darba pienākumus. Pētnieki citās valstīs ir piedāvā arī teorētisku konceptu “etniskā piederība kā prasme” (Friberg & Midtbøen, 2017), kas norāda uz darba devēju tendenci pielīdzināt piederību etniskajai grupai neformālu prasmju kopumam.

Pētījuma jautājums. Noskaidrot, vai un kādi etniskie stereotipi par migrantiem darba tirgū raksturīgi Latvijas darba devējiem?

Metodoloģija. Lai noskaidrotu Latvijas darba devēju vidū pastāvošos etniskos stereotipus par migrantiem un ar to saistītās darba migrantu hierarhijas, tika veikta Latvijas darba devējus reprezentējoša kvantitatīva aptauja. Aptaujā piedalījās kopumā 750 uzņēmēji no Latvijas. Aptaujas laiks: 29.11.2024.–10.01.2025.

Svarīgākie secinājumi. Pētījums ļauj secināt, ka Latvijas darba tirgū pastāv etniskās hierarhijas, kas ir saistītas ar stereotipiem par noteiktām migrantu grupām. Attiecībā uz Ukrainas bēgļiem var norādīt, ka darba devēju vidū ir izplatīts stereotips par to, ka viņi ir labi fiziskā darba veicēji. Vispozitīvāk Latvijas darba devēji vērtē Latvijas valstspiederīgos, kas atgriezušies Latvijā pēc darba ārzemēs (remigrantus). Darba devēju vērtējumā remigranti, slaīdzinot ar citām migrantu grupām, ir vispiemērotākie gan darbam apkalpošanas sfērā ar klientiem, gan radošam darbam dažādās ar inovācijām saistītās profesijās. Visnegatīvākie stereotipi attiecībā uz jebkāda veida darbu darba devēju vidū ir par bēgļiem no Sīrijas, Irākas, Afganistānas.

Referāts sagatavots projektā “Migrantu uzņemšana nenoteiktības apstākļos: pārvaldība un vietējā līmeņa iekļaušana” (Nr. LZP-2023/1-0227).

VĒLAMIE IMIGRANTI VS. NEPIEŅEMAMIE SVEŠINIEKI: LATVIJAS IEDZĪVOTĀJU ATTIEKSMJU TIPOLOĢIJA

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Ievads. Karš pie Latvijas robežām un plašāki ģeopolitiskie procesi ir pastiprinājuši Latvijas iedzīvotāju jau tradicionāli rezervēto attieksmi pret imigrāciju. Vienlaikus pētījumi gan starptautiskā, gan Latvijas kontekstā rāda, ka uzņemšanās sabiedrības attieksmi pret imigrantiem ietekmē ne tikai makrolīmeņa faktori un vēsturiskais konteksts, bet arī individuālā līmeņa raksturojumi, tostarp indivīdu subjektīvā pieredze.

Arī Latvijas iedzīvotāju aptauju rezultāti pierāda ne tikai izglītības, vecuma, etniskās piederības un sociālekonomiskā statusa ietekmi, bet arī subjektīvo dimensiju – piederības izjūtas, subjektīvās labklājības un personīgās migrācijas pieredzes lomu attieksmē pret migrantiem.

Pētījuma mērķis ir identificēt un klasificēt Latvijas iedzīvotāju attieksmes pret imigrantiem no dažādiem izcelsmes reģioniem, izmantojot iedzīvotāju kvantitatīvās aptaujas datus (n = 609, 2025), kas iegūti projekta “Migrantu uzņemšana nenoteiktības apstākļos” ietvaros. Pielietojot klasteranalīzi, respondenti tiek grupēti, balstoties uz vērtējumiem par vēlamo, pieļaujamo un nepieļaujamo imigrantu skaita pieaugumu no konkrētiem reģioniem.

Salīdzinājumā ar iepriekšējiem pētījumiem būtiski mainījusies attieksme pret imigrāciju no tuvākā reģiona valstīm (pret kurām Latvijas iedzīvotāji iepriekš bija visatvērtākie). Vislabvēlīgākā attieksme saglabājas pret Ukrainas bēgļiem – 71% respondentu uzskata, ka imigrantu skaitu no Ukrainas varētu palielināt no neliela līdz pat nozīmīgam apjomam. Ievērojami pieaudzis to iedzīvotāju īpatsvars, kuri neatbalsta iebrāucēju uzņemšanu no Krievijas; līdzās Somālijai un Sīrijai tā tiek ierindota visnevēlamāko imigrantu izcelsmes valstu vidū.

Secinājumi. Analīzes rezultātā identificēti trīs attieksmju klasteri. Pirmajā klasterī (30%) dominē respondenti, kuri atbalsta mērenu imigrācijas pieaugumu no lielākās daļas valstu, izņemot Somāliju un Sīriju. Otrajā klasterī (25%) iekļaujas respondenti, kuri neatbalsta imigrāciju ne no vienas valsts. Trešo klasteri (44%) veido respondenti, kuri atbalsta imigrāciju no Ukrainas un pieļauj minimālu imigrantu pieaugumu no citām valstīm, izņemot Krieviju, Somāliju un Sīriju. Nākamajā analīzes solī tiek noskaidroti faktori, kas ietekmē piederību konkrētam attieksmju klasterim, kā arī, balstoties uz plašu jautājumu loku, ieskicēts Latvijas iedzīvotāju priekšstats konstruētais “vēlamā” un “nevēlamā” imigranta portrets.

Tēma izstrādāta LZZP projekta “Migrantu uzņemšana nenoteiktības apstākļos: pārvaldība un vietējā līmeņa iekļaušana” (lzp-2023/1-0227) ietvaros.

UKRAINIAN MIGRANTS' PERCEPTIONS OF LATVIA AS A HOST COUNTRY: KEY ASPECTS

Hanna Pališ

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The study examines the attitudes of Ukrainian forced migrants who have been residing in Latvia since the full-scale invasion toward Latvia as a host country and society.

The analysis is based on data collected by the author through in-depth interviews conducted with Ukrainians in different cities of Latvia in 2025. The findings reflect the multi-level process of adaptation and partial integration of Ukrainian migrants in the Latvian social context.

On the one hand, the research explores how Ukrainian migrants evaluate the socio-economic and legal conditions of living in Latvia, as well as the support provided by state and local institutions, civil society organizations, and local residents. On the other hand, it analyzes migrants' attitudes toward Latvia as a country of residence, including their willingness to learn the Latvian language, become familiar with local culture and traditions, and establish social relationships with Latvian citizens.

The analysis emphasizes different dimensions of migrants' well-being, including economic, social, and mental-psychological aspects, taking into account conditions of uncertainty and the role of cultural distance and societal attitudes toward migrants.

In addition, the paper refers to sociological data illustrating the broader context of relations, highlighting the high level of trust and positive perception of Latvia among Ukrainian citizens, particularly strengthened during the full-scale war due to Latvia's active support for Ukraine.

7.2. sekcija. **LATVIJAS IEDZĪVOTĀJI UN TELPISKĀ
ATTĪSTĪBA ĀRĒJO UN IEKŠĒJO
IZAICINĀJUMU LAIKMETĀ /**
DEMOGRAPHIC AND SPATIAL
DYNAMICS IN THE CONTEXT
OF EXTERNAL AND INTERNAL
CHALLENGES IN LATVIA

TREŠO VALSTU IMIGRĀCIJAS IETEKME UZ LATVIJAS UN ES DALĪBVALSTU DZIMSTĪBU

Juris Paiders

LU EZTF Ģeogrāfijas nodaļa

Kopējie dzimstības radītāji Eiropas Savienībā ir vieni no viszemākajiem starp globāliem reģioniem. Pētījumā tiek analizēta drošības risku atšķirība starp Latviju, Baltijas valstīm un ES rietumu daļas valstīm.

Kā liecina Eurostat apkopotā statika, vidēji ES 2024. gadā piedzima 7,9 bērni uz 1000 iedzīvotājiem. 2024. gadā Itālijā uz 1000 iedzīvotājiem piedzima 6,3 bērni, Spānijā – 6,5, bet Grieķijā un Lietuvā – 6,6. Latvija ar 6,9 jaundzimušajiem uz 1000 iedzīvotājiem bija piektā sliktākā ES.

Kā liecina Eurostat apkopotā statika, tad 2023. gadā vidēji 18,4% no visiem jaundzimušajiem ES piedzima sievietēm, kuru dzimtā vieta bija ārpus ES 27.

Vidēji ES 2023. gadā migrantu sievietēm dzimušu bērnu skaits uz 1000 migrantiem bija divas reizes lielāks par ES27 dalībvalstīs dzimušo iedzīvotāju dzimstību. Francijā migrantu dzimstības radītāji bija 2,47 reizes lielāki par vietējo iedzīvotāju dzimstību, Portugālē 2,53 reizes, reizes, Itālijā 2,33 reizes, Luksemburgā un Beļģijā 2,31 reizes, bet Vācijā 2,21 reizes lielāka. Baltijas valstīs jaundzimušo skaits ārzemēs dzimušajām sievietēm pret ārzemēs dzimušajiem vietējiem iedzīvotājiem ir ievērojami mazāks par dzimstību ES27 dzimušajiem iedzīvotājiem.

Migrantu izcelsmes valstīs rada ievērojamu ietekmi uz migrantu demogrāfisko uzvedību pēc iecelšanās ES. 2023. gadā jaundzimušo skaits Francijā no ārpus ES27 iebrukušajām sievietēm 2023. gadā uz 1000 iedzīvotājiem, kuri nav dzimuši kādā no ES27 dalībvalstīm bija 21,1 jaundzimušie uz 1000 migrantiem. Tas ir lielāks nekā kopējā dzimstība Alžīrijā (19,6 jaundzimušie uz 1000 iedzīvotājiem) Bangladešā (20,4 dzimušie uz 1000 iedzīvotājiem) un pat Indonēzijā (15,9 jaundzimušie uz 1000 iedzīvotājiem).

Pašreizējās dzimstības tendences ES rada ievērojamu risku ES lielāko valstu un ASV attiecībās. ASV Nacionālās drošības stratēģijā (*National Security Strategy of the United States of America*) ir izvirzīti jautājumi par to vai, turpinoties esošajām demogrāfiskajām tendencēm, starp ASV un NATO Rietumeiropas valstīm saglabāsies vienota izpratne par NATO mērķiem.

NO IERAŠANĀS LĪDZ ADAPTĀCIJAI DARBA TIRGŪ: ĀRVALSTU STUDENTU MOBILITĀTE UZ LATVIJU KĀ STUDIJU GALAMĒRĶI

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Kopš 20. gadsimta beigām ārvalstu studentu mobilitāte (ISM) ir kļuvusi par centrālu augstākās izglītības internacionalizācijas aspektu. Migrācijas pētījumos tiek uzsvērtā mobilitātes paradigmas maiņa, iedzīvotāju pārvietošanās procesiem kļūstot dinamiskākiem, daudzslāņainākiem un telpiski sarežģītākiem. Tomēr literatūrā joprojām dominē rietumvalstu un augsti kvalificētu jeb “talantīgo” studentu piesaistes perspektīva, nepietiekami analizējot alternatīvus studiju galamērķus un daudzveidīgas studentu pieredzes trajektorijas.

Latvija šajā kontekstā kalpo kā piemērs mazāk populāram ISM galamērķim. Vienlaikus valstī notiekošās demogrāfiskās pārmaiņas nosaka to, ka ārvalstu studentu piesaiste kļūst par kritiski svarīgu migrācijas plūsmu sastāvdaļu. Tādēļ nepieciešama padziļināta izpratne par ārvalstu studentu motivāciju, integrāciju un potenciālo ieguldījumu vietējā sabiedrībā un pilsētvidē.

Kā ārvalstu studentu motivācija, sociāldemogrāfiskais profils un ikdienas dzīves pieredze – īpaši iesaiste vietējā darba tirgū – atspoguļojas Latvijas augstākās izglītības internacionalizācijas ainavā?

Pētījuma empīrisko bāzi veido 2026. gadā īstenota ārvalstu studentu aptauja, kurā piedalījās vairāk nekā 500 respondentu. Reprezentativitāte nodrošināta ar kvotu izlases metodi, saskaņojot izlases struktūru ar ģenerālkopu pēc dzimuma, studiju līmeņa, izcelsmes reģiona, studiju jomas un augstskolas. Analizēti galamērķa izvēles faktori (studiju kvalitāte un vide, izmaksas, drošība, kultūras pieredze), kā arī studentu sociālā integrācija, mijiedarbība ar vietējiem iedzīvotājiem, piederības izjūta un ikdienas dzīves pieredzes. Datu analīzei un telpiskajai vizualizācijai izmantoti ArcGIS Online interaktīvie datu paneļi, kas ļauj integrēt sociāldemogrāfiskos un telpiskos datus un nodrošināt pētījuma rezultātu pieejamību gan pētniekiem un politikas plānotājiem, gan plašākai sabiedrībai.

Ārvalstu studentu integrāciju Latvijas darba tirgū būtiski diferencē sociāldemogrāfiskais profils un adaptācijas periods. Pētījuma rezultāti norāda, ka Eiropas studenti darba tirgū iesaistās retāk, primāri veselības aprūpē, kas ir saistīts ar izvēlēto studiju programmu, turpretim Āzijas studenti biežāk nodarbināti viesmīlības un ražošanas nozarēs. Maģistrantūrā studējošo nodarbinātība ir gandrīz divreiz augstāka nekā bakalaura līmenī, un ilgāks uzturēšanās laiks valstī tieši korelē ar sekmīgāku sociālekonomisko integrāciju. Šīs kopsakarības pozicionē ārvalstu studentus kā stratēģisku cilvēkkapitāla resursu Latvijas tautsaimniecības un demogrāfiskās ilgtspējas attīstībai.

Pētījums veikts projekta “Ģeogrāfija, demogrāfiskais profils un pieredze mazāk populāros galamērķos: ārvalstu studentu mobilitāte uz Latviju” (projekta Nr. lzp-2024/1-0556) ietvaros.

DEMOGRĀFISKO UN SOCIĀLI EKONOMISKO FAKTORU NOZĪME TERITORIJU NEVIENMĒRĪGĀ ATTĪSTĪBĀ REĢIONOS UN APDZĪVOTAJĀS VIETĀS

Edvards Jurgis Auzāns, Māris Bērziņš, Jānis Krūmiņš, Niks Stafeckis

LU EZTF Ģeogrāfijas nodaļa

Pētījums aplūko demogrāfisko un sociāli ekonomisko faktoru ietekmi uz teritoriju nevienmērīgu attīstību Latvijas reģionos un apdzīvotajās vietās. Kopš 2000. gada Latvijā notikušas būtiskas pārmaiņas, ko raksturo iedzīvotāju skaita sarukums, sabiedrības novecošanās, ekonomikas un nodarbināto profesionālās struktūras pārmaiņas. Šie procesi ir veicinājuši atšķirīgas attīstības tendences starp dažādām teritorijām, īpaši pastiprinot sociāli telpisko diferenciāciju starp Rīgas metropoles reģionu un pārējiem Latvijas reģioniem. Daudzviet ārpus galvaspilsētas reģiona novērojama depopulācija, ekonomiskās aktivitātes samazināšanās un sarūkšanas procesi.

Pētījumā padziļināti skatīta demogrāfisko un sociāli ekonomisko faktoru ietekme uz pilsētu un reģionu attīstības nevienmērību Latvijā. Darba ietvaros analizēta šo faktoru savstarpējā mijiedarbība un to ietekme uz teritoriju attīstības atšķirībām un pilsētu sarūkšanas procesiem.

Analīzē izmantoti Oficiālās statistikas portāla publiski pieejamie dati, kas nodrošina plašu demogrāfisko un sociāli ekonomisko rādītāju klāstu. Pētījumā pielietotas kvantitatīvās analīzes metodes – hierarhiskā klasteru analīze un galveno komponentu analīze, kas ļauj identificēt līdzīgu attīstības raksturlielumu grupas un noteikt galvenos faktorus, kas ietekmē teritoriju attīstības atšķirības.

Rezultāti liecina, ka Latvijas teritoriju attīstību būtiski ietekmē iedzīvotāju skaita dinamika, ekonomiskās aktivitātes koncentrācija, darba tirgus iespējas un migrācijas procesi. Spēcīgāka ekonomiskā izaugsme un iedzīvotāju piesaiste koncentrējas Rīgas metropoles reģionā, savukārt daudzas mazākas pilsētas un perifērie reģioni saskaras ar iedzīvotāju skaita sarukumu un ekonomiskās aktivitātes kritumu. Tas veicina reģionālo polarizāciju. Kopumā pētījums uzsver, ka teritoriju attīstības atšķirības Latvijā ir daudzdimensionāls process, kurā savstarpēji mijiedarbojas demogrāfiskie, ekonomiskie un sociālie faktori, tādēļ reģionālās attīstības politikā nepieciešama diferencēta pieeja dažādu teritoriju vajadzībām.

DEMOGRĀFISKĀS UN EKONOMISKĀS ATTĪSTĪBAS KOPSAKARĪBAS LATVIJAS PILSĒTĀS KOPŠ INDUSTRIALIZĀCIJAS SĀKUMA

Māris Fogelis

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Dažas pilsētas ārpus Rīgas aglomerācijas uzrāda lielāku noturību iedzīvotāju skata ziņā un labākus ekonomiskos rādītājus, kamēr citas strauji zaudē iedzīvotājus un funkcionalitāti. Aplūkotas pilsētu attīstības trajektorijas un to korelācija ar kopējām demogrāfiskām tendencēm valsts līmenī un veikta faktoru analīze pilsētu attīstības izvērtējumā.

Pētījuma jautājums – kādiem faktoriem ir būtiskākā ietekme uz atsevišķu pilsētu labākiem ekonomiskās attīstības indikatoriem? Kādi faktori ir noteikuši sekmīgu uzņēmumu atrašanos Latvijas mazās/vidējās pilsētās ārpus Rīgas aglomerācijas? Vai kapitāla, tajā skaitā kapitāla tirgus, pieejamībai reģionos ir kritiska nozīme uzņēmējdarbības attīstībā?

Pētījumā veikta statistiska analīze, kā atsevišķu Latvijas pilsētu ilgtermiņa demogrāfiskie rādītāji korelē ar kopējiem valsts demogrāfijas rādītājiem un kāda ir korelācija ar jaunākiem ekonomiskiem indikatoriem. Novērtēta arī vēsturiskās lielražošanas, infrastruktūras, administratīvo funkciju izmaiņu ietekme uz jaunākiem ekonomikas parametriem, izmantojot ranžēšanas metodi un statistisko analīzi. Papildus aplūkots kapitāla tirgus pieejamība reģionos un aplūkoti vairāku pilsētu/ uzņēmumu piemēri.

Pētījumā secināts, ka vēsturiskie faktori (iedzīvotāju skaits un sastāvs, infrastruktūras izmaiņas, lielražošana) ietekmē atsevišķu pilsētu un tajās esošo uzņēmumu attīstības trajektorijas, bet determinētas cēloņsakarības ir grūti nodefinēt – pie līdzīgiem nosacījumiem ir gan relatīvi labi, gan slikti demogrāfiskie un ekonomiskie rezultāti. Autors pētījumā parāda cēloņsakarību limitus un nejaušību ietekmi.

RĪGAS METROPOLES AREĀLA ILGTSPĒJĪGA URBANIZĀCIJA – ATTĪSTĪBAS FAKTORS IEKŠĒJO UN ĀRĒJO IZAICINĀJUMU LAIKMETĀ

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Rīgas metropoles areāls (turpmāk – Metropoles areāls) stratēģijā “Latvija 2030” ir definēts kā nacionālo interešu telpa un būtisks valsts konkurētspējas faktors. Pēdējo divdesmit piecu gadu laikā tas ir kļuvis par visstraujāk augošo valsts teritoriju, *t.sk.* no iedzīvotāju skaita un apdzīvojuma struktūras pārmaiņu perspektīvas. Tomēr tā apdzīvojuma attīstība nav bijusi ilgtspējīga – to raksturo zema blīvuma suburbanizācija, funkcionāla fragmentācija un apbūves teritoriju izplešanās, apgrūtinot vietu funkcionēšanu un palielinot infrastruktūras uzturēšanas slogu.

Eiropas politiku kontekstā – ilgtspējīga attīstība, auglīgo augšņu saglabāšana, apbūves aizņemtu zemes platību neto pieauguma apturēšana (*no net land take*) u. c. – un vienlaikus valsts iedzīvotāju skaita sarūkšanas apstākļos, jaunu teritoriju paredzēšana apbūvei vienā areālā un turpmāka haotiskas apdzīvojuma struktūras veidošanās, rada būtiskus riskus valsts teritoriālajai kohēzijai.

Pētījuma mērķis ir izvērtēt, kādā mērā Metropoles areāla pašreizējās urbanizācijas trajektorijas un pārvaldības sistēmas spēj nodrošināt ilgtspējīgu urbanizāciju un stiprināt Latvijas teritoriālo noturību.

Pētījumā analizēti Metropoles areāla urbānās attīstības procesi teritoriālā un institucionālā skatījumā. Salīdzināta iedzīvotāju skaita dinamika un zemes izmantošanas apguve jaunai apbūvei. Analizēta divu pretēju virzītājspēku grupu mijiedarbība. Vērtēti plānošanas dokumentos ietvertie urbānās izaugsmes redzējumi.

Pētījumā konstatēts, ka ilgtspējīgas urbanizācijas jautājumi Latvijā nav guvuši pietiekamu politisko prioritāti, atklājot plaisas starp politikām un “zaļo” teritoriju apbūves praksi. Secināts, ka vietējā līmenī nav konsekventi īstenotas augstāku plānošanas līmeņu dokumentu nostādnes. Nav nostiprināts funkcionējošs areāla pārvaldības mehānisms.

Noslēgumā uzsvērts, ka Metropoles areāla ilgtspējīga urbanizācija, lai neradītu ilgtermiņa riskus areāla attīstībai, un, kontekstā ar sarūkšanas procesiem, riskus valsts iekšējai noturībai, ir ne tikai areāla plānošanas un pārvaldības, bet arī nacionālās drošības jautājums. Tādējādi iekšējo un ārējo izaicinājumu apstākļos, kopīga Metropoles areāla urbanizācijas plānošana un areāla pārvaldība kļūst par vienu no stratēģiski nozīmīgākajiem uzdevumiem Latvijā.

PRIEKŠLIKUMI LATVIJAS ILGTSPĒJĪGAS ATTĪSTĪBAS STRATĒGIJAS 2050 IZSTRĀDES SATURISKAJAM IETVARAM

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Latvijas ilgtspējīgas telpiskās attīstības stratēģijai un tās īstenošanai jākalpo par vienu no valsts ārējās un iekšējās drošības stūrakmeņiem. Nu jau vairāk kā 30 gadus valsts reģionālās attīstības politikas uzstādījumos ir definēta nepieciešamība veidot līdzsvarotu teritoriju attīstību, bet būtiskās teritoriālās sociāli ekonomiskās atšķirības nav mazinājušās, ir pastiprinājusies nomaļu teritoriju demogrāfiskā un sociālā kapitāla sarukšana. Tas rada trauslu Latvijas teritorijas kopējo situāciju gan no cilvēcīgā, gan no saimnieciskā un visiem drošības aspektiem.

Mērķis ir veidot priekšlikumus saturā integrētas telpiskās perspektīvas izstrādei LIAS 2050 balstoties uz esošo LIAS 2030 pieredzi un esošajām vajadzībām. Priekšlikumu izstrāde balstās uz dokumentu analīzi, intervijām.

Līdzsvarotas un policentriskas telpiskās struktūras veidošana pēc būtības, ir nepieciešamība. Tās ietvaros ir iezīmējama Rīgas metropoles atbildība kopējai valsts reģionu attīstībai, kas ir arī tās konkurētspējas resurss. Kā vienu no svarīgākajiem attīstības virzieniem ir jāparedz demogrāfiskā un sociāli ekonomiskā kapitāla stiprināšana teritoriālo kopienu un diferencētā apdzīvoto vietu sistēmā.

Ir vairāki tematiskie virzieni, kuri nav bijuši LIAS 2030, bet ir nepieciešami jaunā attīstības politikas dokumenta izstrādē. Viens tiem ir Latvijas drošības teritoriālā organizācija un stratēģisko infrastruktūras objektu tīkls. Tā ietvaros ir arī jāveido Latvijas un tās reģionālā līmeņa civilās aizsardzības sistēma, kura ir starpsektoriāla un operacionāli saprotama ikvienam iedzīvotājam.

Ņemot vērā LIAS 2030 pieredzi ir jāparedz divi principiāli risinājumi. Pirmkārt, atbilstoši telpiskās (ilgtspējīgas) attīstības plānošanas principiem un ES attīstības politiku vadlīnijām (Eiropas telpiskās attīstības perspektīva ETAP u. c.) nebūtu jānošķir “telpiskās attīstības perspektīva”. Tai jābūt integrētai. Otrkārt, jāparedz stratēģijas īstenošanas un uzraudzības mehānisms, kas nodrošinātu 1) Nacionālā attīstības plānu kā stratēģijas īstenošanas instrumentu, 2) LR valdību deklarēto vidēja termiņa attīstības uzstādījumu integrāciju un politiku pārmantojamību.

POLITIKU TERITORIĀLĀ IETEKME: JAUNIEŠU MIGRĀCIJA UN PAKALPOJUMU PIEEJAMĪBA LAUKOS

Anita Seļicka, Dace Liepiņa-Zusāne, Ilze Tomanoviča-Barone

Latvijas Lauku forums

Lauku attīstībā nepieciešama vietas vajadzībās balstīta un pārnozaru koordinēta pieeja, sistemātiski izvērtējot nozaru politiku teritoriālo ietekmi.

Depopulācija, pakalpojumu samazināšanās un pieejamības pasliktināšanās veido savstarpēji pašpastiprinošu ciklu.

Jauniešu emigrācija un cilvēkkapitāla zudums ir cieši saistīti ar lauku teritoriju pievilcību un stratēģiskām rīcībām attīstības plānošanā.

Latvijas ilgtspējīgas telpiskās attīstības stratēģija uzsver līdzsvarotas un policentriskas telpiskās struktūras nozīmi. Tomēr lauku teritorijās ilgstoši vērojama demogrāfiska un sociāli ekonomiska sarukšana – iedzīvotāju skaita samazināšanās, sabiedrības novecošanās un jauniešu emigrācija. Latvijas politikas instrumenti attiecībā uz lauku teritorijām ir strukturāli saskaņoti un papildinoši, tomēr to īstenošana ir fragmentēta un ar ierobežotiem mehānismiem. Nepieciešama ciešāka starpnozaru koordinācija, labāks teritoriālās ietekmes novērtējums un sistemātiskāka lauku vajadzību izvērtēšana, ko apgrūtina nepietiekama teritoriāli detalizētu datu pieejamība un atšķirīgas pieejas to izmantošanā politiku plānošanā un izvērtēšanā.

Analīzes mērķis ir izvērtēt politiku teritoriālo ietekmi uz lauku teritorijām Latvijā, īpašu uzmanību pievēršot pakalpojumu pieejamības pārmaiņām pēdējo 20 gadu laikā, kā arī jauniešu mobilitātes tendencēm. Analīze fokusēta uz apdzīvotām vietām ar iedzīvotāju skaitu zem 5000, lai labāk izprastu mazāku teritoriju attīstības izaicinājumus.

Analīzē izmantota kombinēta pieeja, apvienojot kvantitatīvo statistikas datu analīzi, kvalitatīvos datus un politikas plānošanas dokumentu izpēti. Kur tas iespējams, tika atlasīti un papildus aprēķināti dati par apdzīvotām vietām ar iedzīvotāju skaitu zem 5000. Kvalitatīvo datu ieguvei tika veiktas intervijas ar plānošanas reģionu pārstāvjiem, savukārt attīstības plānošanas un politiku izvērtējuma dokumentu analīze ļāva izvērtēt politiku mērķus, instrumentus un to potenciālo teritoriālo ietekmi.

Analīze rāda, ka jauniešu un kvalificētu speciālistu aizplūšana nav skatāma tikai kā darba tirgus jautājums, bet kā komplekss teritorijas pievilcības rādītājs, kas cieši saistīts ar pakalpojumu pieejamību un dzīves kvalitāti. Lauku teritorijās pakalpojumu nodrošinājuma izmaiņas zema iedzīvotāju blīvuma apstākļos rada pašpastiprinošu dinamiku – iedzīvotāju skaita kritums samazina pakalpojumu pieejamību vai to maiņu uz digitālu formu, savukārt pakalpojumu samazināšanās veicina turpmāku migrāciju. Rezultāti norāda uz nepieciešamību stiprināt pārnozaru un vietas vajadzībās balstītu pieeju lauku attīstībā un sistemātiski izvērtēt politikas lēmumu teritoriālo ietekmi, tostarp izmantojot tādus instrumentus kā lauku filtrs (*rural proofing*).

PAKALPOJUMU PIEEJAMĪBA UN IEDZĪVOTĀJU LĪDZDALĪBA PĒC ADMINISTRATĪVI TERITORIĀLĀS REFORMAS: ČETRU LAUKU KOPIENU ANALĪZE

Aiva Apša-Ķīšeniece

Biedrība "Latvijas Lauku forums"

Administratīvi teritoriālā reforma (ATR), kas Latvijā stājās spēkā 2021. gadā, būtiski pārveidoja pašvaldību pārvaldības struktūru, telpisko organizāciju un attiecības starp novadu centriem un attālākām teritorijām. Reforma tika pamatota ar nepieciešamību stiprināt pašvaldību kapacitāti un nodrošināt efektīvāku pakalpojumu organizāciju. Tomēr tās ietekme uz pakalpojumu pieejamību un iedzīvotāju iespējām ietekmēt lēmumus lauku teritorijās joprojām ir diskutabla.

Analīzes mērķis ir izvērtēt, kā pēc ATR mainījusies pakalpojumu pieejamība, lēmumu pieņemšanas procesi un iedzīvotāju līdzdalības iespējas lauku teritorijās.

Analīze veikta četros pagastos ārpus reģionālajiem attīstības centriem – Embūtē (Dienvidkurzemes novads), Apē (Smiltenes novads), Kurmenē (Bauskas novads) un Vabolē (Augšdaugavas novads). Izmantota kombinēta pieeja: iedzīvotāju anketēšana, intervijas ar pagastu pārvalžu vadītājiem, klātienē diskusijas ar iedzīvotāju grupām, kā arī attīstības dokumentu, demogrāfisko un sociālekonomisko statistikas datu analīze.

Analīze rāda, ka pakalpojumu pieejamības izmaiņas nevar viennozīmīgi attiecināt uz ATR. Pakalpojumu reorganizāciju lielā mērā ietekmē ilgstoša iedzīvotāju skaita samazināšanās, izmaksu pieaugums un iedzīvotāju paradumu maiņa, piemēram, pasta pakalpojumu digitalizācija vai mobilitātes paradumi. Vienlaikus ATR ir mainījusi pārvaldības dinamiku: lēmumu pieņemšana kļuvusi centralizētāka, savukārt mazāk apdzīvotām teritorijām sarežģītāk nodrošināt redzamību un pārstāvniecību lielā novada struktūrā. Iedzīvotāju iespējas ietekmēt lēmumus bieži ir atkarīgas no vietējās kopienas aktivitātes, komunikācijas ar pašvaldību un pagasta pārvaldes spējas nodrošināt sadarbību starp iedzīvotājiem un novada vadību. Rezultāti aktualizē jautājumu par līdzsvaru starp efektīvu pārvaldību un lauku teritoriju līdzvērtīgu attīstību.

Analīze tiek veikta projekta "Kopienas kartogrāfija: pakalpojumi, pārvaldība un līdzdalība laukos" ietvaros, līguma nr.03-2025/SL/6, līdzfinansē Eiropas Savienība, GEAR UP! programma.

PROFESIONALIZĀCIJA, POLARIZĀCIJA VAI STABILITĀTE: NODARBINĀTO PROFESIONĀLĀS STRUKTŪRAS PĀRMAIŅU TERITORIĀLĀS ATŠĶIRĪBAS LATVIJĀ

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Pētījumi par darba tirgus struktūras pārmaiņām pilsētās un reģionos aptver diskusijas par nodarbināto profesionalizāciju, polarizāciju vai dažkārt arī pieaugošu nodarbināto īpatsvaru zemas kvalifikācijas profesijās. Šajā darbā analizētas nodarbināto profesionālās struktūras pārmaiņas Latvijā, īpašu uzmanību pievēršot teritoriālajām atšķirībām reģionos un starp apdzīvotajām vietām.

Pētījumā aplūkots, kā mainījusies nodarbināto profesionālā struktūra dažādās Latvijas teritorijās un kā šīs pārmaiņas saistītas ar ekonomiskajiem procesiem. Analīzē izmantoti tautas skaitīšanas dati par 2000., 2011. un 2021. gadu, kas ļauj izvērtēt nodarbināto profesionālās struktūras pārmaiņas 587 teritoriālajās vienībās. Profesijas klasificētas trīs līmeņos – augsti kvalificēti nodarbinātie, vidēji kvalificēti un zemas kvalifikācijas profesijas.

Rezultāti liecina, ka Latvijā profesionālās struktūras attīstība ir dinamiska. Periodā no 2000. līdz 2011. gadam, kas sakrita ar globālās finanšu krīzes ietekmi, 68% teritoriju bija vērojama nodarbināto profesionālās struktūras pasliktināšanās. Savukārt laikā no 2011. līdz 2021. gadam novērota izteikta profesionālās struktūras uzlabošanās, un 79% teritoriju pieaugu augsti kvalificētu nodarbināto īpatsvars. Kopumā aplūkotajā periodā 40% teritoriju bija vērojams uzlabojums, apmēram tikpat teritorijās (39%) – pasliktināšanās, bet tikai neliela daļa saglabāja stabilu profesionālo struktūru. Pētījums parāda, ka profesionālās struktūras pārmaiņas Latvijā ir cieši saistītas ar makroekonomiskajiem procesiem un atspoguļo krīžu izraisītu pasliktināšanos, kam seko pakāpeniska atveseļošanās un nodarbināto profesionalizācija.

15 MINŪŠU PILSĒTAS KONCEPTA PRAKTISKO RISINĀJUMU NOVĒRTĒJUMS RĪGĀ

Romans Nazarovs

Rīgas Tehniskā universitāte

15 minūšu pilsētas koncepts saistāms ar pasaulē aktuālu pilsētplānošanas pieeju, kas piesaista plašu sabiedrības un daudzu ekspertu uzmanību. Tomēr, ņemot vērā koncepta straujo attīstību un plašo interpretāciju dažādību, tas tiek nepārtraukti modificēts un paplašināts. Rīga 2023. gadā izstrādāja “Apkaimju centru attīstības plānu 2024.–2028. gadam”, kurā aprakstīti 15 minūšu pilsētas koncepcijas pamatprincipi un noteiktas pieejamības zonas 15 minūšu rādiusā no apkaimju centriem, dokumentā nav aprakstīta analīzes metodoloģija, kas pamatotu zonu noteikšanu un koncepcijas ieviešanu.

Pētījuma mērķis ir pievērst uzmanību nepieciešamībai stiprināt empīrisko un analītisko pamatojumu 15 minūšu pilsētas koncepta praktiskai ieviešanai Rīgā, izvērtējot tā piemērošanas priekšnosacījumus pilsētvides kontekstam.

Tika veikta zinātniskās literatūras analīze, raksti apskata 15 minūšu pilsētas koncepcijas teorētiskos aspektus, priekšrocības un kritiku, atbilstības novērtēšanas metodes, kā arī citu pilsētu pieredzi tās ieviešanā. Tika izmantota vosviewer analīze, lai aprakstītu 15 minūšu pilsētas koncepcijas pētījumā aplūkotās tēmas un zinātniskās tendences. Tika analizēta iedzīvotāju dalība Rīgas līdzdalības budžeta balsojumā no 2019. līdz 2025. gadam. Analizēti Rīgas pašvaldības dokumenti par 15 minūšu pilsētas koncepcijas ieviešanu, lai izprastu, kādi principi, faktori un riski tika ņemti vērā.

Rezultāti liecina, ka 15 minūšu pilsētas koncepcija atrodas teorētiskās un metodoloģiskās attīstības stadijā, vienlaikus parādoties kritikai un pierādījumu trūkumam par tās ietekmi uz pilsētvidi. Gan balsojošo iedzīvotāju skaits, gan to īpatsvars samazinās, kas aktualizē jautājumu par sabiedrības iesaistes pilsētas attīstības procesos. Literatūras analīze rāda, ka, lai pamatotu koncepcijas iekļaušanu plānošanas dokumentos, tiek izmantotas ģeogrāfiskās informācijas sistēmu (ĢIS) analīzes metodes, nosakot pieejamības laika sliekšņus konkrētās pilsētās vai to daļās. Analizētā starptautiskā pieredze liecina par būtisku koncepcijas daudzveidību gan izmantotajās metodēs, gan piemērotākajos laika intervālos.

Secināms, ka 15 minūšu pilsētas koncepcijas ieviešana Rīgā būtu jābalsta uz integrētu pieeju, apvienojot sabiedrības līdzdalības analīzi un ĢIS balstītu novērtējumu, pielāgojot to pilsētas vēsturiskajai un telpiskajai struktūrai.

BŪTISKO PAKALPOJUMU SASNIEDZAMĪBAS KARTĒŠANA RĪGĀ 15 MINUŠU PILSĒTAS KONTEKSTĀ

Māris Bērziņš, Santa Sormule

LU EZTF Ģeogrāfijas nodaļa

Pilsētās dzīvojošiem dažādu pakalpojumu nodrošinājums un sasniedzamība bieži ir ļoti atšķirīga, gan salīdzinot pilsētas savstarpēji, gan arī dažādās apkaimēs vienas pilsētas ietvaros. Dzīvesvietas pievilcību un iedzīvotāju dzīves kvalitāti nosaka cilvēkiem būtisko pakalpojumu nodrošinājums un tuvums. Pilsētvidē, kur cilvēki visas pamatvajadzības var sasniegt 15 minūšu laikā ejot kājām vai pārvietojoties ar velosipēdu, raksturo ilgtspējīgu un pievilcīgu dzīves vidi.

Šajā pētījumā analizēta trīs ikvienam iedzīvotājam svarīgu pakalpojumu sasniedzamība Rīgā 15 minūšu pilsētas koncepta kontekstā, pievēršot uzmanību telpiskajām atšķirībām dažādās pilsētas apkaimēs. Darba mērķis ir novērtēt izglītības, veselības aprūpes un tirdzniecības pakalpojumu sasniedzamību dažādās pilsētas teritorijās un identificēt teritorijas ar ierobežotu piekļuvi šiem pakalpojumiem.

Analīzē izmantota gravitācijas principā balstīta sasniedzamības rādītāja noteikšanas metode (Walkable Accessibility Score), kas ļauj novērtēt pakalpojumu sasniedzamību gājējiem. Papildus analizēts sasniedzamības rādītājs, kas aprēķiniem izmanto ielu, celiņu un ietvju tīklu pētāmajā teritorijā. Pētījumā analizētas visas Rīgas apkaimes, kā arī detalizēti izpētītas četras morfoloģiski atšķirīgas teritorijas: Āgenskalns, Ķengarags, Pļavnieki un Bieriņi, kas pārstāv dažādus pilsētībūvniecības plānošanas un apbūves attīstības modeļus.

Rezultāti atklāj izteiktu centra–perifērijas sasniedzamības gradientu. Rīgas centra apkaimēs pakalpojumu sasniedzamība ir ievērojami augstāka, bet nomalēs esošajās apkaimēs zemāka. Detalizētā analīze parāda, ka vēsturiskajās jauktas apbūves teritorijās, piemēram, Āgenskalnā, pieejamība ir augsta, bet padomju periodā būvētajos lielmēroga dzīvojamajos rajonos, piemēram, Ķengaragā un Pļavniekos, vērojama laba tirdzniecības pakalpojumu pieejamība, bet būtiski veselības aprūpes pakalpojumu trūkumi. Savukārt ārpuspilsētas teritorijās, piemēram, Bieriņos, kopējais pakalpojumu nodrošinājums un sasniedzamība ir ļoti zema.

INTEGRĒTA ĢEOTELPISKĀ INFORMĀCIJAS INFRASTRUKTŪRA KĀ PRIEKŠNOSACĪJUMS TELPISKĀS ATTĪSTĪBAS POLITIKAS ĪSTENOŠANAI PAŠVALDĪBĀS

Ieva Korna, Armands Auziņš, Māris Kaļinka

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Policentriskā telpiskā attīstība paredz līdzsvarotu reģionu izaugsmi, ekonomisko centru attīstību, vienmērīgu pakalpojumu pieejamību izkliedi, un koordinētu infrastruktūras plānošanu, attīstot vairākus funkcionālos centrus un mazinot telpisko nevienlīdzību. Pašvaldībām šajā procesā ir centrāla loma, jo policentriskā attīstība praktiskajā līmenī veidojas caur to plānošanas lēmumiem. Attiecīgi šādu mērķu sasniegšanai un novērtēšanai jābalstās uz ģeotelpisko datu izmantošanu. Tomēr telpisko datu izmantošana pašvaldībās ir fragmentēta un nepietiekami integrēta lēmumu pieņemšanas procesos.

Pētījuma mērķis ir izvērtēt, vai Latvijas pašvaldībās izveidotā telpisko datu infrastruktūra (SDI) un integrētās ģeotelpiskās informācijas ietvara (IGIF) komponentes nodrošina pietiekamu institucionālo un tehnisko briedumu, lai veicinātu sistemātisku, datus balstītu lēmumu pieņemšanu pašvaldību likumā noteikto autonomo funkciju īstenošanā.

Pētījumā izmantotas kvalitatīvās pētniecības metodes. Veikta normatīvo aktu analīze, identificējot pašvaldību autonomās funkcijas, ar tām saistītos tiesiskos regulējumus un no tiem izrietošās telpisko datu vajadzības. Tika īstenotas daļēji strukturētas intervijas ar pašvaldību pārstāvjiem par telpisko datu pārvaldību un izmantošanu pašvaldību darbībā. Balstoties uz dokumentu analīzi, atvērto datu resursiem un ekspertu konsultācijām, telpiskie dati strukturēti tematiskajās grupās. Uz šīs struktūras pamata izveidota novērtējuma matrica telpisko datu nozīmīguma izvērtēšanai visu 22 autonomo funkciju īstenošanā.

Pētījuma rezultāti liecina, ka telpiskie dati ir būtiski 19 no 22 pašvaldību autonomo funkciju īstenošanas, īpaši transporta un infrastruktūras plānošanas, teritorijas attīstības, pakalpojumu pieejamības un drošības jomās. Tomēr to izmantošana pašvaldībās ir fragmentēta un nepietiekami koordinēta starp struktūrvienībām, un telpiskie dati pārsvarā tiek izmantoti kartogrāfiskā un operatīvā līmenī. Tās norāda, ka telpiskie dati Latvijas pašvaldībās ir būtisks, bet nepilnīgi izmantots resurss, un to integrācijai lēmumu pieņemšanā nepieciešama vienota telpisko datu pārvaldības pieeja, kapacitātes stiprināšana un telpisko datu infrastruktūras attīstība.

7.3. sekcija. **DROŠĪBA DEMOKRĀTIJĀ: BRĪVĪBAS UN
KONTROLES LĪDZSVARS SABIEDRĪBĀ
UN ZINĀTNĒ /**

**SECURITY IN DEMOCRACY:
THE BALANCE BETWEEN FREEDOM
AND CONTROL IN SOCIETY
AND SCIENCE STRENGTHENING
GLOBAL COMPETITIVENESS**

THE RELATIONSHIP BETWEEN THE UN SECURITY COUNCIL AND THE UN GENERAL ASSEMBLY

Ieva Miļūna

Riga Graduate School of Law

The UN Security Council and the UN General Assembly both are entitled to rule on the maintenance of international peace and security. It has been stipulated in the UN Charter. However, the author explores the thesis whether the UN General Assembly may serve as a counterweight in cases of Chapter VII of the UN Charter decisions, when the UN Security Council is blocked due to its veto powers. The case of Ukraine serves as an example, when the UN General Assembly appeared as a significant player in ruling on the issues of the on-going war. Also, the “Veto Initiative”, which requires the UN Security Council members to explain the use of their vetoes before the UN General Assembly may point out to the consensus that there is time to the abolition of vetoes. Moreover, significant number of UN Member States have signed the Code of Conduct which requires to desist from using vetoes in cases of crimes against humanity, war crimes and genocide. The author concludes that the UN General Assembly shall be entrusted with a more important role in the issues of maintenance of international peace and security.

The author has used doctrinal and qualitative research methods to conduct her research.

COUNTERING PROPAGANDA AND DISINFORMATION IN WARTIME: THE CASE OF NGOS AND PROFESSIONAL ORGANIZATIONS IN UKRAINE

Hanna Paliļ

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Ukraine, while facing a high-intensity war, is simultaneously subjected to massive attacks of propaganda, disinformation, and the full spectrum of hybrid operations conducted by Russia. Russia's activities in the information sphere, which are offensive and toxic in nature, are also directed at the Baltic states, posing threats to their national security and social cohesion, as well as to their coordinated support for Ukraine.

For Latvia, which is located in a risk zone of informational, hybrid, and direct challenges from Russia, the experience developed by Ukrainian NGOs and professional organizations in countering such threats has practical significance and represents valuable knowledge for potential application.

Therefore, the aim of this study is to highlight effective directions and practical approaches implemented by civil society organizations, professional and journalistic associations and initiatives in Ukraine. In order to counter threats to national security in the information sphere, these organizations actively cooperate with relevant national authorities and international partners. Ukrainian society remains highly active, and the civic sector is involved through various formats in the broader system of countering propaganda and disinformation.

Particular attention is paid to the need to debunk historical myths and contemporary manipulative narratives produced by Russia, including distortions of the course of the war, international politics, and other issues. Among the most effective practices are media monitoring and fact-checking, the rapid exposure of disinformation and fake news, public rebuttals and explanatory communication, information and media literacy campaigns, as well as the development of methodological recommendations for experts and citizens.

The research identifies networks of effective organizations and the most successful, tested, and scalable countermeasures, contributing to a better understanding of the resilience of counter-disinformation systems under wartime conditions.

MEDIA REGULATION AS AN INDICATOR OF FREEDOM OF SPEECH: SOME HISTORICAL EXAMPLES AND UPCOMING AMENDMENTS TO LATVIA'S PRESS LAW

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On February 19 this year, the Saeima (Parliament of Latvia) supported in the first reading the draft law developed by the Ministry of Culture “Amendments to the Law on the Press and Other Mass Media” (No. 1199/Lp14). The draft is based on Latvia’s obligation to implement the Regulation (EU) 2024/1083 (the so-called European Media Freedom Act), essentially to ensure media freedom.

The author of the report will focus on only one aspect – the proposal to supplement Article 9 of the Press law with a seventh part in the following wording: “Prior to registering a mass media the Enterprise Register shall request the opinion of the Ministry of Culture on the compliance of the mass media outlet with this law and other regulatory acts in the field of media services.”

In the author’s opinion, this proposal conceptually changes the regulation of the press in Latvia, moving from the current “registration” system to a “licensing” system. Furthermore, the draft law does not specify the procedure for submitting the “opinion of the Ministry of Culture,” does not set any criteria for evaluating mass media, nor does it specify the procedure for reviewing the legality of the “opinion” of this executive body. It is unclear how the Ministry of Culture will be able to evaluate the activities of a mass media outlet before it begins operating (before registration).

This proposal gives the executive branch the right to issue positive/negative opinions on the registration of mass media outlets, thereby directly affecting freedom of the press (freedom of speech), which is a human right and one of the fundamental elements of a democratic state.

The initiative evokes negative associations with the interwar period: under the 1924 Press Law, the establishment of a press publication was based on an application by the publisher and editor-in-chief, which the Minister of the Interior could reject only in technical cases exhaustively listed in the law; In 1938, the Press Law adopted by the K. Ulmanis authoritarian government stipulated a transition to the “permit” principle – permission from the Ministry of Public Affairs was required to register mass media (at that time, the press). Latvian press history authorities prof. R. Treijs and prof. A. Dimants have always cited these two different laws as examples of democratic and authoritarian state action.

Based on a 1938 law, most of the press publishers in Latvia were shut down – the Ministry of Public Affairs had given them negative reviews. Among them was the Russian Lawyers’ Association magazine “Zakon i Sud”, while the journal of the Riga German Lawyers’ Association, “Rigasche Zeitschrift fur Rechtswissenschaft”, was “added” to the Herder Institute in Riga, and the law journal “Jurists”, published by the association “Aequitas”, lost its independence and was “incorporated” into the structure of the University of Latvia.

The author of the paper calls for reflection on the mistakes made in Latvia's history, for ensuring that they are not repeated, and for guaranteeing freedom of the press in Latvia, which is particularly important for the protection of the country's democratic system – now more than ever.

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DISINFORMATION AND POLITICAL RADICALIZATION RISKS IN THE DIGITAL ENVIRONMENT: PUBLIC DISCOURSE ON THE ISTANBUL CONVENTION IN LATVIA

Eva Gaigalnice

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The role of digital communication environments in the development of political debates, where the spread of information is facilitated, but at the same time, the spread of disinformation, emotional, and radicalized political narratives, which can lead to political radicalization, is a notable phenomenon. Social media has become a key site for political communication, where the contested ideologies and identity-based political narratives are often communicated. This has been observed, especially in the context of politically sensitive policy debates.

The ratification of the Istanbul Convention by the Latvian parliament in November 2023, and the subsequent political initiative to withdraw from the Convention in 2025, has become one of the most polarized political debates in the recent history of Latvian politics. Despite the fact that the Convention aims to strengthen the mechanisms for preventing violence against women and domestic violence, the public debate has moved from the realm of law and policy to the realm of political ideologies, especially around the concept of gender, sovereignty, and identity.

The research question that is being explored by the study is – how do the narratives of disinformation, and the phenomenon of radicalization, emerge and evolve in the context of the public discourse around the Istanbul Convention?

The study uses a qualitative content analysis of Facebook-based discourse at three points of the debate: the ratification phase (2023), the withdrawal mobilization phase (2025), and the political aftermath of the parliamentary vote to withdraw from the Convention. The sample consists of 45 highly visible Facebook posts, together with 240 comments.

The results show that the online discourse was largely driven by narratives about the Convention threatening traditional values, national sovereignty, and social stability. Disinformation, such as the over-dramatization of the concept of “gender ideology,” was a key factor in the shaping of the discourse, leading to public reaction to the Convention.

The research demonstrates the role of disinformation-based narratives that can turn policy debates into identity-based conflicts, leading to a more radicalized political discourse online.

Project No 5.2.1.1.i.0/2/24/I/CFLA/007 “Internal and External Consolidation of the University of Latvia” of the second round of the Consolidation and Governance Change Implementation Grants within Investment 5.2.1.1.i “Research, Development and Consolidation Grants” under Reform 5.2.1.r “Higher Education and Science Excellence and Governance Reform” of Reform and Investment Strand 5.2 of the Latvian Recovery and Resilience Mechanism Plan “Ensuring Change in the Governance Model of Higher Education Institutions”

THE RELATIONSHIP BETWEEN THE UN SECURITY COUNCIL AND THE UN GENERAL ASSEMBLY

Ieva Miļūna

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The UN Security Council and the UN General Assembly both are entitled to rule on the maintenance of international peace and security. It has been stipulated in the UN Charter. However, the author explores the thesis whether the UN General Assembly may serve as a counterweight in cases of Chapter VII of the UN Charter decisions, when the UN Security Council is blocked due to its veto powers. The case of Ukraine serves as an example, when the UN General Assembly appeared as a significant player in ruling on the issues of the on-going war. Also, the “Veto Initiative”, which requires the UN Security Council members to explain the use of their vetoes before the UN General Assembly may point out to the consensus that there is time to the abolition of vetoes. Moreover, significant number of UN Member States have signed the Code of Conduct which requires to desist from using vetoes in cases of crimes against humanity, war crimes and genocide. The author concludes that the UN General Assembly shall be entrusted with a more important role in the issues of maintenance of international peace and security.

The author has used doctrinal and qualitative research methods to conduct her research.

8

**Vides ilgtspēja un klimata
pārmaiņu mazināšana /**

- **Environmental sustainability
and climate change mitigation**

8.1. plenārsēde. **HIDROSOCIĀLĀS PĪEEJAS ŪDEŅU
PĒTNIECĪBĀ UN PĀRVALDĪBĀ /**
HYDROSOCIAL APPROACHES
TO WATER RESEARCH
AND GOVERNANCE

ŪDENSTŪRISMA EKOLOĢIJAS: UPE KĀ HIDROSOCIĀLO IZTĒĻU UN RĪCĪBU EKOSISTĒMA

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Upju ekoloģiskās aizsardzības politika Latvijā vēsturiski veidojusies līdztekus ūdenstūrisma attīstībai, norādot uz saskarsmes punktiem starp dažādām hidrosociālajām iztēlēm jeb vēlamajām upju hidroekoloģiskajām konfigurācijām. Hidrosociālā iztēle ir koncepts, kura ietvaros upes tiek saprastas ne tikai kā biofizikālas ekosistēmas, bet kā sociālas un politiskas realitātes, kurās materializējas dažādi normatīvi, zinātniski un estētiski rāmēti, institucionāli nostiprināti naratīvi un rīcības attiecībā uz upēm, to vēlamā funkcionalitāti un hidroekoloģisko stāvokli. Atbilstoši tam, pētījuma fokusā ir jautājums par to, kādas hidrosociālās iztēles figurē ūdenstūrisma, kā tās sasaucas vai atšķiras no formālajām upju apsaimniekošanas politikām un materializējas dažādās upju ekoloģiskās pielāgošanas rīcībās. Balstoties uz intervijām ar ūdenstūrisma jomas dalībniekiem, pētījums izgaismo, kā ūdenstūrisms iedzīvina un nostiprina dabas aizsardzības iztēli par upēm kā hidroekoloģiskām vienībām, validē un līdzveido dažādas upju hidroekoloģiskās eksistences, leģitimizē upju aizsardzības un apsaimniekošanas politikas, vienlaikus apstrīdot pārvaldības normas un norādot uz to nekonsekvencēm. Vairums ūdenstūrisma prakšu ne vien ietver multisensoru hidroekoloģisko mācīšanos par upju dažādību un pārmaiņām, bet arī īsteno neformālu vides apsaimniekošanu un signalizē par upju pārtūristiskošanos. Ūdenstūrisms nav tikai “ietekme uz vidi” vai “antropogēnā slodze”, bet arī nozīmīga hidrosociālā prakse, kas rada alternatīvas, ķermeniski situētas upju izpratnes un dažādo dominējošās hidrosociālās iztēles. Pārdefinējot ūdenstūrisma no sociālas uz ekoloģisku praksi, bet ūdenstūristus no pasīviem dabas lietotājiem par aktīviem hidrosociālajiem dalībniekiem, iezīmē plašāku loku ar dalībniekiem un kopsaucējiem diskusijā par upju ekoloģiski apzinātas koplietošanas nosacījumiem un to salāgošanu ne vien starp cilvēkiem, bet arī starp cilvēkiem, ūdeņiem un citām dzīvajām būtnēm.

Projekts “Ūdeņu kultūras: transformatīva pieeja ilgtspējīgām cilvēka-ūdeņu attiecībām” (Izp-2023/1-0248).

DABAS ATJAUNOŠANA PERIFĒRIJĀ: RŪPJU DISKURSI BEJAS DAMBJA NOJAUKŠANĀ

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Dambju nojaukšana Eiropā un citviet pasaulē aizvien biežāk tiek īstenota kā dabas atjaunošanas prakse, kas pārveido ne tikai upju ekosistēmas, bet arī cilvēku attiecības ar vēsturiski veidotām ainavām. Dažādu valstu pētījumi rāda, ka šādi projekti nereti kļūst par piemēriem, kuros globāli formulēti dabas aizsardzības mērķi sastopas ar lokālām vērtībām, vietas nozīmēm un atšķirīgām zināšanām par vidi. Latvijā no 2022. līdz 2023. gadam tika īstenots pirmais liela mēroga dambja nojaukšanas projekts – Bejas dambja demontāža Alūksnes upē. Tas notiek laikā, kad sabiedrības izpratne par dambju nozīmi mainās: būves, kas iepriekš tika uztvertas kā ainavas labiekārtošanas un vietējās attīstības elementi, biežāk tiek vērtētas kā šķēršļi upju ekoloģiskajai nepārtrauktībai. Pētījumā šīs sociāli ekoloģiskās izmaiņas analizētas, izmantojot rūpju ētikas pieeju. Veicot interviju, mediju un vēsturisko materiālu analīzi, identificēti trīs rūpēs balstīti diskursi. Ekoloģiskais diskurss, ko aktīvi atbalsta arī makšķernieku kopienas, uzsver upes dabiskā tecējuma atjaunošanu un migrējošo sugu dzīvotņu uzlabošanu. Vietā balstītais jeb kultūrvēsturiskais diskurss akcentē dambja un muižas seno vēsturi, ierasto ainavu un vietējo iedzīvotāju attiecības ar vietu. Hibrīdais diskurss atbalsta dambja nojaukšanu ar nosacījumu, ka vietas vēsturiskā nozīme tiek atzīta un simboliski saglabāta. Vietējo iedzīvotāju stāstos atklājas dažādu zaudējumu akumulēšanās, kas saistīta ar pārmaiņām ierastajā ainavā un ilgstošām sociāli telpiskām mijattiecībām. Bejas dambja nojaukšanas gadījums izgaismo to, ka dabas atjaunošana vienlaikus pārkārto attiecības ar vietu un vidi, aktualizējot jautājumu par to, kuras rūpes iegūst institucionālu atzīšanu un kuras paliek ārpus lēmumu pieņemšanas ietvariem.

Projekts “Ūdeņu kultūras: transformatīva pieeja ilgtspējīgām cilvēka-ūdeņu attiecībām” (Izp-2023/1-0248).

UPES VĒSTĪJUMI LAIKĀ UN TELPĀ: PĒTNIECĪBĀ-BALSTĪTA METODOLOĢISKA LĪDZDALĪBAS PIEEJA SALDŪDENS EKOSISTĒMU KARTĒŠANĀ

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Ūdeņu pētniecībā ekosistēmu pakalpojumu pieeja ir būtiski stiprinājusi saikni starp ekosistēmu funkcionēšanu un cilvēku labbūtību, piedāvājot strukturētu telpiska novērtējuma ietvaru kā rīku efektīvizēt lēmumu pieņemšanu šīs nozares pārvaldības jautājumos. Vienlaikus praksē novērojama ierobežota saldūdens ekosistēmu hidro-sociālo saskarsmju apzināšana laikā un telpā, tostarp, kā ūdeņi veidojas attiecībās starp biofizikāliem procesiem, kultūras nozīmēm un institucionālām izvēlēm. Kā mainās izpratne par ūdeņu pārvaldības iespējamām trajektorijām, kad upes tiek pozicionētas ne vien kā pakalpojumu sniedzējas, bet arī kā līdzdalībnieces, lai vēstītu par ainavtelpas atmiņām un tās mainību saistībā ar klimatiskām un antropoloģiskām ietekmēm? Vai šāda vairāk-nekā-cilvēka perspektīva var veicināt iekļaujošas koprades prakses esošās vides biofizikālās situācijas novērtējumā un līdzdalīgā nākotņu veidošanā?

Ziņojums aktualizē metodoloģijas ietvaru, kas attīstīts situētā gadījuma izpētē Ventas ielejā, Kuldīgas novadā, aktualizējot iedzīvotāju pieredzi saskarsmē ar vietējās upes ainavtelpu kā līdzāspastāvošu dinamisku ekosistēmu. Īstenojot līdzdalīgu iesaistes darbnīcu, tika pielietota dizaina-pieejas kartēšanas, stāstniecības, simboliskās domāšanas un arhīvu fragmentu analīzes metodes, strukturēta trīs spekulatīvos slāņos: krasti kā atmiņu un iemiesotas pieredzes telpa; gulte kā cilvēka ietekmju un pārvaldības prakšu nospiedumi; nākotnes harta kā kolektīvu risinājumu un vērtību artikulācija. Šāda pieeja sniedza iespējas telpiski apzināt sociālas, ekoloģiskas, ekonomiskas un kultūras, tā skaitā mitoloģiskas nozīmes, demonstrējot, kā uzskatāmi nepietiekami pārstāvētas un kopienā balstītas zināšanas iespējams sistemātiski integrēt ūdeņu pētniecībā. Ziņojums piedāvā praktisku ietvesmu pētniekiem, plānotājiem un lēmumu pieņēmējiem, iekļaujošākām iesaistes praksēm un pārvaldības formām, kur ūdeņu ekosistēmas tiek atzītas par aktīvām attiecību līdzveidotājām kopīgas, sociāli un ekoloģiski noturīgas ainavtelpas veidošanā.

BEBRS “BRĪVI PLŪSTOŠO” UPJU REŽĪMĀ

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Bebru aizsprosti Latvijas mazajās upēs kļūst par vietām, kur saduras atšķirīgas izpratnes par to, kas ir laba upe, kā tai jāplūst un kādas attiecības ar ūdeni ir vēlamas. Konflikts nav par bebra bioloģisko klātbūtni kā tādu, bet par to, kādu upes stāvokli un kādu dabiskuma versiju pārvaldība izvēlas nostiprināt konkrētā vietā un laikā. Balstoties uz ekspertu aptauju, mēs analizēsim, kā bebru radītie šķēršļi tiek interpretēti apsaimniekošanā un kā tie iekļaujas diskusijās par ekoloģisko kvalitāti, līdzāspastāvēšanu un dabā balstītu risinājumu potenciālu. Starptautiskajā literatūrā bebris raksturoti kā ekosistēmu inženieri, kuri, būvējot aizsprostus, veicina bioloģisko daudzveidību, ūdens noturēšanu uz vietas un lokālo mazās ūdens aprites ciklu, vienlaikus pārveidojot upju hidroloģiju un biogeoķīmiskos procesus. Šī ietekme nav tikai ekoloģiska, tā pārraksta arī sociālās attiecības ar ūdeņiem, regulēšanas režīmus un priekšstatus par plūdumu, aktualizējot hidrosociālā cikla dimensiju. Mēs diskutēsim, kā šīs ekoloģiskās iespējas saskaras ar vietējām prioritātēm – straujteču aizsardzību, meliorācijas mantojumu un konfliktu mazināšanas loģiku; un vai iespējams formulēt kontekstuāli diferencētu pieeju, kas ļautu domāt ekoloģiskās zināšanas kopā ar apsaimniekošanas praksi, nevis pretstatā tai. Šādā skatījumā bebru aizsprosti nav tikai šķēršļi vai resursu jautājums, bet mezgli daudzugu attiecībās – vietas, kur tiek pārbaudītas iespējas “būt-kopā” ar upi citādā režīmā.

Projekts “Ūdeņu kultūras: transformatīva pieeja ilgtspējīgām cilvēka-ūdeņu attiecībām” (lzp-2023/1-0248).

STRAUMES POLITISKĀ EKONOMIKA: UPJU MATERIALITĀTES AĢENCES UN POLITIZĀCIJAS LATVIJAS UPĒS

Kārlis Lakševics

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Pēdējā dekadē ūdeņu pētniecībā arvien vairāk ienāk hidrosociālās pieejas, kas pievēršas tam, kāda ir upju biofizikālo īpašību sociāli politiskā aģence. Tādējādi ūdens plūstamība, sedimenti, barības vielas un ķīmiskais sastāvs tiek izprasti ne tikai kā stāvoklis, kas radies kā noteiktu procesu sekas, kas pieprasa konkrētas intervences vai kas paver telpu dažādu sugu dzīves telpai, bet to klātbūtne, esot dziļā sasaistē un nereti arī konfliktā ar esošām cilvēku darbībām, politikām un plāniem, iezīmē politiski piestrāvētu materialitāti. Balstoties uz trīs dažādām datu kopām, kas aplūko upju materialitāti Latvijas upēs – Bolupes upes infrastruktūrēšanas konflikta dokumentu analīzi, ekspertu aptauju par dabiskajiem šķēršļiem mazajās upēs un kvalitatīvajām intervijām ar laivotājiem un laivu iznomātājiem, prezentācijā es aplūkoju, kādos veidos upes materialitātes tiek redzētas kā iegūstam sociālpolitisku aģenci. Tā kā upju materialitātes interpretācijas atšķiras, es analizēju to interakcijas kā ontoloģisku cīņas lauku, kur sastopas upes plūsmas, novades un pārplūdes kontroles prakses, saimnieciskās intereses, eko-moderno dzīvīgo ūdeņu izpratnes, vēlme to pieredzēt kā piedzīvojumu un brīvības telpu, sugu un biotopu apdraudējums un neolibērālā ūdeņu un dabas aizsardzības pārvaldības fragmentācija. Kopumā interakcijas starp šīm ūdeņu “lasīšanas” praksēm atklāj, kurām upju biofizikālajām īpašībām Latvijā dažādos kontekstos tiek piedēvēta lielāka vērtība, kontrolējamība un ietekme un kurām – mazāka, kā arī kurām ir lielāka ietekme uz ūdeņu politizāciju un kurām – uz depolitizāciju.

Projekts “Ūdeņu kultūras: transformatīva pieeja ilgtspējīgām cilvēka-ūdeņu attiecībām” (Izp-2023/1-0248).

SLAPJAIS UN MITRAIS UZ MODERNITĀTES SLIEKŠŅA: JĀKOBĀ BENJAMINA FIŠERA “LIVONIJAS DABAS VĒSTURES” PIEMĒRS

Anne Sauka

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Cilvēka vēlme kontrolēt un piejaucēt ūdeņus, ko ilustrē arī zinātniskās valodas abstrakcija, kas ūdeni homogenizējusi, ielēdzot to ķīmiskajā formulā H_2O , iezīmē cilvēka-ūdeņu attiecību modernitātes nedienas. Šodien, vides un ūdeņu humanitārās zinātnes modernitātes skatījumu noliedz. Priekšplānā izvirzās šāds paralēlisms: kamēr ūdeņi pārvērtušies “ūdenī”, situētās un dzīvotās zināšanas pārtapušas zinātnisko zināšanu epistemoloģiskajā monokultūrā. Proti, modernitāte pieļauj tikai noteikta veida zināšanas un viena veida ūdeni.

Lai šo situāciju pārvarētu, pētnieki pievēršas dažāda veida situētām zināšanām, domājot līdz ar mākslu, analizējot folkloru un dzīvoto pieredzi, un tostarp, neatsakoties arī no zinātnes kā medija ūdeņu pieredzei un izpratnei. Sekojot šim aicinājumam pārdomāt ūdeņu daudzveidīgumu un savstarpējību ar cilvēku, arī es savos pētījumos izskatu alternatīvās cilvēka-ūdeņu attiecību genealōģiskās līnijas.

Šajā referātā mani īpaši interesē ūdeņi Jākoba Benjamina Fišera darbā “Livonijas dabas vēsture” (1791). Fišers studē botāniku pie Karla Linneja – lielā modernitātes klasifikatora, un viņa darbs reprezentē Apgaismības laikmetam raksturīgo pievēršanos dabas zinātniskajai izpētei, taču vienlaikus tas uzrāda arī modernitātes saknes pirmsmodernitātē, un tai raksturīgās cilvēka attiecības ar daudzveidīgi pieredzē sastopamiem ūdeņiem. Tādējādi šis darbs ļauj ieraudzīt valdošās cilvēka-ūdeņu attiecību līnijas veidošanos kā tādu, kas pati balstīta neviennozīmīgā zināšanu dažādībā, kur taksonomija un objektificējošs apraksts sastopas ar agrākiem priekšstatiem par cilvēka attiecībām ar mitrumu un slapjo. Referātā apkopota prelimenāra Latvijas teritoriju aprakstošā pētījuma analīze, ko vēlāk paredzēts pārvērst plašākā pētījumā par pirmsmodernā un modernā savstarpējību cilvēka-ūdeņu attiecībās.

Projekts “Ūdeņu kultūras: transformatīva pieeja ilgtspējīgām cilvēka-ūdeņu attiecībām” (Izp-2023/1-0248).

UPJU SAGLABĀŠANAS DISKURSI LATVIJĀ: DISKUSIJA PAR DAUGAVPILS HES BŪVNICĪBU LAIKRAKSTĀ “LITERATŪRA UN MĀKSĻA” (1986–1987)

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Džeina Dosone vides aizsardzības tēmas, kas kalpoja par katalizatoru dažāda veida protestiem pret pastāvošo iekārtu Padomju Savienībā 80. gados, tai skaitā Latvijas PSR, saista ar ekonacionālismu kā politisku un sociālu parādību. Viņa apgalvo, ka ekoloģiskās kustības kalpoja vismaz daļēji par aizsegu politiskajiem mērķiem un ne vienmēr bija saistīta ar attīstītu vides problēmu apziņu. Lai gan nevar noliegt tā laika aktīvisma spēju sasaistīt ekoloģiskos, identitātes un politiskos jautājumus, nav arī iespējams nošķirt ekoloģiskās tēmas kā tikai aizsegu kaut kam citam. Drīzāk jājauc, kā ekoloģiskie diskursi tiek pārņemti, pārinterpretāti un no jauna radīti konkrētajā situācijā.

Referātā pievērsīšos vislavenākajam piemēram no Latvijas 80. gadu ekoloģiskā aktīvisma vēstures – cīņai pret Daugavpils HES celtniecību. Konkrēti analizēšu diskusiju par būvniecību laikrakstā “Literatūra un Māksla”, identificējot un raksturojot tajā izmantotos diskursus. Jāņem arī vērā, ka protesti pret aizsprostu un hidroelektrostaciju būvniecību ir viena no visplašāk pētītajām tēmām saistībā ar upju aizsardzības aktīvismu. Referātā centīšos parādīt Daugavpils HES gadījumu plašākā vēsturiskā un starptautiskā kontekstā.

Projekts “Ūdeņu kultūras: transformatīva pieeja ilgtspējīgām cilvēka-ūdeņu attiecībām” (lzp-2023/1-0248).

NEKĀRTĪGIE ŪDEŅI: KARTĒJOT SASTAPŠANĀS ROBEŽAS STARP ŪDEŅAINĀM MATERIALITĀTĒM

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Navigējot mūsdienu vides ģenealoģiju lauku, hidrosociālā jēdziena konteksts gan vides humanitārajās zinātnēs, gan ikdienišķās sadzīves formās vedina būt vērīgam pret veidiem, kā konceptualizējam ūdeņainās materialitātes pieredzi. Hidrofeminisma un jaunā materiālisma filosofija vienojas idejā, ka (sa)dzīvošana pasaulē saistās ar to, kā pasaule ir iztēlota. Šī atziņa ļauj pārdomāt līdzšinējos pieņēmumus, kas savstarpējības procesos balsta *paša* un (vairāk-nekā-cilvēka) *cita* sastapšanās pieredzi. Šādā tvērumā iespējams iztaujāt līdzšinējo duālistisko pasaules kārtību, kas ar negatīvu uzskatījumu iztēlo ūdeņainās materialitātes nekārtību vai juceklību gan kā nevietā sastapto, kārtību izjaucošo ūdeni, gan kā cilvēka nolaidības radīto nekārtību ūdens ekosistēmās. Sekojot idejai par ūdeņainām attiecībām kā materiāli-diskursīviem mezglojumiem, vedinu uz alternatīvu uzskatījumu ūdeņu nekārtības sastapšanai un priekšstatīšanai. Kā procesuāli iztēloties mijattiecības ar materialitāti, kurā izmaiņas neaprobežojas ar antropocentriskām un hierarhiski pakļaujošām sadzīves formām un kurā vairāk-nekā-cilvēka citi figurē kā aficēt- un rīcīb- spējīgi dalībnieki? Savā pētījumā, vadoties pēc Astrīdas Neimanis un Žila Delēza filosofijas, piedāvāju domāt ūdeņus līdzās citādības (alterity) nojēgumam. Šis skatījums ļauj ne tikai kartēt valdošās attieksmes pret “dabisko citu” kā reducējošu vai baisu ne-es kategoriju, bet arī domāt citādiskošanas procesu caur savienošanos un distancēšanas sakārtojumiem (assamblages), konceptualizējot ūdens nekārtību kā radošu spēku, kas iesaistās alternatīvā pasaules-sarežģītības ainas veidošanā.

Projekts “Ūdeņu kultūras: transformatīva pieeja ilgtspējīgām cilvēka-ūdeņu attiecībām” (Izp-2023/1-0248).

EITROFIKĀCIJAS SOCIĀLĀ DIMENSIJA: SABIEDRĪBAS UZTVERE UN DABĀ BALSTĪTU RISINĀJUMU PIEŅEMAMĪBA BALTIJAS JŪRAS REĢIONĀ (Stenda referāts)

Agnese Reķe, Anda Ruskule, Ivo Vinogradovs, Anita Zariņa

Latvijas Universitāte

Eitrofikācija ir viens no būtiskākajiem ūdens kvalitātes izaicinājumiem Baltijas jūras reģionā, kas ietekmē gan iekšzemes ūdeņus, gan Baltijas jūras ekosistēmu. Lai gan eitrofikācija jau ilgstoši ir ūdens pārvaldības un regulējumu, kā arī ūdens kvalitātes pētījumu fokusā, problēmas sociālā dimensija – sabiedrības zināšanas un attieksme pret eitrofikāciju un risinājumiem tās mazināšanai – ir maz pētīta.

Referātā tiks prezentēti starpvalstu sabiedriskās domas pētījuma rezultāti, kas iegūti starptautiskā projektā CREATE 5 Baltijas jūras reģiona valstīs: Latvijā, Lietuvā, Igaunijā, Somijā un Polijā. Pētījuma mērķis ir analizēt iedzīvotāju zināšanas par eitrofikāciju, uztveri par ūdeņu sniegtajiem ekosistēmu pakalpojumiem, priekšstatus par piesārņojuma cēloņiem un ietekmēm, kā arī attieksmi pret dabā balstītiem risinājumiem ūdens kvalitātes uzlabošanai.

Aptauja aptver jautājumus par personīgo saikni ar konkrētiem ūdensobjektiem, novērotajām ūdens kvalitātes izmaiņām, problēmas aktualitātes vērtējumu un atbalstu tādiem risinājumiem kā mitrāju un palieņu atjaunošana, buferjoslu veidošana, kā arī gliemeņu un aļģu audzēšana jūrā. Analīze ļauj salīdzināt sabiedrības uztveri dažādās valstīs un izvērtēt dabā balstītu risinājumu sociālo pieņemamību.

Pētījums sniedz ieguldījumu diskusijā par sabiedrības zināšanu, vērtību un attieksmju nozīmi ceļā uz ilgtspējīgu ūdeņu apsaimniekošanu.

Projekts “Cross-REalm modelling and assessment of Aquatic ecosystem services: Towards a science-based design of nature-based solutions to tackle Eutrophication” (CREATE, ES RTD/2025/06).

ZEMES SEGUMA UN ZEMES LIETOJUMA IZMAIŅAS TĒRVETES UPES AINAVĀ LAUKSAIMNIECĪBAS INTENSIFIKĀCIJAS IETEKMĒ (Stenda referāts)

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Pētījumā analizētas zemes lietojuma un zemes seguma izmaiņas Tērvetes upes 100 m buferjoslā laika posmā no 2015. līdz 2024. gadam, izvērtējot tās lauksaimniecības intensifikācijas kontekstā. Pētījuma mērķis ir noskaidrot, kā šajā periodā mainījusies Tērvetes upes ainava un kā šīs pārmaiņas saistītas ar lauksaimniecisko darbību un atbalsta politiku. Darba teorētiskajā daļā apkopota literatūra par lauksaimniecības intensifikācijas ietekmi uz upju ekoloģisko kvalitāti un buferjoslu nozīmi ūdens aizsardzībā, kā arī aplūkota dabā balstītu risinājumu loma ilgtspējīgā ainavu pārvaldībā. Upju buferjoslas raksturotas kā nozīmīgs pārejas elements starp lauksaimniecībā izmantojamo zemi un ūdeni, kas spēj mazināt barības vielu noteci, stabilizēt krastus un uzturēt bioloģisko daudzveidību. Pētījumā veikta telpiskā analīze, izmantojot ģeogrāfiskās informācijas sistēmas un kartogrāfiskos materiālus, lai noteiktu dabiskā seguma, aramzemju un citu zemes lietojuma veidu izmaiņas Tērvetes upes buferjoslā. Papildus analizēta agrovides pasākumu un ekoshēmu teritoriālā izplatība, izvērtējot to iespējamo ietekmi uz ainavas struktūru. Rezultāti liecina, ka atsevišķos upes posmos aramzemes pietuvojušās ūdensmalai, bet dabiskās veģetācijas joslas kļuvušas šaurākas vai fragmentētākas. Vienlaikus identificētas teritorijas ar potenciālu stiprināt dabā balstītus risinājumus, tostarp koku un zālāju buferjoslu atjaunošanu, kā arī upes ieleju atjaunošanu.

UPJU LOMA APDZĪVOJUMA TESPISKO STRUKTŪRU VEIDOŠANĀ LĪDZENUMA AINAVĀ: VIRCAVAS BASEINA PIEMĒRS (Stenda referāts)

Dita Kokoreviča

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Darbā tiek analizēta upju nozīme apdzīvājuma telpisko struktūru veidošanā līdzenuma ainavā, par piemēru tika izvēlēts Vircavas upes baseins Zemgales līdzenumā. Pētījuma mērķis ir noskaidrot, kādas bija apdzīvājuma izvietojuma īpatnības saistībā ar ūdenstecēm 20. gadsimta 20.–40. gados, īpašu uzmanību pievēršot vecsaimniecību un jaunsaimniecību telpiskajam novietojumam attiecībā pret hidrogrāfisko tīklu. Darba teorētiskajā daļā apkopota zinātniskā literatūra par apdzīvājuma veidošanos pie ūdens objektiem Eiropas un Latvijas kontekstā, analizējot dabas, saimnieciskos un politiskos faktorus, kas ietekmējuši apdzīvājuma attīstību saistībā ar ūdensobjektiem. Pētījumā veikta vēsturisko kartogrāfisko materiālu analīze un uz to pamata izstrādātas tematiskās kartes, rekonstruējot saimniecību, kā arī hidrogrāfiskā un ceļu tīkla izvietojumu Vircavas upes baseinā. Balstoties uz izveidotajām kartēm, veikta apdzīvājuma telpiskā analīze, nosakot saimniecību attālumu līdz ūdenstecēm un izvērtējot izvietojuma likumsakarības starp vecsaimniecībām un jaunsaimniecībām. Rezultāti liecina, ka upes ir kalpojušas kā būtisks strukturējošs elements līdzenuma ainavā, ietekmējot gan saimniecību novietojumu, gan zemes izmantošanas veidus.

ŪDENS PILSĒTĀ: STRŪKLAKAS KĀ ŪDENS KLĀTBŪTNES FORMA RĪGĀ 20. GADSIMTĀ (Stenda referāts)

Andrejs Mežinskis

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Ūdensapgādes infrastruktūra mūsdienu pilsētās ir pārsvarā neredzama un atrodas pazemē, un strūklakas ir viens no dažiem veidiem, kā ūdens apzināti parādās un tiek padarīts redzams publiskajā telpā. Tās atspoguļo dažādus veidus, kā cilvēki attiecas pret ūdeņiem pilsētvidē dažādos laikos. Strūklakas atrodamas dažādās telpiskos kontekstos – dārzos un parkos, rūpnīcu un slimnīcu pagalmos, daudzdzīvokļu ēku pagalmos, reprezentatīvu ēku priekšlaukumos. Dažāds ir arī strūklaku veidols – baseinu forma, sprauslu daudzums, skulpturālu elementu iekļaušana. Šī daudzveidība nav nejauša, to ietekmē tādi apstākļi kā tehnoloģiskās iespējas, dominējošās sociālās un ideoloģiskās nostādnēs. Dažos kontekstos strūklakas var funkcionēt kā rekreatīvi elementi, citos kā telpu strukturējoši akcenti, vietzīmes, bet vēl citos kā tehnisku (piemēram, gaisa kondicionēšanas) sistēmu sastāvdaļas. Referātā apskatītas strūklaku funkciju, telpiskā konteksta un izskata pārmaiņas Rīgā 20. gadsimtā, pievēršoties diviem vēsturiskajiem periodiem – Pirmās republikas laikam (1918–1940) un padomju laikiem (1944–1991). Tā izstrādē izmantoti vēsturiski kartogrāfiskie materiāli un arhīvu dati, lai līdztekus analizētu telpisko kontekstu un to funkcionālo un sociālo lomu, uzrādot to saistības.

BIBLISKĀS PARADIGMAS, MĀRTIŅA LUTERA TEOLOĢIJA UN JAUTĀJUMS PAR DZĪVNIEMIEM

Ralfs Kokins

Latvijas Universitāte

Vai dzīvniekiem ir dvēsele? Vai dzīvnieki spēj apzināties ciešanas? Kā tie piedalās mūsu dzīvē un kāda ir to vieta mūsu eshatoloģiskajās rīcībās? Vai dzīvnieki tiks izglābti mūžībai? Mūsdienu akadēmiskajā diskursā šāda veida jautājumi bieži tiek marginalizēti kā pārlietu sentimentāli vai konceptuāli nenobrieduši. Tie nereti tiek reducēti līdz ideoloģiskiem, juridiskiem un selektīvi no dabaszinātnēm aizgūtiem argumentiem. Teoloģiskajā refleksijā par dzīvniekiem pārsteidzoši maz tiek izmantoti tieši teoloģiski argumenti, tāpēc referāts no jauna aktualizē dzīvnieku jautājumu teoloģijā, balstoties uz bibliskajām pamatparadigmām, kā arī izgaismojot mazāk zināmus vai retāk aplūkotos aspektus Mārtiņa Lutera teoloģijā. Šāda pieeja ne tikai palīdz aizpildīt teoloģisko vakuumu dzīvnieku ētikas jautājumos, bet arī veido pamatu argumentētam starpdisciplināram dialogam starp teoloģiju, filozofiju, bioētiku un dabaszinātnēm, vienlaikus aktualizējot jautājumu par cilvēka morālo atbildību radības kopainā.

AINAVA, IDENTITĀTE UN EKO-SOCIĀLĀ RĪCĪBSPĒJA PĒCKARA LATVIJĀ

Ieva Garda-Rozenberga

LU Literatūras, folkloras un mākslas institūts

Otrais pasaules karš un tam sekojošā padomju militārā, ekonomiskā un industriālā politika būtiski pārveidoja Latvijas ekonomiskās, demogrāfiskās un sociālās struktūras, transformējot arī vidi un ainavu gan laukos, gan pilsētās. Mūsdienās kara un padomju režīma mantojums joprojām ir redzams bezpersoniskās, standartizētās pilsētvidēs, pamestās lauku teritorijās un degradētās, militāri piesārņotās vietās. Šie satricinājumi ne tikai izmainīja fizisko ainavu, bet arī pārveidoja cilvēku emocionālās saites ar apkārtni, aktualizējot jautājumus par vietas identitāti, eko-sociālo rīcībspēju un eko-nacionālajiem procesiem. Šajā kontekstā daba pakāpeniski kļuva par piederības un pretestības simbolu, un rūpes par vidi kļuva neatraujami saistītas ar rūpēm par mājām un nāciju. Kā norādījusi Katrīna Švarca, vides apdraudējumi bieži tika interpretēti kā draudi pašai nācijai.

Latvijas pieredze rāda, ka vides iesaisti nav iespējams izprast, neņemot vērā vietu, atmiņu un identitāti. Gan nacionāla mēroga protestos pret hidroelektrostaciju būvniecību, gan lokālajās kopienu iniciatīvās vides aizsardzība funkcionēja kā dziļi iesakņota eko-sociālās rīcībspējas forma. Šīs darbības bija atbilde ne tikai uz ekoloģisko kaitējumu, bet arī uz draudiem kultūras nepārtrauktībai, dzīvām ainavām un kopienu autonomijai. Tādējādi eko-nacionālisms attīstījās gan kā reakcija, gan kā identitātes izpausme, kur daba kļuva par piederības, zaudējuma un pretestības simbolu. Analizētie gadījumu pētījumi parāda, ka rūpes par vidi ir neatraujamas no rūpēm par savu mājvietu un nāciju. Turklāt šis cīņās atklāj politiskās, ekoloģiskās un emocionālās ģeogrāfijas savstarpēju saplūšanu. Savukārt vides aizsardzība kļūst par līdzekli, ar kura palīdzību cilvēki apliecina savas tiesības uz vietu, atgūst rīcībspēju un veido nepārtrauktības stāstījumu uzspiestu pārmaiņu apstākļos, aizsargājot dabu kā resursu, nacionālu simbolu un sociāli iesakņotu telpu.

Projekts "Pēckara Latvijas vides vēsture: ainavas, vara un sabiedrība" (Nr. Izp-2025/1-0599)

DÉTENTE ZAĻĀ DIMENSIJA: VIDES AIZSARDZĪBAS POLITIKAS TRANSFORMĀCIJA PSRS STARPTAUTISKĀ SASPĪLĒJUMA ATSLĀBUMA KONTEKSTĀ (1969–1979)

Aleksandrs Petrovs

Latvijas Universitāte

Starptautiskā saspīlējuma atslābums jeb vienkārši *détente* (no franču val. – atslābums) bija 1960. gadu beigās un 1970. gados starp PSRS un Rietumvalstīm izveidojies ārpolitikas modelis, kura ietvaros starp abiem toreizējiem pasaules politiskajiem “poliem” norisinājās Aukstā kara laikmetam bezprecedenta sadarbība. Tās rezultātā tika noslēgtas vairākas vienošanās un īstenotas kopīgas programmas aizsardzības, ekonomikas, kultūras, tirdzniecības, kā arī vides aizsardzības jomā.

Tomēr šī sadarbība nozīmēja ne tikai ideju un labāko praksi sintēzi, bet arī konkurenci. Īpaši jāņem vērā, ka vides aizsardzības politikas iekšējās organizācijas jomā starp abām sistēmām kompromisi objektīvi nebija iespējami. Kamēr padomju vides aizsardzības sistēma bija balstīta uz 1917. gadā veikto vispārējo zemes un dabas resursu nacionalizāciju, ASV un lielā mērā arī citu Rietumvalstu modeļos starp valsti kā regulētāju un apkārtējo vidi kā regulēšanas objektu vienmēr atradās privātais sektors – business un zemes īpašnieki.

Neskatoties uz to, pusēm izdevās izstrādāt, pieņemt un īstenot vairākas globāla līmeņa vienošanās, kurām bija ārkārtīgi liela ietekme uz pasaules ekoloģisko stāvokli gan īstermiņā, gan ilgtermiņā. Referāta mērķis ir raksturot vides aizsardzības politikas transformācijas galvenās iezīmes Padomju Savienībā starptautiskā saspīlējuma atslābuma politikas laikā. Par piemēru tiek ņemtas konkrētas vienošanās ar Rietumvalstīm, dalība sadarbības programmās, iniciatīvās un zinātniskajos pasākumos, kā arī ar to saistītās teorētisko un ideoloģisko nostādņu pārmaiņas valsts iekšienē.

Projekts “Latvijas Universitātes iekšējā un ārējā konsolidācija” (Nr. 5.2.1.1.i.0/2/24/I/CFLA/007)

DABA PĒC HOLOKAUSTA: OJĀRA VĀCIEŠA DZEJOLIS “RUMBULA”

Artis Ostups

LU Literatūras, folkloras un mākslas institūts

Pēdējo sešu gadu laikā holokausta studijās pieaugusi interese par nacistu pastrādāto noziegumu vides aspektiem, pievēršoties dabas nozīmei gan Otrā pasaules kara notikumos, gan upuru piemiņas saglabāšanā. Holokausta vides pētījumi satuvina ierasti nošķirtas humanitāro zinātņu jomas un apgabalus, kā arī rosina pārskatīt dažādus literārus darbus. Referātā analizēts Ojāra Vācieša dzejolis “Rumbula” (1964). Vācieša tekstā mežs ir atmiņas aģents ar savu balsi, kas ne tikai atgādina par notikušo, bet arī pieprasa ētisku rīcību. Kā aicina dzejnieks, cilvēkam ir jāpieskaras koku raupjajai mizai un jāsajūt pagātne. Referātā aplūkots šīs prasības vēsturiskais konteksts, afektīvā poētika un potenciāls traumas studiju un jaunā materiālisma atziņu sintēzei.

GARĀ PUPA: EKO-FEMINISTISKS SKATĪJUMS LATVIJAS LAIKMETĪGAJĀ MĀKSLĀ

Jana Kukaine

Rīgas Stradiņa universitāte

Pētījumā analizēts garās pupas motīvs Latvijas laikmetīgajā mākslā eko-feministiskā perspektīvā, pievēršot uzmanību rūpju praksēm, zināšanu pēctecībai un sieviešu ģenealogijām. Indoeiropiešu mitoloģijās un latviešu folklorā garā pupa darbojas kā savienošs elements starp pasaulēm, iezīmējot satikšanos, pārbaudījumu un transformāciju. Latviešu pasakā sērdienīte uzkāpj garajā pupā, lai debesīs satiktu savu mirušo māti, Kārļa Skalbe pasakas versijā šī saikne tiek pastiprināta – garā pupa kļūst par mātes pirms nāves atstāto novēlējumu, kas bārenei palīdz pārvarēt grūtības.

Eko-feministiskā lasījumā garās pupas motīvu var interpretēt kā spēcinošu un sargājošu mātes–meitas attiecību metaforu, kas ietver rūpes, zināšanu nodošanu un izdzīvošanas prakses. Latvijas laikmetīgajā mākslā šo perspektīvu attīsta māksliniece Liene Mackus, īpaši porcelāna darbu sērijā “Sākums” (2024) un instalācijā “Altāris olšūnai” (2023). Mākslinieces interese par pupiņām sakņojas personiskā pieredzē – vecmāmiņas kādreizējā nodarbošanās ar pupiņu selekciju iezīmē starppaaudžu nepārtrauktību, kur dārkopība kļūst par attiecību, rūpju un izdzīvošanas praksi. Pētot mantojumā saņemto pupiņu vizuālās un materiālās īpašības, māksliniece izmanto vaginālās estētikas elementus, garās pupas lasījumā stiprinot atsauci uz sieviešu seksualitāti, ķermeniskumu un dzīvības cikliskumu.

Sieviešu un augu attiecību kultivēšana vienlaikus nodrošina ģimenes iztiku un veido rūpju un vides zināšanu formas, kas tiek nodotas nākamajām sieviešu paaudzēm. Garā pupa, kā dabkultūras naratīvs, iezīmē dzīvības cikliskumu, materiālas izdzīvošanas stratēģijas un kultūras atmiņu, izceļot sieviešu dzīvotās pieredzes un ikdienas dzīves zināšanas kā nemateriālā kultūras mantojuma daļu. Lai arī mātes–meitas attiecību pavediens izaug no pagātnes, tas vienlaikus uztur dzīvības turpināšanos un aicina iztēloties alternatīvus un dzīvotspējīgākus nākotnes scenārijus.

Projekts “Laikmetīgā māksla un folklorā: Atslēdzot aizsauli” (Nr. lzp-2024/1-0479)

POSTKOLONIĀLISMA UN DEKOLONIĀLISMA PERSPEKTĪVAS MĀKSLĀ CAUR CILVĒKA UN VIDES MIJATTIECĪBĀM

Ieva Astahovska

Latvijas Laikmetīgās mākslas centrs

Referātā pievērsta uzmanību, kā mākslinieki Latvijā un Baltijā strādā ar cilvēka un vides attiecībām, kā arī ar posthumānajām un ekoloģiskajām perspektīvām. Šīs tēmas aplūkotas caur nesenās pagātnes prizmu – padomju perioda beigu un pēcpadomju vizuālās un materiālās kultūras kontekstā, kā arī caur tās nospiedumiem ikdienas dzīvē. Referātā analizēts, kā šajā kontekstā savstarpēji mijiedarbojas sociālpolitiskā atmiņa, identitātes jautājumi, nacionālisma diskurss un padomju koloniālisma seku problemātika.

Referāts turpina pētījumu par postkoloniālisma un dekoloniālisma jēdzienu reģionālām interpretācijām. Tajā analizēti mākslas darbi, kas atspoguļo un komentē šo sarežģīto politiski vēsturisko kontekstu ne vien caur cilvēku pieredzi, bet arī caur attiecībām ar citām dabas būtnēm – līdzāspastāvēšanu, solidaritāti vai konfrontāciju.

Aplūkotie mākslas darbi arī parāda, kā globāli lietotie postkoloniālisma un dekoloniālisma jēdzieni tiek pārnesti un iemiesoti konkrētās pieredzēs, izpratnēs un rīcībās, iesaistot gan darbu ar koloniālās pagātnes mantojumu, gan refleksiju par mūsdienu sociālpolitiskajiem un ekoloģiskajiem satricinājumiem.

ILGTSPĒJAS INTEGRĒŠANA SPECIĀLĀ UN AKADĒMISKĀ LIETOJUMA ANĢĻU VALODAS KURSOS AUGSTĀKAJĀ IZGLITĪBĀ

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Ņemot vērā klimata pārmaiņu un ilgtspējīgas attīstības aktualitāti, augstākajā izglītībā arvien nozīmīgāka kļūst ilgtspējas kompetenču mērķtiecīga integrēšana studiju procesā. Erasmus+ projekta ietvaros četru universitāšu (Oulu Universitāte, Saragozas Universitāte, Jagelona Universitāte un Latvijas Universitāte) sadarbībā tiek izstrādāta inovatīva pieeja ilgtspējas integrēšanai speciālā lietojuma (ESP) un akadēmiskās anġļu valodas (EAP)ursos. Projekta konceptuālais ietvars balstās GreenComp kompetenču modelī, uzsverot vides, ekonomisko, sociālo un ētisko dimensiju savstarpējo saistību.

Projekta mērķis ir izveidot atvērtas piekļuves digitālu platformu, kurā apkopota labā prakse, atkārtoti izmantojami mācību materiāli, izpētē balstīti uzdevumi un daudzvalodu ilgtspējas terminu glosārijs. Metodoloģiskā pieeja balstīta starpdisciplinārā sadarbībā, kritiskās domāšanas attīstīšanā, ētiskā mākslīgā intelekta rīku izmantošanā un komandas darbā. Projekta rezultātā top arī rokasgrāmata pasniedzējiem ar praktiskiem ieteikumiem klātienēs, hibrīda un patstāvīgā mācību procesa organizēšanai.

Referātā analizēti projekta starprezultāti, identificētie izaicinājumi ilgtspējas kompetenču integrēšanā valodasursos un demonstrēti konkrēti didaktiskie risinājumi. Īpaša uzmanība pievērsta jautājumam, kā valodas apguve var kļūt par efektīvu instrumentu studentu ilgtspējas domāšanas un profesionālo nākotnes prasmju attīstīšanā augstākajā izglītībā.

JAUNIEŠU ZINĀŠANU PRAKSE PAR APRITES EKONOMIKU: HAKATONA GADĪJUMPIEMĒRS

Santa Krastiņa

Latvijas Universitāte

Sabiedrības, jo īpaši jauniešu, izpratne par aprites ekonomiku joprojām ir fragmentāra. Tā pārsvarā tiek saistīta ar šķirošanu un lietotu preču iegādi, neietverot plašāku stratēģisku skatījumu un sistēmiskās domāšanas dimensiju. Latvijā šī problēma ir īpaši aktuāla – gandrīz puse iedzīvotāju nav dzirdējuši par aprites ekonomiku (Eltermane, 2023), savukārt jaunieši vides jautājumus prioritāšu skalā bieži vērtē kā maznozīmīgus (European Parliament, 2025).

Pētījuma mērķis ir izpētīt un analizēt hakatonu kā mācību organizācijas formu neformālajā izglītībā, lai veicinātu jauniešu izpratni par aprites ekonomiku. Pētījums balstās uz starptautiskās zinātniskās literatūras analīzi trīs savstarpēji saistītās jomās: aprites ekonomikas konceptualizācija un tās stratēģijas, neformālās izglītības iespējas vides tematikā, kā arī hakatons kā problēmbalstītas mācīšanās metode.

Empīriskajā daļā Rīgā tika organizēts vienas dienas hakatons jauniešiem vecumā no 14 līdz 19 gadiem, kurā dalībnieki komandās strādāja pie izaicinājumiem aprites ekonomikas kontekstā, piemēram, meklējot risinājumus bojātu SUP un kajaku airu atkārtotai izmantošanai. Dati tika iegūti, izmantojot anketēšanu, pedagoģiskos novērojumus prezentāciju posmā un fokusgrupu intervijas.

Pētījuma rezultāti iezīmē, ka hakatons kā neformālās izglītības metode rada labvēlīgu vidi, kurā jaunieši var ne tikai apgūt aprites ekonomikas principus, bet arī attīstīt kritisko domāšanu, sadarbības un problēmrisināšanas prasmes. Hakatona formāts, apvienojot teorētisko ietvaru ar praktisku darbību un starpdisciplināru pieeju, veicina jauniešu pašapziņu kā pārmaiņu veicinātājiem vides ilgtspējas jomā.

8.2. sekcija. **ILGTSPĒJĪGA ĶĪMIJA UN MATERIĀLI
VIDEI DRAUDZĪGĀM TEHNOLOĢIJĀM /**
SUSTAINABLE CHEMISTRY AND
MATERIALS FOR ENVIRONMENTALLY
FRIENDLY TECHNOLOGIE

CONVERSION OF LOW-GRADE HEAT INTO ELECTRICITY USING NANO-CONFINED POLYETHYLENE OXIDE-BASED POLYMER ELECTROLYTE

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In modern energy and technological systems, a significant fraction of generated energy is dissipated as low-grade heat. Converting this low-temperature heat into useful electricity remains a major challenge, particularly because conventional solid-state thermoelectric materials are not efficient in this range. Ionic thermoelectric systems offer an alternative approach, where thermally driven ion transport generates an electrical potential. These systems are especially useful for lower temperature (below 100 °C) applications, but even in these bulk polymer electrolytes often suffer from limited control over ion transport and interfacial effects. In this context, confining the electrolyte within nanoporous structures presents a promising strategy to better regulate ionic pathways and tailor transport characteristics [1].

Polyethylene oxide (PEO) is widely used as a polymer matrix for solid and gel electrolytes owing to its favourable ion-transport characteristics. In this work, a polyethylene oxide (PEO)-based polymer electrolyte was prepared using sodium chloride as the ionic salt. The prepared electrolyte was then introduced into nanoporous materials, including AAO membranes and silica aerogels, via a vacuum-assisted infiltration process to investigate how confinement within nanoporous structures affects ion transport and overall thermoelectric behaviour. The thermoelectric response was examined by measuring the voltage generated under an applied temperature gradient. To investigate ion transport within the nanoporous matrix, electrochemical impedance spectroscopy and cyclic voltammetry were performed. Different polymer compositions were investigated while keeping the salt content constant, and the influence of polymer concentration on transport characteristics was determined. The optimal electrolyte composition was identified, ensuring better thermoelectric performance and indicating a favourable balance between ionic mobility and the structural stability of the polymer matrix [2].

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IMPACT OF NICKEL DOPING ON THE ELECTRONIC PROPERTIES OF THE WTe_2 SINGLE CRYSTALS (Poster)

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Topological semimetals of the transition-metal dichalcogenide family, particularly WTe_2 , have attracted significant attention in recent years due to their combination of unusual electronic properties, strong anisotropy, extremely large magnetoresistance, and the presence of topologically protected surface states[1]. These features make the material promising for applications in spintronics, sensing technologies, quantum devices, and for exploring fundamental phenomena in strongly correlated systems. However, the electronic structure of WTe_2 is exceptionally sensitive to external perturbations such as pressure, strain, chemical doping, and magnetic field. Controlled chemical substitution of atoms in the crystal lattice therefore serves as a powerful tool for deliberately tuning the material's properties and for investigating the mechanisms underlying its unconventional behavior [2].

In this work, pure WTe_2 and Ni-doped $\text{Ni}_x\text{W}_{(1-x)}\text{Te}_2$ ($x = 0.01, 0.03, 0.05, 0.10$) single crystals were synthesized and comprehensively characterized. The crystals were grown by chemical vapor transport (CVT), which ensures a high degree of structural perfection and enables precise control of the dopant concentration. X-ray diffraction analysis revealed that Ni incorporation leads to a systematic shift of diffraction peaks toward lower 2θ angles, indicating an increase in interplanar spacing and an overall expansion of the crystal lattice. The atomic arrangement corresponds to the orthorhombic space group $\text{Pmn}2_1$, characteristic of the T_d phase. Despite the smaller atomic radius of Ni compared to W, the observed lattice expansion suggests a complex interaction between the dopant and the host lattice, potentially involving interstitial incorporation, vacancy formation, and local strain effects.

Magnetotransport measurements revealed pronounced changes in both the temperature and magnetic-field dependence of resistivity. Pristine samples exhibit metallic conductivity and a high residual resistivity ratio (RRR). Ni doping enhances charge-carrier scattering, modifies the Fermi-surface geometry, and leads to the emergence of new Shubnikov–de Haas quantum-oscillation frequencies, observable at magnetic fields as low as 5 T. Detailed analysis of the experimental data demonstrates that even small amounts of Ni have a significant impact on the electronic structure, underscoring the high sensitivity of WTe_2 to chemical substitution.

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IONIC THERMOELECTRIC PROPERTIES OF SODIUM ALGINATE–SILICA AEROGEL COMPOSITES (Poster)

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Buildings account for a substantial share of global energy consumption, underscoring the urgent need for advanced materials that improve energy efficiency and enable sustainable energy harvesting. Among emerging solutions, ionic thermoelectric materials have attracted growing attention for their ability to convert low-grade waste heat into electricity. Their intrinsic flexibility, low thermal conductivity, and environmental compatibility make them particularly promising for integration into next-generation energy systems.

In this work, sodium alginate, a natural biopolymer, was investigated as a polymer electrolyte for ionic thermoelectric applications. Crosslinked sodium alginate hydrogels were prepared, and their electrochemical and thermoelectric behaviour was studied. The influence of the polymer network structure on ionic transport was considered. In addition, silica aerogel–alginate composite materials were fabricated in order to evaluate how the confinement within the porous silica aerogel affects ion mobility and the thermoelectric response.

Thermoelectric measurements were carried out under applied temperature gradients. Pure sodium alginate hydrogel showed a measurable thermovoltage response. After incorporation of silica aerogel into the alginate matrix, the thermoelectric behaviour improved twice compared to that of pure alginate hydrogels. This improvement can be related to structural modification of the polymer network and nanoconfinement effects inside the porous aerogel structure, which influence Na^+ ion migration and ionic transport processes.

Overall, the results indicate that sodium alginate–silica aerogel composites can therefore be considered promising materials for the further development of ionic thermoelectric systems for low-grade heat-to-electricity conversion.

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PHYSICO-CHEMICAL STABILIZATION OF FUROSEMIDE VIA AMORPHOUS SOLID DISPERSIONS (Poster)

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Amorphous solid dispersions (ASD) are widely used to improve the solubility and dissolution of poorly water-soluble active pharmaceutical ingredients (APIs) by stabilizing them in an amorphous form within a polymeric matrix. However, their thermodynamic instability can lead to recrystallization and phase separation, which limits their long-term performance. Beyond polymers, non-polymeric excipients such as organic acids, sugars/sugar alcohols, and surfactants can significantly influence ASD stability through intermolecular interactions and molecular mobility [1].

In this study, we investigated amorphous solid dispersions of furosemide (Fig. 1.) formulated with excipients from different functional classes to evaluate their impact on intermolecular interactions, miscibility, and dissolution behavior [2].

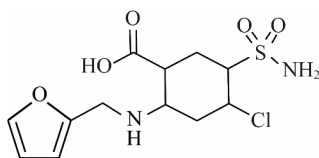


Fig. 1. Molecular structure of furosemide

The amorphous character of the dispersions was confirmed by X-ray powder diffraction (XRPD). Intermolecular interactions were analyzed using Fourier transform infrared spectroscopy (FTIR). Differential scanning calorimetry (DSC) was employed to construct binary melt phase diagrams and assess miscibility and amorphous solubility limits. Dissolution behavior was evaluated by time-resolved UV/Vis spectroscopy. The results demonstrate that excipient class strongly influences molecular interactions, miscibility, and dissolution performance of furosemide ASDs.

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INFLUENCE OF IRRADIATION ATMOSPHERE ON FORMATION OF FREE RADICALS IN SHEEP WOOL FIBERS (Poster)

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Sheep farming has found an important role in enhancing development of lands for agricultural use. Sheep grazing on uneven terrains, unsuitable for cattle, helps to control brushing, prevents soil erosion, improves plant biodiversity and quality for future plantings. Moreover, lamb meat contains high quality dietary proteins for human metabolic processes [1]. However, due to change of consumer habits, the demand of another sheep product – wool – has decreased and it raises concerns due to its complex and difficult disposal management [2]. At the same time, sheep wool fibers have potential to be used in filtering systems, car interiors, buildings, packages and other fields [3]. Moreover, the pretreatment and modification of fibers may improve the properties required for specific applications.

In the present research, the sheep wool fibers, mainly from the local, Latvian Blackhead sheep breed, were irradiated using 9 MeV accelerated electrons with absorbed doses up to 500 kGy in vacuum and air. The characterization of non-irradiated and irradiated fibers was performed by Fourier transform infrared spectroscopy and thermogravimetry/differential scanning calorimetry, while a detailed analysis of free radicals was performed with electron paramagnetic resonance (EPR) spectroscopy. The obtained EPR results show to irradiation dose and atmosphere dependent free radicals, located on carbon and sulphur.

Acknowledgements: Preparation and characterization of materials has been carried out within the framework of the ERDF project Nr. 1.1.1.3/1/24/A/161 “Novel biopolymer-sheep wool composites for sustainable insulation and eco-friendly packaging solutions”.

Modification of materials has received funding from the European Unions Horizon Europe research and innovation programme under grant agreement No. 101057511.

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ELECTROCHEMICAL PERFORMANCE OF BINDER-FREE SELF-ASSEMBLED ZN NANOWIRE ANODES IN AGAR-BASED HYDROGEL POLYMER ELECTROLYTE (Poster)

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Over the past few years, aqueous Zn-ion batteries have come to the forefront of research on next-generation batteries due to safety, low cost, high theoretical capacity and potential for extended cyclability and excellent power capability. However, for zinc foil anode, its extreme vulnerability to dendritic deposition and electrochemical corrosion leads to cell failure. Although porous architectures can improve performance, incomplete electrolyte infiltration often causes surface-localized Zn deposition and early short circuits, limiting stability at high currents. An integrated design that can facilitate the complete electrolyte infiltration, and enable a uniform ion flux is essential for stable cycling [1].

This research presents Zn nanowire anodes with controllable structure synthesized by one-step low-pressure physical vapor deposition method. The anode performance was tested in Agarose-based hydrogel electrolyte. Agarose, a polysaccharide of marine origin, has been selected as a model electrolyte material because of its double helical aggregation into a gel structure, functional ether (R–O–R) and hydroxyl (–OH) groups, and mechanical stability. Electrochemical performance was investigated using electrochemical impedance spectroscopy (EIS), cyclic voltammetry (CV), and linear sweep voltammetry (LSV) measurements in CR2032 coin cells employing a multichannel PalmSens4 potentiostat. The cells employed an agar polymer electrolyte pre-immersed in 1 M ZnSO₄ (APE, 1 M ZnSO₄), which served as the electrolyte medium and separator

Zn nanowire electrodes demonstrate improved plating/stripping behavior in agar-based hydrogel polymer electrolyte compared to commercial Zn foil, with lowest charge-transfer resistance and stable electrochemical response. Anodic LSV results further show suppresses high-voltage anodic current growth compared to aqueous electrolyte, indicating a wider apparent anodic stability window. Overall, the combined electrode architecture and hydrogel electrolyte contribute to moderate interfacial reactions and enhanced stability of Zn-based systems.

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COCRYSTALLIZATION BEHAVIOR OF STRUCTURALLY RELATED NITROFURANS WITH BENZOIC ACID AND PYRIDINE DERIVATIVES

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Cocrystal engineering represents a powerful strategy for tailoring solid-state properties through the deliberate incorporation of a coformer into a crystalline lattice, thereby modifying key physicochemical characteristics. This approach is widely applied to optimize the performance of pharmaceutical active ingredients (APIs), creating new opportunities to enhance stability, solubility, dissolution behavior, and bioavailability. Importantly, cocrystallization enables systematic modulation of solid-state properties without altering the covalent structure or intrinsic pharmacological activity of the API.¹ Depending on the crystallization technique employed and the experimental conditions applied, multiple polymorphic forms of a given cocrystal may arise. Such solid-form diversity is highly relevant in pharmaceutical development, as different polymorphs can exhibit distinct thermodynamic stability, mechanical properties, and dissolution profiles.²

In the present study, two structurally related nitrofurantoin antibiotics, nitrofurantoin (NF) and furazidin (FUR), were selected as model compounds due to their limited aqueous solubility and pronounced propensity for solid-state diversity. NF has previously been reported to form cocrystals with substituted benzoic acids and pyridine derivatives, making this system particularly suitable for investigating principles governing rational coformer selection.³⁻⁵

The objective of this work was to assess whether the structurally analogous APIs (NF and FUR) display comparable cocrystallization tendencies toward a series of benzoic acid and pyridine derivatives, and to evaluate the implications of these findings for rational cocrystal design. Nine benzoic acid derivatives and one pyridine derivative were screened as potential cofomers, resulting in eight previously unreported crystalline phases, including five phases of FUR and three phases of NF. Although both APIs formed cocrystals with selected aromatic cofomers, the substitution pattern significantly influenced the outcomes. Subtle variations in substituent position and steric properties altered the interplay between hydrogen bonding and aromatic interactions, producing distinct solid-form landscapes. Despite the presence of analogous hydrogen-bonding motifs, minor structural modifications in the cofomers led to divergent crystallization behavior, highlighting the pronounced sensitivity of cocrystal formation.

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ENCAPSULATION OF ACTIVE PHARMACEUTICAL INGREDIENTS IN CYCLODEXTRIN BASED MOFS

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Metal – organic frameworks (MOFs) have emerged as highly versatile materials with applications in pharmacy, medicine, and materials science due to their tunable porous architectures. Cyclodextrin based MOFs (CD MOFs) are particularly attractive as drug delivery platforms because they enable modification of active pharmaceutical ingredients (APIs) without altering their inherent biological activity, offering the potential to improve bioavailability, stability, and controlled release [1–3].

In this study, we explored the encapsulation of model drugs – including carmofur (HCFU), 5 – fluorouracil (5 – FU), and salicylic acid (HBA) – into several newly synthesized CD MOFs with structural features and properties not previously reported. Different crystallization protocols were applied to optimize the encapsulation process, and the efficiency of drug inclusion was systematically evaluated. The resulting API:CD – MOF composites were characterized using a combination of analytical techniques: differential scanning calorimetry (DSC) and thermogravimetric analysis (TGA) provided insight into thermal stability and guest incorporation, while solid-state NMR spectroscopy (ssNMR) confirmed molecular interactions between the host framework and the encapsulated drugs.

Furthermore, preliminary *in vitro* and *vivo* assays were performed to assess the cytotoxicity, biocompatibility, and potential therapeutic applicability of the API-loaded CD MOFs. The results indicate that the newly developed CD MOFs can successfully encapsulate small molecule APIs, maintain structural integrity, and offer favorable biocompatibility profiles, highlighting their potential as versatile and safe carriers for drug delivery.

Overall, this work demonstrates a rational approach to designing and evaluating CD-based MOFs for pharmaceutical applications, providing a platform for the controlled encapsulation of therapeutic agents and advancing the development of next generation drug delivery systems.

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DESIGN AND SYNTHESIS OF AN APTAMER-FLUOROPHORE CONJUGATE FOR MECHANISTIC VALIDATION OF DRUG RELEASE (Poster)

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Aptamers are synthetic oligomers of nucleic acids that are capable of selectively binding to target molecules, which are selected for through the SELEX process. Aptamers are functionally comparable to monoclonal antibodies and can similarly be functionalized to create aptamer-drug conjugates (ApDCs). At the same time, aptamers are more stable to chemical modification, less immunogenic, and are considerably cheaper to produce than monoclonal antibodies; thus, ApDCs can effectively supplant currently utilized monoclonal antibody-drug conjugates.

For initial studies, we have elected to synthesize substrate for conjugation 1, where the NHS-ester moiety is capable of forming a covalent bond to an -NH₂ functionalized aptamer. For our purposes, we have elected to utilize the previously studied GreenB1 aptamer, which binds to β 1-integrin, commonly expressed in many cancer cell lines [1]. Crucially, the linker includes a Cathepsin B induced immolative mechanism, facilitating payload release. By utilizing a locked rhodamine-derived fluorophore in place of a drug molecule, we will be able to validate the mechanism of drug release in cell cultures (see fig. 1).

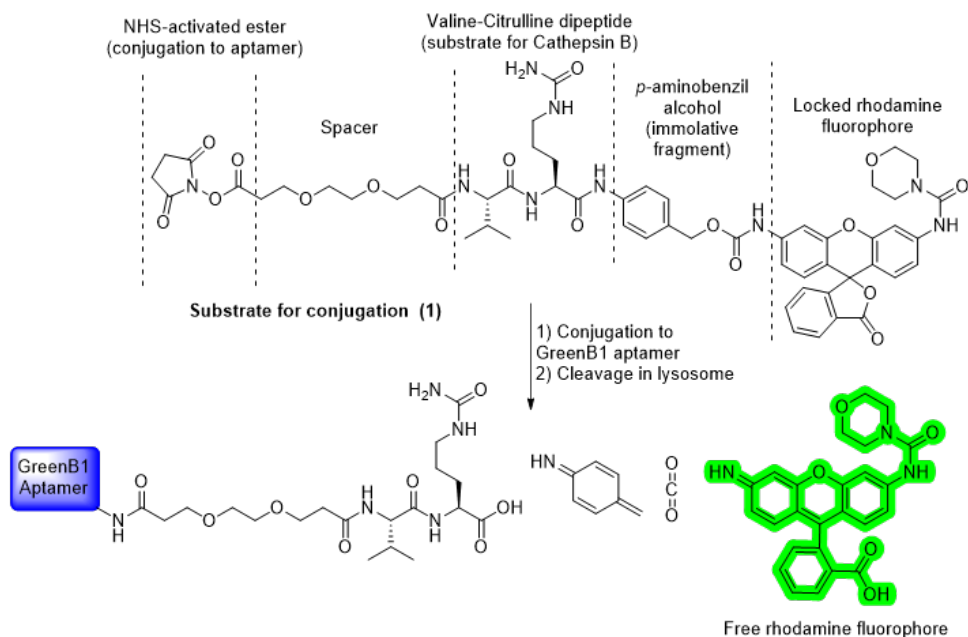


Fig. 1. Design of ApDC conjugate formation and validation

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ELECTROCHEMICAL SYNTHESIS OF SPIRO-HEMIAMINAL ETHERS FROM FURFURAL DERIVATIVES

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Furfural (1), a furan derivative, is one of the products obtained in large quantities during biomass processing [1]. As part of the effort in our group to transform furfural derived substrates into value-added building blocks, we have developed new electrochemical synthesis method for obtaining [4.4]-spirocyclic hemiaminal ether scaffolds 3 from furan derivatives 2 (fig. 1).

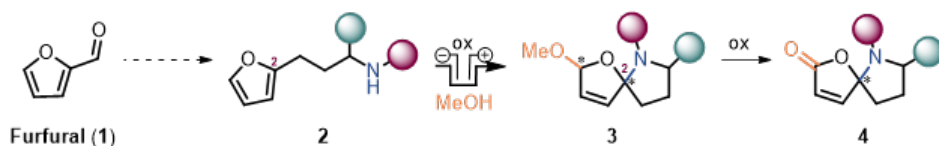


Fig. 1. Electrochemical synthesis of [4.4]-spirocyclic hemiaminal ethers 3 from furan derivatives 2

The [4.4]-spirocyclic scaffolds 3 were assembled through electrochemically induced C-N bond formation between amide and furan ring in substrates 2. Products 4 with a single stereocenter could be obtained by further oxidative transformation of the methoxy group into a carbonyl group.

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MICROWAVE-ASSISTED SYNTHESIS OF ZINC SULFIDE ELECTROLUMINESCENT PHOSPHORS

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Doped zinc sulphide (ZnS) materials exhibit excellent optical and electrical properties, making them superior materials for photoluminescent (PL) and electroluminescent (EL) devices. This study focuses on demonstrating the possibility of synthesizing ZnS doped with various transition and rare-earth elements (ZnS:Mn; ZnS:Cu,Cl; ZnS:Nd; ZnS:Ag,Co) for further application in the fabrication of Alternating Current Thick-Film Electroluminescent (ACTFEL) devices using microwave-assisted (MW-assisted) solvothermal and hydrothermal methods.

The main advantages of microwave-assisted chemical processes are the increased reaction rate and yield, as well as uniform mixture heating, which leads to the formation of particles with a narrow size distribution and high crystallinity. This method is known as one of the most innovative green chemistry synthesis methods.

The first part of the study demonstrates how the possibility of performing reaction mixture *in situ* sampling during MW-assisted synthesis facilitates the investigation process. The obtained results elucidate the correlation between the phase and elemental composition, morphology, and PL properties of ZnS:Cu materials [1].

The second part of the study demonstrates how MW-assisted synthesis enables the incorporation of different dopants into ZnS materials. The incorporation of dopant ions from the reaction mixture into the crystalline structure of the synthesized materials was evaluated by energy-dispersive X-ray analysis. The amount of incorporated dopant for each material was then compared to the integral EL intensity. For the assessment of EL intensity, ACEL devices were fabricated [2].

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SYNTHESIS OF PYRIDINIUM LUMINOPHORES FOR DEVELOPMENT OF BIOGENIC AMINE SENSORS (Poster)

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In recent years solid state organic luminophores have garnered attention for their potential uses in light-emitting diodes because of their low cost of production. One of the breakthroughs in solid-state organic luminophores was the discovery made by K. Leduskrasts in 2019 [1] where solid-state luminescence was achieved by utilizing $\pi^+ - \pi$ interactions in a pyridinium – carbazole system. Further research by K. Leduskrasts and his team led them to discover the structure of derivatives achieving quantum yields up to 85 %.[2]

In collaboration with the Institute of Atomic Physics and Spectroscopy, we've found that such type luminophore can change its optical properties when exposed to ammonia and acetic acid vapors, which suggests their potential use as a solid-state gas sensor.[3] Further modifying the structure of pyridinium based luminophores led us to a structure that is capable of detecting ammonia in concentrations as low as 20 ppm.

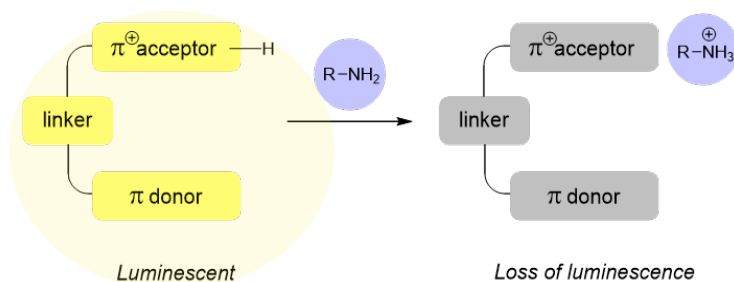


Fig. 1. Proposed working principle of amine detection

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APPLICATION OF CARBON NANOTUBE NETWORKS AS CATHODES IN AQUEOUS ZINC ION BATTERIES (Poster)

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Electrode materials composited with carbon nanotubes (CNTs) have demonstrated significantly enhanced electrochemical properties in aqueous zinc ion batteries (AZIBs) [1,2].

It is considered that addition of CNTs to the active material can provide higher electrical conductivity and efficient transport pathways for Zn^{2+} ions improving cycling performance of these batteries. However, the role of bare CNTs in AZIBs remains largely unexplored but it is expected that, similar to aqueous lithium-ion batteries, CNTs can act as electrodes [3].

In this work, single- and multiwall CNT (SWCNT and MWCNT) networks were utilized as cathodes in AZIBs. These networks were preliminary prepared using spray-coating for SWCNT networks and drop-coating for MWCNT networks, respectively. Initial structural analysis of obtained samples was performed using scanning electron microscopy (SEM) and different electrochemical techniques such as galvanostatic charge/discharge (GCD), cyclic voltammetry (CV) and electrochemical impedance spectroscopy (EIS) were used to investigate electrochemical properties of CNT networks. CV and EIS studies revealed that CNTs actually serve not only as a material that improves electrical conductivity but also participate in the electrochemical processes themselves. GCD measurements of CNT networks showed that they have stable cycling performance, although specific capacities are smaller compared to other electrodes studied, however when creating composite electrodes in AZIBs, participation of CNTs in electrochemical processes must be taken into account.

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POLYMER-SUPPORTED LEWIS BASE CATALYSTS FOR KINETIC RESOLUTION: TOWARD DYNAMIC KINETIC RESOLUTION IN CONTINUOUS FLOW (Poster)

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Dynamic kinetic resolution (DKR) of secondary alcohols is a powerful synthetic method for the transformation of racemic starting materials into optically pure products [1]. It relies on two parallel processes – kinetic resolution (KR) and simultaneous racemization of the unreacted enantiomer. (Fig. 1).

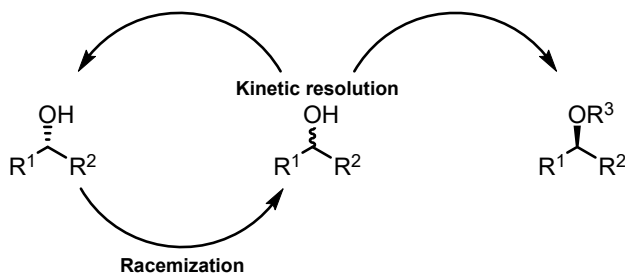


Fig. 1. DKR of secondary alcohols

A vast majority of the DKR protocols described in the literature rely on enzymes to carry out the KR process. This is because transition metal complexes used for racemization can form stable complexes with various organocatalysts, therefore stopping both catalytic cycles. This can be circumvented by attaching both catalysts to an insoluble matrix (e.g., polymer, glass beads, MOFs), therefore isolating the catalysts and preventing the unwanted complexation. Furthermore, this would enable the use of these catalysts in packed-bed reactors under flow chemistry conditions [2]. In this work, various types of chiral acylation catalysts were immobilized onto *Merrifield* resin using a CuAAC reaction. The obtained catalysts were tested in the kinetic resolution of 1-phenylethanol (Fig. 2).

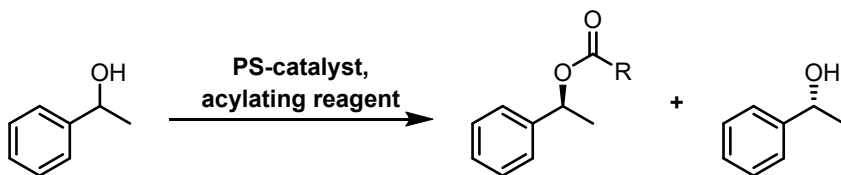


Fig. 2. KR of 1-phenylethanol using polymer supported organocatalysts

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SOLVOTHERMAL SYNTHESIS OF BISMUTH SELENIDE AND SINGLE-WALLED CARBON NANOTUBE HETEROSTRUCTURES AS CATHODE MATERIALS FOR AQUEOUS ZINC-ION BATTERIES (Poster)

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Aqueous zinc-ion batteries (AZIBs) are considered a safe and sustainable alternative to lithium-ion batteries due to their low cost and environmental friendliness. However, their practical application is still limited by slow Zn^{2+} diffusion, low electrical conductivity and structural degradation during cycling [1]. Layered metal chalcogenides are promising cathode materials because their structure facilitates ion intercalation and transport. Bismuth selenide (Bi_2Se_3) is a layered material with van der Waals gaps between quintuple layers, providing large interlayer spacing and favorable electronic properties for ion transport [2]. To improve electrical conductivity, Bi_2Se_3 can be combined with conductive carbon nanomaterials such as single-walled carbon nanotubes (SWCNTs), which form a conductive network and enhance charge transfer. The formation of Bi_2Se_3 /SWCNT heterostructures creates interfacial contact between components, where local electric fields may arise at p-n junctions. These interfacial effects facilitate Zn^{2+} ion transport, reduce diffusion limitations and improve the electrochemical performance of the composite cathode [3].

In this study, Bi_2Se_3 /SWCNT heterostructures were synthesized using a solvothermal method. The synthesis was carried out in a sealed autoclave at elevated temperature, enabling controlled formation and growth of Bi_2Se_3 nanostructures. By adjusting synthesis parameters such as precursor concentration, solvent type, temperature and reaction time, nucleation, crystal growth, morphology and thickness of the structures can be controlled.

The synthesized materials were characterized by scanning electron microscopy (SEM) and energy-dispersive X-ray spectroscopy (EDX) to study morphology and elemental composition, while atomic force microscopy (AFM) was used to analyze the average thickness of the heterostructures. Electrochemical properties were investigated using cyclic voltammetry (CV) and galvanostatic charge-discharge (GCD) to evaluate charge storage behavior, ion transport and cycling stability of Bi_2Se_3 /SWCNT heterostructures as cathode materials for AZIBs.

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SIMULTANEOUS GREEN ENERGY GENERATION AND CO₂ PHOTOREDUCTION USING METAL OXIDE HYBRID NANOWIRE ARRAYS

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The development of efficient renewable energy conversion materials remains a central challenge in the transition away from fossil fuels. At the same time, the continuous rise in atmospheric CO₂ concentration is a major driver of the greenhouse effect and global climate change. Multifunctional materials capable of addressing both challenges simultaneously, by generating renewable (“green”) electricity while enabling CO₂ reduction, would therefore represent a highly desirable strategy for sustainable energy and carbon management.

Copper oxides and zinc oxide are particularly attractive for the fabrication of such materials due to their complementary optoelectronic properties. CuO (1.2–2.1 eV) and Cu₂O (2.0–2.2 eV) exhibit strong absorption across the visible region and part of the infrared region, while ZnO (3.36 eV) provides strong absorption in the UV region, enabling efficient harvesting of a substantial fraction of the solar spectrum [1]. Additionally, copper oxide and ZnO have been shown to possess thermoelectric and photocatalytic properties, which could further improve the energy generation capabilities, as well as reduce CO₂ to more valuable organic substances, like methanol [2]. Nanostructuring has been shown to improve thermoelectric properties of Cu₂O [3], and the increased surface area of nanowires improves CO₂ adsorption. The mentioned properties motivate the fabrication of CuO, Cu₂O, and ZnO into a single heterostructured nanowire system for simultaneous energy conversion and carbon utilization.

In this work, the CuO-Cu₂O-ZnO heterostructure was synthesized using a combination of thermal evaporation and oxidation techniques. A scanning electron microscope equipped with an energy-dispersive X-ray analyser, X-ray diffraction analysis and X-ray photoelectron spectroscopy were used to characterize the morphology, structure, and composition of the material. The CuO-Cu₂O-ZnO heterostructured material was capable of generating an output power of ~0.4 nW·cm⁻², while simultaneously reducing CO₂ to methane, ethylene, and methanol at a photocatalytic conversion rate of ~2.2 μmol·cm⁻²·h⁻¹.

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Acknowledgements. This work was performed within the Latvian Council of Science FLPP project No. lzp-2022/1-0239 “Multifunctional hybrid metal oxide nanowire arrays for simultaneous green power generation and CO₂ reduction”.

PURIFICATION AND ENZYMATIC ACYLATION OF BERRY PRESS RESIDUE ANTHOCYANINS

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University of Latvia, Department of Environmental Science, Faculty of Science and Technology

Berry processing generates significant amounts of biological waste, such as berry press residues remaining after juice production, which is a valuable source of anthocyanins, natural colorants, and polyphenols. The use of natural pigments obtained from such by-products can serve as a sustainable alternative to synthetic dyes and contribute to the development of a circular economy. [1] The practical application of this biomass is limited by anthocyanins instability and the presence of impurities. These challenges can be addressed through purification and concentration of the anthocyanins and stabilization via enzymatic acylation. [2]

The research investigates the purification and concentration of six berry pomace matrices using a column filled with XAD-7HP macroporous resin. The effect of this treatment on the total anthocyanin, total polyphenol concentrations, and antiradical activity in berry press residues was evaluated. The effect of acyl donors and enzymes on the enzymatic acylation of purified honeysuckle berry press residues samples was studied.

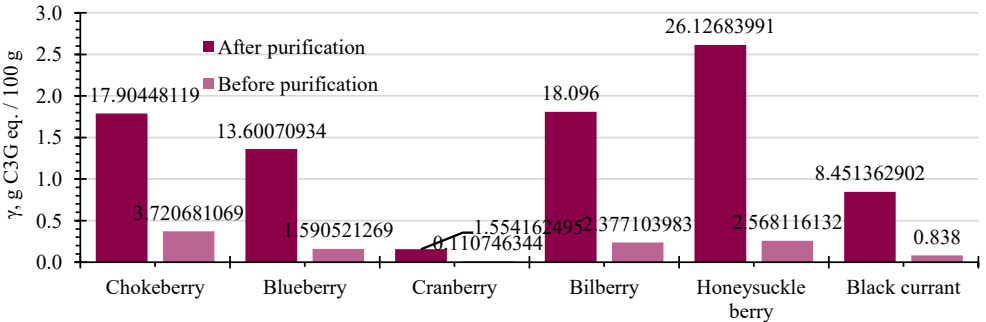


Fig. 1. Total anthocyanin concentration in lyophilized berry press residues expressed as cyanidin-3-O-glucoside (C3G) equivalents before and after purification.

The results show that column filled with XAD-7HP macroporous resin increases anthocyanin and polyphenol concentration and antiradical activity. (Fig1.) The preliminary results shown that the highest yield was observed for the sample that was enzymatically acylated using Novozyme 435 enzyme and octanoic acid as an acyl donor.

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EFFECT OF XANTHINE ADDITIVES AND SOLVENT ON PHASE OUTCOME IN MECHANOCHEMICAL SYNTHESIS OF THE CAFFEINE–ANTHRANILIC ACID COCRYSTAL (Poster)

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Crystal engineering strategies such as cocrystal formation and solid solution design are widely used to tune the structural and physicochemical properties of molecular crystals. Systems composed of structurally related molecules are particularly suitable for investigating the effects of molecular substitution within a crystal lattice [1].

In this study, the caffeine–anthranilic acid cocrystal system was investigated in the presence of structurally related xanthine derivatives theobromine and xanthine (Fig. 1c–d). The influence of additives and solvent on phase formation was explored by liquid-assisted grinding (LAG) using acetonitrile (ACN), ethanol (EtOH), and nitromethane (NM). The obtained crystalline phases were characterized by powder X-ray diffraction (PXRD) and differential scanning calorimetry (DSC).

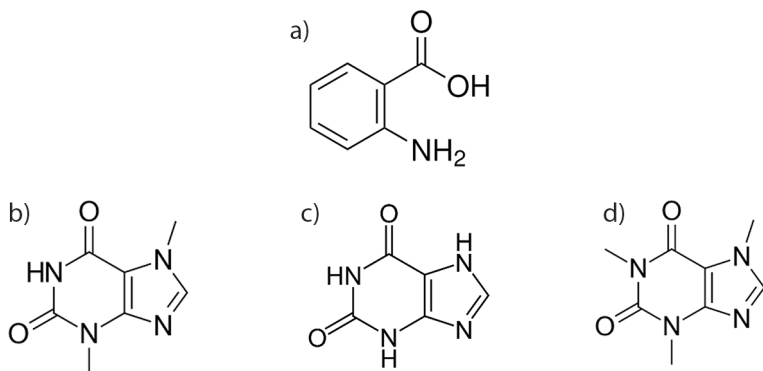


Fig. 1. Molecular structures of anthranilic acid (a), caffeine (b), theobromine (c), and xanthine (d).

The results reveal a strong dependence of phase outcome on both additive identity and solvent choice. LAG with ACN and NM yielded solvated phases, whereas experiments performed with EtOH led to solid solution formation with both additives, as evidenced by systematic shifts in PXRD reflections. These findings highlight the role of structurally related xanthine derivatives as phase-directing agents within the caffeine–anthranilic acid system.

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ELECTROCHEMICAL OXIDATION OF ALCOHOLS USING A TEMPO-MODIFIED FILM (Poster)

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Latvian Institute of Organic Synthesis University

TEMPO-modified polymers have been proven as efficient and reusable mediators in electrosynthesis and can be employed both as a soluble redox-active polymer¹ and as a surface-confined polymer (a.k.a. film).^{1,2} However, using the soluble kind means a more complex separation method (e.g. membrane filtration, precipitation, dialysis), therefore, using a modified electrode for alcohol oxidation is a more attractive strategy, and has already been used by some researchers.^{3,4}

In this research, our goal is to find a combination of polymer and crosslinker for best film stability and catalytic activity for dip-coated electrodes to perform electrochemical alcohol oxidation. We have used a simple two-step method for TEMPO-modified polymer synthesis, and explored how the polymer structure and choice of crosslinker (Fig.1, Fig. 2) impacts the films stability and catalytic activity.

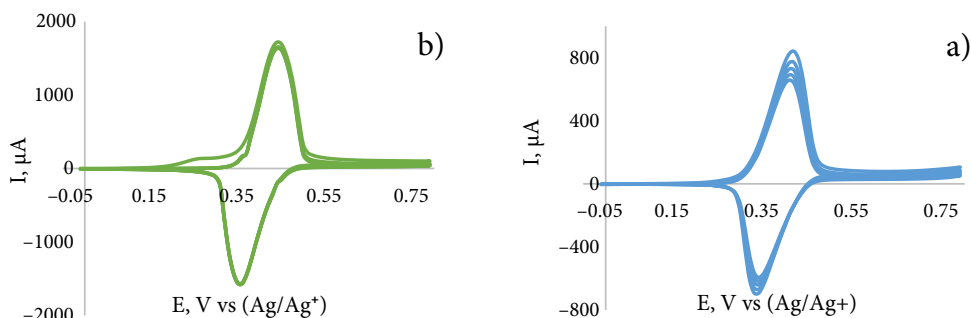


Fig. 1. a) CV of polystyrene-based polymer film, b) CV of polymethacrylate-based polymer film

We have managed to find a TEMPO-modified polymer and electrode modification method with promising stability and catalytic activity and performed alcohol oxidation tests.

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DATA MINING OF OPEN WATER-QUALITY DATABASES: FROM DATA ENGINEERING TO CHEMOMETRIC EXPLORATION (Poster)

Eriks Ikaunieks, Maris Bertins, Arturs Viksna

University of Latvia, Faculty of Chemistry

Open environmental repositories contain extensive water-quality data for mining, but practical use is limited by heterogeneous formats, parameter naming, and units. This contribution outlines a transferable concept to convert open monitoring data into analysis-ready datasets and use chemometric screening to identify key patterns and relationships for targeted studies and monitoring priorities.

The approach combines data acquisition from open repositories with harmonisation of variables (codes, names, units and metadata) and construction of comparable data matrices (e.g., annual aggregation at monitoring-site level). Key practical issues are addressed, including inconsistent units, missing values, and results reported below quantification limits. The intent workflow is reproducible and scriptable, enabling reuse across different databases with minimal manual effort.

Exploratory multivariate analysis (correlations, PCA, clustering) is used to reveal dominant chemical gradients and associations. The results support geo-chemically informed screening by highlighting co-varying variable groups, candidate outliers, and sites with similar signatures for targeted interpretation or method development.

As an illustrative example, Fig. 1 presents a pilot PCA biplot derived from a subset of EEA Waterbase (WISE) data for major ions (Na, K, Mg, Ca, nitrate and sulphate), with points coloured by water body category. The figure demonstrates the intended use of the concept: rapid, transparent screening of open data to obtain interpretable hypotheses and prioritisation cues.

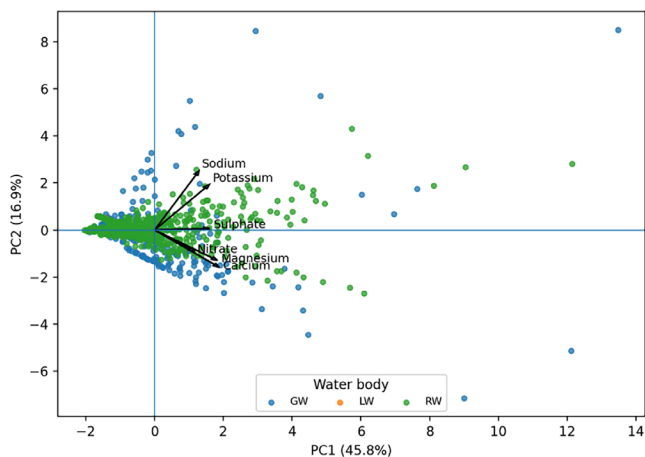


Fig. 1. Example PCA biplot (pilot dataset): major ions from EEA Waterbase (WISE)

References

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TWENTY YEARS AFTER: MODELLING OXYGEN ELECTROCATALYSIS FOR SUSTAINABLE ENERGY

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Theory-driven modelling of the oxygen reduction reaction (ORR) has developed over the past two decades with advances in hardware, software, and algorithms. Early studies relied on adsorption energies and free energy diagrams to establish scaling relations and activity volcano plots. Later approaches incorporated reaction barriers, solvation, and explicit electrode–electrolyte interfaces. These developments define the current understanding of activity and selectivity in ORR through calculations.

In this presentation we discuss how these modelling approaches contribute to the design of electrocatalysts for environmentally friendly energy technologies, including fuel cells, electrolyzers, and metal–air batteries. Dual-atom site catalysts (DACs) are used as a model system because their well-defined coordination environments allow systematic variation of metal identity and metal–metal distance. Density functional theory calculations within the computational hydrogen electrode framework are used to analyse adsorption free energies and reaction pathways for ORR intermediates.

Within this framework, DACs allow a systematic illustration of the main strategies proposed to manipulate scaling relations in oxygen electrocatalysis. Variations in metal composition and metal–metal distance modify adsorption energetics of key intermediates and influence the relative stability of reaction intermediates and transition states. These results connect the methodological development of ORR modelling with catalyst design principles relevant for sustainable chemistry and materials for environmentally friendly energy technologies.

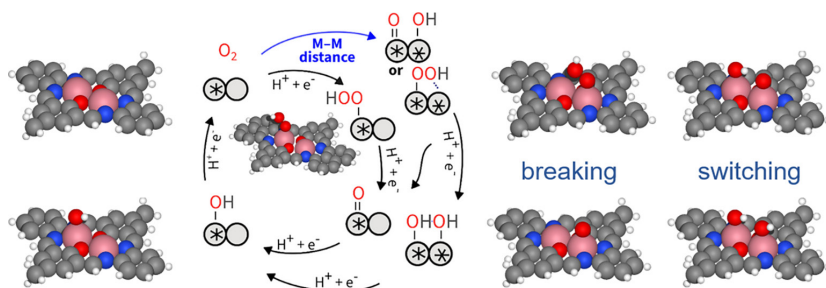


Fig. 1. Dual-atom site models and reaction mechanism schematics.

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Acknowledgements. This work was supported by the Estonian Research Council (PRG3174).

COFORMER-MEDIATED TAUTOMER SELECTION IN MULTICOMPONENT CRYSTALS (Poster)

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The tautomeric form of active pharmaceutical ingredients influences their physicochemical and biopharmaceutical properties. Although typically only one tautomeric form is thermodynamically stable in the solid state, the formation of multicomponent crystals may stabilize other tautomeric forms, potentially leading to improved material properties [1].

In this study, 2-amino-6-methylpyrimidin-4-one (AHMP) was used as a model compound to investigate the factors that influence the occurrence of specific tautomeric forms in multicomponent crystalline systems. AHMP has three tautomeric forms: two keto-forms and one enol-form (see Fig. 1) [2].

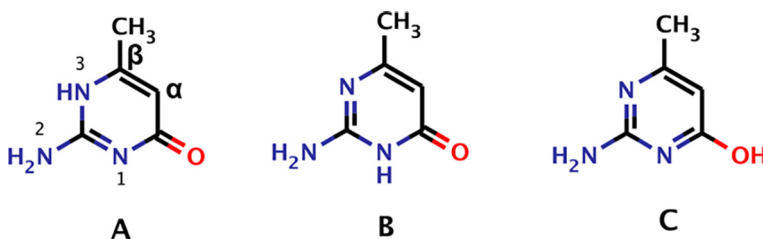


Fig. 1. The AHMP tautomeric forms [2]

The cocrystallization of AHMP was explored under different conditions by performing liquid-assisted grinding and slurry crystallization in different solvents. Solid forms obtained in the cocrystallization were characterized by powder X-ray diffraction. A range of coformers, including organic acids, purines, and different molecular compounds, were evaluated for their ability to promote cocrystal formation.

Most of the new phases can be obtained by using both liquid-assisted grinding and slurry cocrystallization, although slight differences were observed between the outcomes of the two methods. Notably, a new cocrystal was obtained in the presence of para-aminobenzoic acid. In this study crystalline phase, the tautomeric form of AHMP differs from that observed in the previously reported cocrystal with para-aminobenzoic acid.

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FAMILY OF NOVEL SILICON-CONTAINING IMIDAZOLIUM IONIC LIQUIDS: TOXICITY STUDY AND PROSPECTS FOR REVERSIBLE ETHYLENE ABSORPTION (Poster)

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Ionic Liquids (ILs) are promising materials for various applications, including gas absorption and catalysis, due to their unique physicochemical properties. However, the toxicity and environmental impact of ILs are not yet well understood.

In this study, we synthesize novel silicon-containing ILs and assess their structure-activity relationships through microbial toxicity screening and physicochemical property evaluation, ensuring environmental compatibility and potential for IL use in reversible ethylene absorption.¹ Additionally, we developed an HPLC-based method for determining the octanol-water partition coefficient (K_{ow}) in ionic liquids using a slow-stirring method.

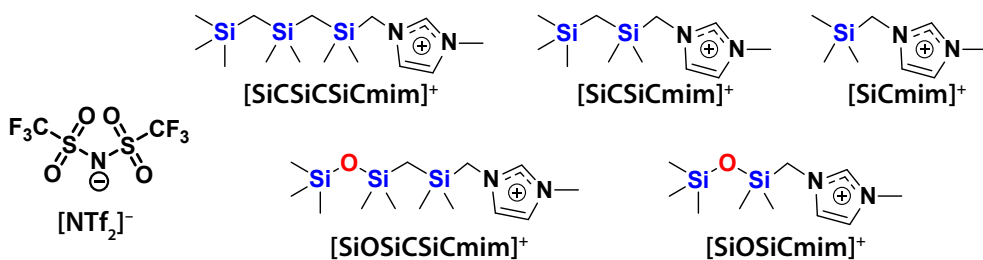


Fig. 1. Novel silicon-containing ionic liquid ion structures studied in this work

The preliminary results show that a longer cation sidechain increases viscosity and K_{ow} and adding a siloxane fragment in the sidechain decreases both viscosity and K_{ow} . However, all of the K_{ow} values measured are less than 15 so these ILs will not accumulate or concentrate in the environment.²

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LEVAN-BASED HYDROGEL WITH INTEGRATED CANNABIDIOL AND INSULIN-LIKE GROWTH FACTOR 1 LIPOSOMES

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⁴Institute of Stomatology, Riga Stradins University

Regenerating oral soft tissues after ablative surgery, trauma, or oral cancer remains a significant challenge due to limited cell ingrowth, inflammation, and pain. Insulin-like growth factor 1 (IGF-1) promotes essential wound-healing processes like cell migration, proliferation, and differentiation [1], while cannabidiol (CBD), a natural, plant-derived compound, provides anti-inflammatory, analgesic, and tissue repair effects [2], aligning with EU Green Deal goals for sustainable biobased materials. Levan-based hydrogels, with their 3D porous structure, offer an ideal matrix for supporting cell growth and retaining bioactive molecules [3]. Encapsulating IGF-1 and CBD into liposomes for incorporation into levan hydrogels enables targeted, controlled delivery to enhance regeneration and mitigate chemotherapy side effects.

The levan-based hydrogel was fabricated from enzymatically produced *Halomonas* levan and crosslinked using 1,4-butanediol diglycidyl ether. Liposomes were prepared via the thin-film hydration method using cholesterol and two phospholipids (DSPC and DSPE-PEG). CBD was incorporated during liposome synthesis, while IGF-1 was loaded during the hydration step. The release of IGF-1 and CBD was quantified using ELISA and ultra-performance liquid chromatography (UPLC) methods, respectively. *In vitro* cytotoxicity and osteogenic differentiation were assessed on patient-derived gingiva-derived mesenchymal stem cells (GMSCs) (Riga Stradiņš University Ethics Committee No. 6-1/12/47, 26.11.2020).

The encapsulation of CBD and/or IGF-1 reduced the particle size of liposomes, where the smallest particles were obtained using the pegylated lipid (DSPE-PEG). IGF-1 and CBD release studies from liposomes in PBS at 37°C revealed faster IGF-1 release (89–94%) compared to CBD (28–34%) release over 14 days. Both levan hydrogel and all liposome formulations demonstrated good biocompatibility with GMSCs, and they are considered as non-cytotoxic, according to the ISO 10993-5:2009. All tested materials promoted osteogenic differentiation of GMSCs even under basal conditions, as shown by elevated alkaline phosphatase secretion and enhanced mineralization.

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Acknowledgements. Funded by the Post-doctoral grant No. RTU-PG-2024/1-0011 (under project No. 5.2.1.1.i.0/2/24/1/CFLA/003), M-era.Net 2 project INJECT-BIO under agreement No. ES RTD/2020/14, and EU Horizon 2020 research and innovation programme under the grant agreement No. 857287 (BBCE).

CONCENTRATION-DEPENDENT THERMOELECTRIC PERFORMANCE OF NANOCONFINED POLY(SODIUM 4-STYRENESULFONATE) ELECTROLYTE (Poster)

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The conversion of low-temperature heat into electrical energy using ionic thermoelectric materials is a promising direction in the development of sustainable energy technologies. Polymer electrolytes are particularly attractive for ionic thermoelectric applications due to their low thermal conductivity, high ionic mobility, and structural tunability. Their ability to host mobile ions within a flexible matrix enables efficient thermally induced ion transport while maintaining mechanical stability and processability. The aim of this work is to investigate how the concentration of poly(sodium 4-styrenesulfonate) (PSSNa) electrolyte confined in a silica-based nanoporous matrix affects the thermovoltage generated under an applied temperature gradient.

In this work, silica aerogel was synthesized using the sol-gel method and infiltrated with PSSNa-based electrolyte of various concentrations. Ion transport within fabricated nanochannels was studied using electrochemical impedance spectroscopy and cyclic voltammetry. Applying a temperature difference across the nanochannels increased the output voltage, attributed to thermally induced ion transport within the silica matrix. The effect of PSSNa concentration on the magnitude and stability of the generated thermal voltage was analyzed to determine the optimal electrolyte concentration that yields the most efficient thermoelectric performance.

Acknowledgement: This research was supported by the European Regional Development Fund (ERDF) project No. 1.1.1.3/1/24/A/113. The authors gratefully acknowledge the support of the Institute of Chemical Physics, University of Latvia.

SORPTION OF CESIUM IONS ON PRUSSIAN BLUE: A PXRD INTENSITY-RATIO APPROACH FOR ESTIMATING SORPTION CAPACITY (Poster)

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Radioactive cesium released in nuclear incidents can contaminate water and food chains, creating long-term radiological risks. Prussian Blue (PB) is a selective cesium-binding material, and practical approaches that rapidly link PB structural features to cesium uptake are valuable for screening and sorbent development. [1]

In this study, PB samples were synthesized at room temperature by reducing a mixture of potassium ferricyanide (“red blood salt”) and iron(III) chloride solutions (molar ratio 3:4) using hydrogen peroxide. Cesium sorption was examined using CsCl solutions at pH 1 and pH 7. Cesium concentrations in the initial solutions and filtrates were determined by ICP-MS and the sorption capacity was calculated from the concentration decrease at equilibrium.

To link sorption behavior with structural features, powder X-ray diffraction (PXRD) patterns were collected for the synthesized PB samples as well as for dried PB samples after cesium sorption. The intensities of the first two diffraction reflections (hkl 200 and 220) were measured, and the relationship between their intensity ratio and the sorption capacity was evaluated. A correlation between the $I(200)/I(220)$ intensity ratio and cesium sorption was observed, and this correlation is proposed as an alternative, PXRD-based approach for estimating sorption. In addition, crystallite sizes were assessed from peak broadening using the Scherrer approach (based on the 200, 220, and 400 reflections) and by full-pattern analysis using the Rietveld refinement. Both approaches showed satisfactory agreement for the synthesized samples, yielding crystallite sizes in the range of 7–12 nm.

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EUTECTIC SOLVENTS OF L-CARNITINE AND POLYOLS FOR ADVANCED, MORE SUSTAINABLE DRUG DELIVERY PROCESSES OF POORLY WATER-SOLUBLE DRUGS (Poster)

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Green solvents and green processes are becoming popular thanks to the development of green chemistry and engineering approaches that enforce sustainability elements.

In the research the eutectic solvents from L-carnitine and polyols (sorbitol, xylitol) were prepared and used for solubility enhancement of ibuprofen.

Thermal mixing and followed vacuum drying were used to create the L-carnitine-based eutectic solvents with polyols. FTIR and DSC techniques were used to characterise the eutectic solvents, and the shaking flask method and LC-UV method were used to determine the solubility of ibuprofen. The concept of the research is shown in Fig. 1.

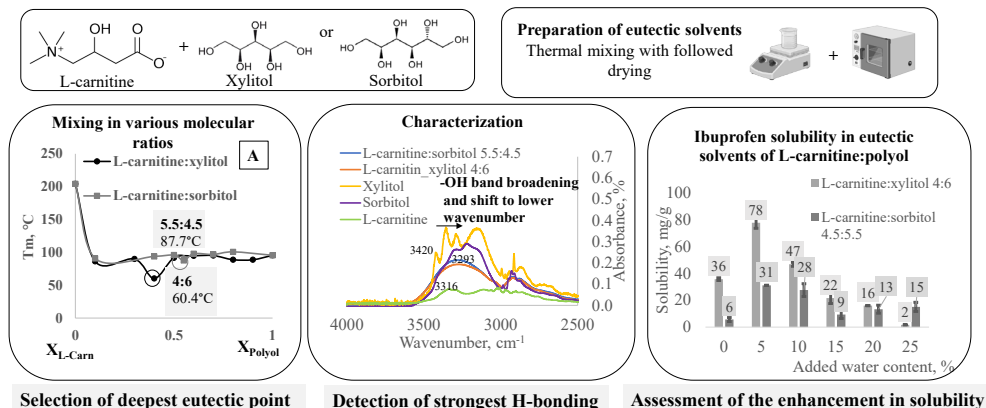


Fig. 1. The concept of the research

Both eutectic systems present a solid-liquid phase diagram characterized by a single eutectic point. The FTIR spectra showed O-H peak shifts from 3316 cm^{-1} to 3293 cm^{-1} and -OH band becomes broader, indicating strong intermolecular hydrogen bonding between L-carnitine and polyols. The DSC showed an absence of endothermic melting peaks of the individual components. The obtained eutectic solvents had high viscosity. To evaluate the drug solubility in water systems, 15–25% water (w/w) was added to eutectic systems. The highest solubility of ibuprofen was reached in a eutectic solvent prepared from L-carnitine:xylitol 4:6 (78 mg/g) with 5% of water. That indicated the interaction (no individual T_m of initial compounds in DSC) between components and successful formation of eutectic solvent. It is reasonable to conclude that the L-carnitine-based eutectic solvents with polyols are novel systems that can be used to improve ibuprofen's

solubility. These systems could be modified to further develop pharmaceutically acceptable formulations, creating the possibility of obtaining novel dosage forms for ibuprofen.

Acknowledgements. This research is conducted under the Scientist Grant "Deep eutectic solvents: An innovative green approach for Solubility enhancement of poorly water-soluble drugs" (RSU-ZG-2024/1-0033), as part of the project "RSU Internal and RSU with LASE External Consolidation" (Project No. 5.2.1.1.i.0/2/24/I/CFLA/005), funded by the European Union Recovery and Resilience Facility and the budget of the Republic of Latvia.

INFLUENCE OF HIGH-PERFORMANCE DISPERSION RATE ON THE MORPHOLOGY AND ELECTROCHEMICAL PERFORMANCE OF NI-RICH NMC811 CATHODES (Poster)

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Li-ion batteries remain one of the most promising forms of efficient energy storage systems used in everyday applications (e.g., electric vehicles, portable devices), due to their unique characteristics including, high specific energy density, long cycling lifespan, and high operating voltage [1]. Among commercially relevant cathode materials, Ni-rich NMC811 ($\text{LiNi}_{0.8}\text{Mn}_{0.1}\text{Co}_{0.1}\text{O}_2$) has attracted significant attention due to its high theoretical capacity and elevated operating voltage [2]. Despite these advantages, the increased nickel content can induce structural instability and mechanical degradation, making electrode processing conditions critically important for achieving stable electrochemical performance.

At the industrial scale, slurry casting is the most widely used technique for electrode fabrication. Therefore, several factors (e.g., particle size, distribution, and microstructural homogeneity) can significantly influence electrode structure and performance. Hydrodynamic shear mixing is the current industrial standard due to its scalability and efficiency; however, it exhibits limited capability to disrupt strongly bound conductive additive agglomerates and often requires extended mixing times [3]. In contrast, high-performance dispersers offer enhanced de-agglomeration of conductive additives and improved microstructural uniformity, resulting in more homogeneous slurries with enhanced electronic percolation networks and improved ionic transport pathways [4].

In this work, NMC811/Super P/PVDF cathode slurries were fabricated using a high-performance disperser at controlled mixing speeds (4000 – 12 000 rpm). Particle size, distribution, and morphology were analysed using XPS and SEM-EDX techniques. Electrochemical characterizations were carried out in a half and full cell configuration.

The result of this study provides mechanistic insights into slurry engineering strategies using a high-performance dispersion and proposes a practical strategy for optimizing the NMC811 slurry preparation.

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PERSPECTIVES OF ELECTROCHEMICAL IMPEDANCE SPECTROSCOPY IN HONEY AUTHENTICITY ANALYSIS (Poster)

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Honey is one of the most frequently adulterated food products worldwide due to its high commercial value. The most common type of adulteration involves the addition of inexpensive sugar syrups (e.g., beet or corn syrup), which alters the nutritional value of honey. Since visual inspection is insufficient to detect such fraud, reliable analytical methods are required for authenticity assessment [1]. Conventional techniques used for honey adulteration detection include chromatographic and spectroscopic methods (e.g., HPLC, GC-MS, FTIR, IRMS), which provide high sensitivity and selectivity. However, these methods are often time-consuming, expensive, and require complex instrumentation. As an alternative approach, electrochemical impedance spectroscopy (EIS) offers a rapid, non-destructive, and potentially portable analytical method capable of characterizing both the electrical properties and electrochemical processes occurring in honey [2].

In this work, honey adulteration was investigated in different honey samples by using EIS analysis technique. The honey samples were adulterated with sugar beet syrup at various concentrations. Before the analysis, the samples were diluted with deionized water (50:50, w/w) to reduce excessive resistance. EIS measurements were carried out in a symmetrical two-electrode cell using platinum electrodes in a frequency range of 0.05–500 Hz. The obtained results were fitted using an equivalent circuit model based on the Levenberg–Marquardt algorithm.

The results of this work demonstrated that the obtained EIS hodographs characterize charge-transfer processes at the electrode/electrolyte interphase, which can be described by a Randles-type equivalent circuit consisting of solution resistance (R_s) and charge-transfer resistance (R_{ct}). The results demonstrated that R_s values correlate with the degree of honey adulteration, reflecting changes in ionic conductivity and viscosity caused by sugar syrup addition. In contrast, R_{ct} values may indicate the botanical origin of honey which depend on the presence of active organic compounds and interfacial processes.

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AQUEOUS ELECTROLYTE CONFINED WITHIN SILICA-BASED NANOCHANNELS FOR HEAT-TO-ELECTRICITY CONVERSION (Poster)

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Thermal energy harvesting has gained significant interest, as the demand for cleaner and more sustainable energy solutions continues to grow. A substantial portion of thermal energy is released into the environment as low-grade waste heat, typically at temperatures below 100 °C. This waste heat is generated as a by-product of numerous sources, including industrial operations and natural processes. Converting this thermal energy into electricity represents a promising strategy for addressing the increasing global energy demand while simultaneously reducing carbon dioxide emissions. The creation of an innovative nanofluidic platform based on ion transport through nanoscale channels within silica-based materials, enhanced by nanoconfinement effects, offers a transformative approach to sustainable energy harvesting and storage, with the potential to significantly improve the performance of next-generation thermal energy conversion technologies.

This study presents evaluation of thermoelectric energy conversion efficiency of aqueous electrolyte solution confined within different nanofluidic platforms incorporating silica-based nanochannels. The nanochannels were infiltrated with $1 \cdot 10^{-4}$ M Na_2SO_4 aqueous electrolyte to promote ion transport, thereby enabling the direct conversion of thermal and electrokinetic energy into electricity. To assess the thermoelectric performance, a custom-designed sandwich-type cell was constructed. When a temperature gradient was applied across the system, a measurable increase in electrical output was observed. This voltage generation arises from thermally driven ion migration within the nanochannels. The findings provide valuable insight into the capabilities of silica-based nanofluidic platforms for thermoelectric applications, identifying both their advantages and current limitations in heat-to-electricity conversion technologies.

Acknowledgements. This work was supported by European Union's Horizon 2020 research and innovation programme project "The Recycling of waste heat through the Application of Nanofluidic Channels: Advances in the Conversion of Thermal to Electrical energy TRANSLATE" under grant agreement number 964251.

RADIATION STABILITY CHARACTERISATION OF LITHIUM-CONTAINING CERAMIC MATERIALS WITH DIFFERENT CRYSTALLINE PHASE COMPOSITIONS FOR APPLICATION IN NUCLEAR FUSION REACTORS (Poster)

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Deuterium-tritium (D-T) reaction is one of the most promising among the fusion reactions and is as sustainable energy source in the future nuclear fusion reactors. Two-phase lithium orthosilicate (Li_4SiO_4) – lithium metatitanate (Li_2TiO_3) ceramic composite material has been identified as a potential tritium breeding material [1]. One of the key challenges for nuclear fusion reactors is the alteration of microstructure and crystalline phase composition of ceramic breeder materials during long-term operation under exposure to neutrons and other type of ionising radiation, high temperatures, magnetic field, etc. [2].

In the present work, two-phase Li_4SiO_4 - Li_2TiO_3 ceramic composite material was prepared using solid-state reaction method, as well as single-phase samples without and with additions of titanium and silicon precursors were made. The crystalline phase composition of the prepared samples was evaluated using powder X-ray diffraction (PXRD) technique and attenuated total reflection – Fourier transformation infrared (ATR-FTIR) spectroscopy. Afterwards, all samples were irradiated using 9 MeV accelerated electrons with absorbed doses up to 500 kGy. The formed and accumulated paramagnetic radiation-induced defect centres in the irradiated samples were examined using electron paramagnetic resonance (EPR) spectroscopy.

On the basis of the obtained results, it can be concluded that the EPR signals in the irradiated two-phase ceramic composite material primarily originate from paramagnetic radiation-induced defect centres in the Li_4SiO_4 phase, while additions of titanium precursor – potentially acting as a source of titanium for isovalent substitution in the Li_4SiO_4 phase – induce the formation of EPR signals with g-factor below 2.00 by introducing electron traps.

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DEVELOPMENT OF BIO-INSPIRED ENERGETIC CO-CRYSTALS

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Energetic materials are crucial for defence, aerospace, and civilian technology. However, common secondary explosives like TNT and RDX are known to be toxic to both humans and ecosystems. Therefore, there is significant interest in developing green, non-toxic energetic materials that, at the same time, have the potential for greater energetic output than previous generations of explosives while still meeting improved safety standards [1].

Co-crystals are a new form of energetic materials that can possess these contradictory properties, energetic potential, and safety through intramolecular interactions. Hydrogen bonding and π - π interactions provide stabilizing effects and confer insensitivity to external stimuli in materials. These interactions also increase the material's density, allowing for greater energetic output [2].

In this research, we have developed uracil and adenine derivatives modified with explosophoric groups and explored their potential to form base-pair-mimicking co-crystals.

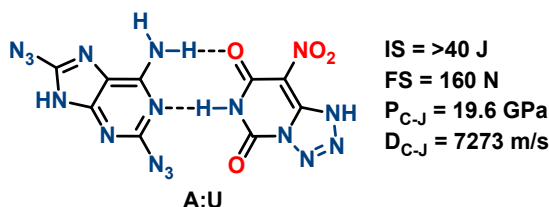


Fig. 1. Structure and energetic properties of co-crystal A:U.

We showed that by mixing derivatives A and U, a new crystalline phase, A:U, with high insensitivity to external stimuli is formed. Its impact sensitivity reached up to 40 J and friction sensitivity of 160 N. Co-crystal A:U also possessed good detonation parameters, with a detonation pressure of 19.6 GPa and a detonation velocity of 7273 m/s (Fig. 1).

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ADVANCING ESTER HYDROSILYLATION: FROM ALDEHYDE SYNTHESIS TO ONE-POT ACCESS TO FUNCTIONAL ACETALS

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The selective transformation of esters into aldehydes and their derivatives remains a significant challenge in organic synthesis, as traditional reducing agents often suffer from low selectivity and over-reduction. Recent advances in catalytic ester hydrosilylation using halogenated heteroleptic triarylboranes (SilBoRed™) have enabled efficient conversion of esters into aldehyde precursors – silyl acetals with near-quantitative yields, providing a mild and practical alternative to conventional reduction methods.¹⁻²

Building on this approach, we developed a one-pot hydrosilylation–acetalization sequence that allows the direct transformation of esters into acetals via in situ quenching with alcohols or thiols.³ The method operates at low catalyst loading and tolerates a broad range of functional groups, eliminating the need for intermediate aldehyde isolation.

These strategies provide streamlined access to silyl acetals or acetals, which serves as stable aldehyde precursors, protecting groups, and fragrance-relevant compounds, highlighting the versatility of triarylborane-catalyzed ester hydrosilylation for both synthetic and industrial applications.

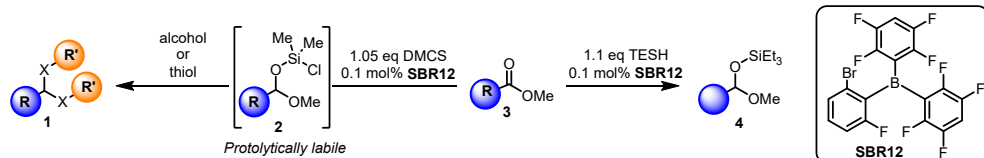


Figure 1. Ester Hydrosilylation/Acatalization.

Supervisor: Dr. chem. Gints Smits

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GETTING AROUND INTRINSIC ERRORS OF DENSITY FUNCTIONAL THEORY CALCULATIONS IN ELECTROCATALYSIS (Poster)

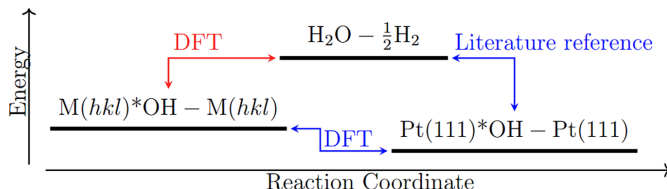
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Error cancellation plays a central role within Density functional theory, especially where the trends of a variety of connected chemical systems are concerned, such as the comparison between catalytic systems. Error cancellation here refers to the cancellation of inaccuracies of the density gradient. When the chemical reaction describes a large change there in, we get an inadequate error cancellation; this is seen in the case of adsorbed oxygen species being compared to a reference of gas phase molecules; hence the name Gas-Phase errors. [1], [2], [3] Here we present a general strategy to circumvent gas-phase errors in electrocatalysis by referencing all reaction energies to surface-bound intermediates rather than molecular species. The approach removes the dominant systematic bias without empirical corrections and yields internally consistent energy diagrams with reduced uncertainty.



The image describes how the same span in chemical space can be described via different paths, with a different direction of DFT leading to a reference with more like densities and therefore greater error cancellation. We employ the Bayesian Error Estimation with the BEEF-vdW functional, this exchange correlation functional has a trained ensemble of functionals with variations which together estimate the bias of the calculated reaction energy.

Finally we go on to show how this approach of reference pathways can be applied within more complex frameworks such as the reaction barriers calculated with Nudged-Elastic-Band methodology.

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DEEP LEARNING APPROACH FOR SOLVING CENTROSYMMETRIC CRYSTAL STRUCTURES FROM LOW-RESOLUTION DIFFRACTION DATA

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Crystal structure determination is essential for pharmaceutical research, development of novel materials, and many other areas of chemistry. However, structure solution from X-ray or electron diffraction data is often hindered by the lack of methods for solving the phase problem in low-resolution and low-completeness cases. Recently a breakthrough in this area was achieved by deep learning – the PhAI neural network was able to correctly phase diffraction data up to 2 Å resolution, surpassing conventional phasing methods [1]. Attempts to generalize this approach beyond space group $P2_1/c$ and unit cell dimensions of 10 Å have thus far faced scalability issues.

Our developed routines for database-guided training data generation [2] and a new, efficient diffraction data representation in graph form allow us to train GraPhAI-v1 – a graph neural network for phasing structures in any centrosymmetric space group and with unit cells up to 20 Å. The performance on real crystal structures is highest when an atom with $Z \geq 19$ is present, such as in coordination compounds or metal-organic frameworks; GraPhAI-v1 solves over 80% of such structures at 2 Å resolution (Fig. 1). Furthermore, phasing accuracy also remains high when using experimental instead of simulated diffraction data.

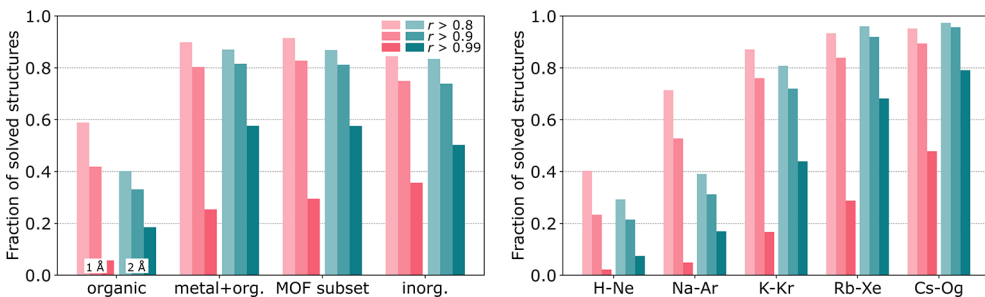


Fig. 1. Results of phasing the test set of 10 000 centrosymmetric crystal structures with unit cell size up to 20 Å. Left: structures partitioned by compound class, right: partitioned by heaviest element

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ELUCIDATION OF THE MECHANISM OF AMORPHIZATION AND DISSOLUTION OF BAD GLASS FORMERS AS A FUNCTION OF DRUG-POLYMER INTERACTION AND PREPARATION METHOD: TOWARD SUSTAINABLE TECHNOLOGIES

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The majority of oral pharmaceutical products are administered orally, while most of the contemporary active pharmaceutical ingredients (APIs) have poor aqueous solubility in the gastrointestinal tract (GIT)-relevant pH. At the same time, most drugs should be absorbed from the GIT to the bloodstream to ensure a pharmacological effect. Poor solubility of API results in incomplete/insufficient absorption—low bioavailability (BA), while the non-absorbed fraction of the drug leaves the human body in a natural way and pollutes our environment. Thus, we aimed our project at increasing the apparent solubility of APIs in order to increase their BA [1]. For this purpose, as an approach, we chose a polymer-based amorphous solid dispersion (ASD) and, as a model drug, naproxen. In the context of polymer-based ASD, naproxen belongs to the hardest-case-scenario group of substances, specifically a bad-glass-former fast-crystallising substance. Fluid-bed coating and electrospinning were selected as solvent-based preparation techniques. At the pre-formulation stage, to screen the most suitable polymer and organic solvent, the solubility distance (Ra), the solvent class in accordance with ICH, the boiling point of the solvent, the experimental solubility of the API in the solvent, the dynamic vapor sorption of the solvent by the polymer, the drug solubility in the polymer, and the drug precipitation in dissolution media with pre-dissolved polymer were investigated [2, 3]. To pre-test the solvent-based coating process, the deposition of ASD on the tablet core using a pan-coater was investigated [4]. In addition, the effect of ASD drug loading and preparation conditions on naproxen dissolution was also investigated [5]. It's been almost 1.5 years since our project began, and at the next stage, we will convert our pre-formulation knowledge into the pharmaceutical dosage form preparation towards higher BA and more sustainable technologies.

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LOW-PRESSURE PHYSICAL VAPOUR DEPOSITION OF SELF-ASSEMBLING ZN NANOWIRE NETWORKS FOR APPLICATION AS ADVANCED ANODES IN ZN-BASED BATTERIES (Poster)

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The growing demand for sustainable and environmentally friendly energy storage has spurred significant interest in aqueous rechargeable batteries. The use of pure metal foil as an anode in aqueous rechargeable batteries is common due to its accessibility and simplicity; however, such anodes undergo repeated dissolution and deposition, resulting in morphology changes, dendrite formation, and anode corrosion¹.

Nanostructured materials offer promising strategies for stabilizing metal anodes, as their sponge-like, highly porous, and stable structures allow the electrolyte to penetrate the anode material and provide internal space within the anode for the dendritic growth of Zn during battery cycling.

This study focuses on the development of nanostructured self-assembling binder-free metal nanowire anodes using an environmentally friendly and one-step low-pressure physical vapor deposition method. By adjusting the synthesis conditions, different structural features of the nanowire networks were obtained. The structure of metal nanowire networks was controlled and altered by the substrate temperature during deposition. It was observed that structures deposited on the substrates located in the higher temperature area exhibited dense and highly interconnected structures, whereas structures deposited on the substrates located in the lower temperature area consisted of a network of finer nanowires. These observations demonstrate the significant influence of substrate temperature on the morphological properties of metal nanostructures. The morphology of the samples was analyzed using a field-emission scanning electron microscope (SEM), while structural characterization was performed using X-ray diffraction (XRD).

The results demonstrate that nanostructured self-assembling binder-free metal nanowire anodes enhance the efficiency of aqueous batteries. Optimization of the electrode design enables the development of affordable and environmentally friendly energy technologies for safe and sustainable applications.

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Acknowledgements. The research is financed by the Recovery and Resilience Facility project “Internal and External Consolidation of the University of Latvia” (No.5.2.1.1.i.0/2/24/I/CFLA/007), grant No. LU-BA-PA-2024/1-0061 “Advanced anodes for sustainable aqueous rechargeable zinc-based batteries”.

CESIUM SORPTION IN WATER ON PRUSSIAN BLUE-CELLULOSE COMPOSITE (Poster)

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For the recovery of the environment and the preservation of health in the event of contamination, radioactive isotope sorbents must be improved. For sorption characterization, isotherms are usually constructed and analysed in coordinates of sorption – sorption equilibrium concentration. The difficulty is hampered by the use of solutions of multiple concentrations. It is more convenient for sorption characterization to select a solution of one concentration, and change the masses of the sorbent. In this case, the mass dependence of the sorbed substances on the mass of the sorbent is described by the equation:

$$Q = \frac{m(\alpha - \sqrt{\alpha^2 - 4A\beta})}{-2A} \quad (1) \quad \alpha = kC_0 + 1 + \frac{q_0mk}{v} \quad (2) \quad \beta = q_0kC_0 \quad (3) \quad A = \frac{km}{v} \quad (4)$$

Where Q – sorbate sorbed quantity, g; C₀ – initial solution concentration; k – sorption rate constant; m – mass of sorbent; v – initial solution volume.

Equation (1) fits the experimental data very well. After optimization, the regression gives R²=0.992. For 39 experimental points, the standard deviation is 1,7E-5.

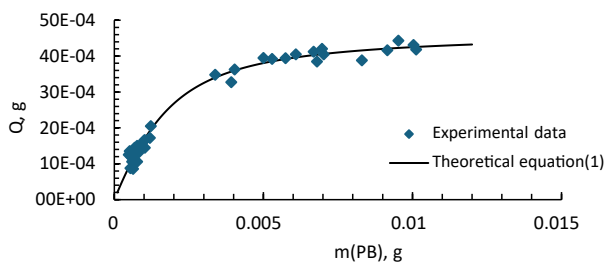


Fig. 1. Dependence of sorption capacity on the mass of PZ on the cellulose

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FORMATION OF PARAMAGNETIC RADIATION-INDUCED DEFECT CENTRES IN TWO-PHASE LITHIUM ORTHOSILICATE – LITHIUM METATITANATE COMPOSITE MATERIAL (Poster)

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To achieve fuel self-sufficiency in nuclear fusion reactors, *in-situ* tritium breeding using lithium-containing materials is essential [1]. A promising candidate for tritium breeding is two-phase lithium orthosilicate (Li_4SiO_4) – lithium metatitanate (Li_2TiO_3) composite material; however, the crystalline phase purity and consequently radiation stability of this material is highly sensitive to the synthesis procedure as well as the stoichiometry of precursors [2].

In the present work, the formation of radiation-induced defect centres was investigated in two-phase Li_4SiO_4 - Li_2TiO_3 composite material under exposure to X-rays, with results compared against single-phase materials and those doped with titanium and silicon precursors. Prior to irradiation, the prepared samples with different contents of lithium precursor were characterised using powder X-ray diffraction (PXRD) technique and attenuated total reflectance – Fourier transformation infrared (ATR-FTIR) spectroscopy to confirm the chemical and crystalline phase composition. Following irradiation, the formed paramagnetic radiation-induced defect centres were analysed using electron paramagnetic resonance (EPR) spectroscopy.

The obtained EPR spectra of the irradiated two-phase Li_4SiO_4 - Li_2TiO_3 composite material displayed a complex signal structure: signals with $g > 2.00$ were primarily attributed to paramagnetic radiation-induced defect centres in the Li_4SiO_4 phase, while signals with $g < 2.00$ appeared to be induced by the addition of titanium precursor. The intensities of the $g = 2.40$ and $g = 2.00$ signals increased with the excess of lithium precursor in the irradiated Li_4SiO_4 powder. However, upon the addition of titanium precursor to Li_4SiO_4 powder, these signals differed: the $g = 2.04$ signal intensity still increased with the addition of excess lithium precursor, while the $g = 2.00$ signal exhibited an inverse trend, showing a decrease in intensity. Notably, the EPR signals from the Li_2TiO_3 phase were not detected, most likely due to the high radiation stability of this compound in comparison to Li_4SiO_4 .

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SYNTHESIS OF STRUCTURALLY SIMPLIFIED DIAZONAMIDE A ANALOGS (Poster)

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Latvian Institute of Organic Synthesis

Diazonamide A is a structurally unique secondary metabolite first isolated by Fenical and coworkers from the colonial marine ascidian *Diazona angulata*¹. The structurally complex diazonamide A (1) was found to be highly cytotoxic anticancer agent against several types of cancer cell lines². Studies conducted by Suna³ revealed that compound 2a, a structurally simplified analog of 1, can be synthesized more easily while retaining high antiproliferative properties. However, 2a lacks some ADME properties which renders it from entering preclinical studies. To optimize the structure of analog 2a for further development as anticancer agent, we designed a series of compounds, 2b and 2c, by replacing the indane cycle in 2a with more polar isoindoline and benzofuran moieties.

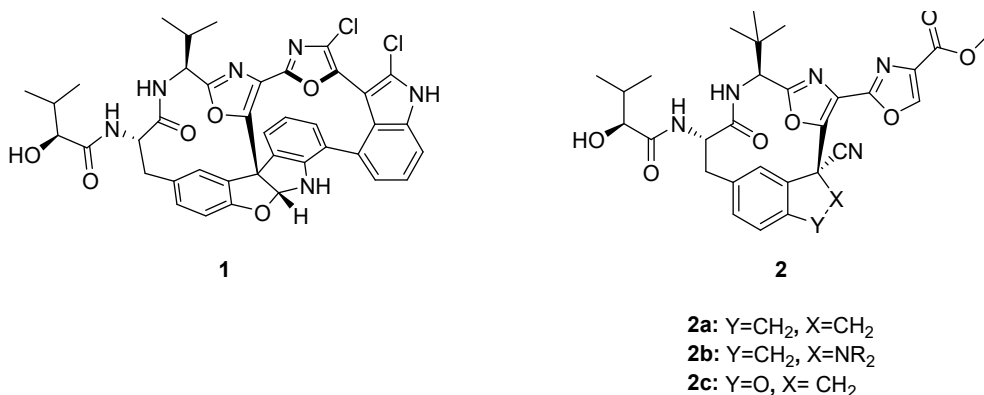


Fig. 1. Structures of diazonamide A (1), simplified analog 2a and compounds 2b and 2c.

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CARBANION-INITIATED DIAGONAL GROB FRAGMENTATION IN SUBSTITUTED CYCLOBUTANES (Poster)

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Cyclobutane ring opening is a valuable tool in organic chemistry[1], used and developed in fields such as total synthesis, pharmacy and material science. Grob fragmentation is one of the cyclobutane ring opening strategies which usually occurs orthogonally[2][3] due to more preferred orbital overlap. Not many examples exist where the fragmentation occurs diagonally[4], whereas carbanion-initiated diagonal fragmentation is unknown. The regioselectivity and stereoselectivity also remain unclear for non-fused cyclobutanes.

Herein we report a new synthetic approach towards substrates which are potentially suitable for diagonal Grob fragmentation initiated by the carbanion. In this context and for the reason of studying the regio- and stereoselectivity of the fragmentation, α -pinene, as an abundant and widely available natural substance, was chosen.

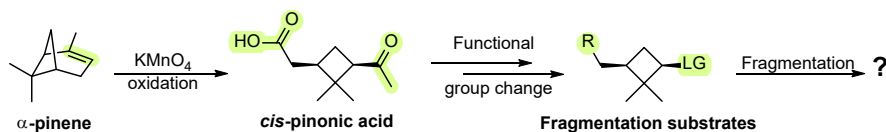


Fig. 1. Overall strategy of synthesizing substituted cyclobutanes

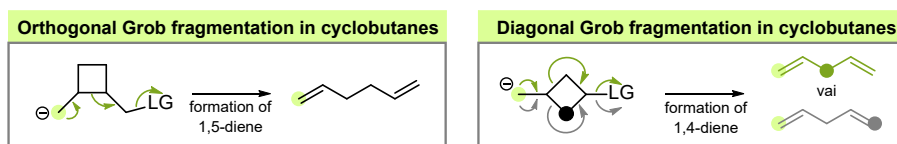


Fig. 2. Grob fragmentation regioselectivity

Fragmentation tests demonstrate that fragmentation is possible and provides single product with high regioselectivity, but it is substrate-dependent.

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INVESTIGATION OF TRIBOVOLTAIC EFFECT (Poster)

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Contact electrification, also known as triboelectricity, is a natural phenomenon that occurs whenever two different materials or material phases come into contact and subsequently separate [1].

Tribovoltaic devices are characterized by their ability to directly generate direct current (DC) voltage, which makes their integration into practical power systems comparatively straightforward.

Such devices can utilize ambient waste mechanical energy, including environmental vibrations, and convert it into electrical energy. Despite extensive research efforts in this area, triboelectric-based technologies have not yet achieved large-scale commercialization. The main limitations are related to relatively low energy conversion efficiency and limited material or device lifetime.

For this reason, our work focuses on investigating new approaches for electricity generation based on the tribovoltaic effect. In this work, transition metal chalcogenide-based semiconductor materials were fabricated, and their stoichiometry and morphology were characterized by SEM/EDX analysis, in the scope of their application in tribovoltaic devices. Also, conductive AFM tribovoltaic experiments were performed on different material pairs to investigate the fundamental principles of the tribovoltaic effect.

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Acknowledgements. This work was performed within Latvian Council of Science project No. lzp-2024/1-0223 “Tribothermoelectric devices with enhanced power output”.

TRANSFORMATION OF HINDERED TERTIARY ALDEHYDES INTO ALKYNES (Poster)

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Riga Technical University, Faculty of Natural Sciences and Technology

Alkyne moiety is valuable functional group in organic chemistry which appears in drugs and their precursors. Alkynes are readily convertible into other functional groups, making them key intermediates in multistep synthesis of complex natural products and drugs.

Aldehydes are important starting materials in alkyne synthesis which allows convenient substituent design. There are three general strategies to convert aldehydes into alkynes: the Corey–Fuchs approach [1], Seyferth–Gilbert approach [2] including the Ohira–Bestmann modification [3], and the Colvin approach [4] (Figure 1). All these routes can be formally divided into two steps including aldehyde olefination followed by the Fritsch–Buttenberg–Wiechell rearrangement of the *in situ* generated alkylidene carbenoid.

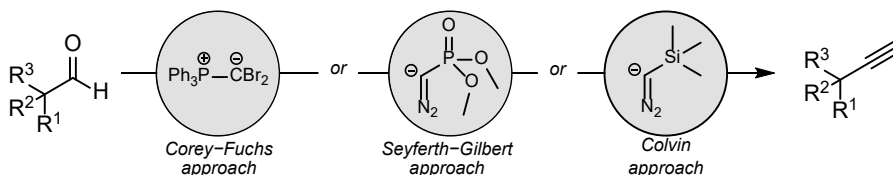


Fig. 1. Known methods for aldehyde transformation into alkynes.

While all three main methods demonstrate comparable efficiency for simple aldehydes, bulky aldehydes are potentially challenging substrates for this transformation since sterically hindered functional group manipulations are problematic in general.

Herein we report our research focused on the hindered tertiary aldehyde transformation into alkyne. The reactivity tests of the aforementioned approaches for both unhindered and hindered substrates were performed, and the most suitable reaction conditions were determined.

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ACYCLIC DIARYL λ^3 -BROMANES: SYNTHESIS AND USE IN CYCLOADDITION REACTIONS VIA ARYNE GENERATION

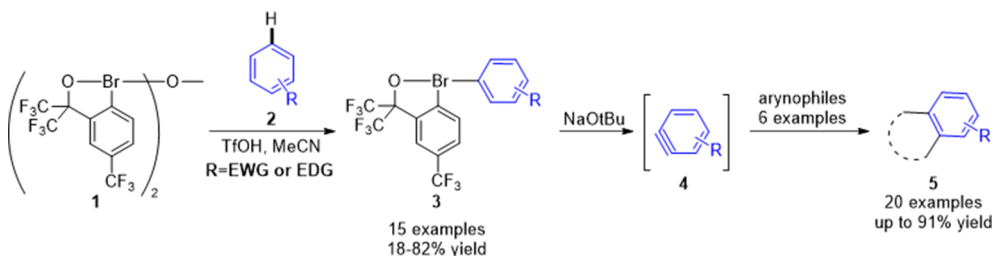
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The chemistry of hypervalent bromine(III) compounds is currently experiencing rapid development. Cyclic biaryl λ^3 -bromanes exhibit unique reactivity – they can be used to generate arynes under mild conditions, and consequently utilized to synthesize polycyclic cores found in optoelectronic materials and bioactive compounds [1,2]. Although acyclic diaryl λ^3 -bromanes offer the prospect of converting a single aryl group to an aryne, their use in aryne generation is less investigated. In addition, all reported methods for preparing acyclic diaryl λ^3 -bromanes from non-prefunctionalized arenes rely on the use of highly toxic and extremely reactive BrF_3 [3].

Herein, we report the use of a stable, electrochemically generated Br(III) compound **1** in the synthesis of the acyclic diarylbromanes **3** via Friedel-Crafts reaction with arenes **2**, containing different electron-donating or electron-withdrawing groups (Scheme 1) [4]. Diarylbromanes **3** are used in cycloaddition reactions with various arynophiles through aryne generation in the presence of a strong base. After the cycloaddition reaction, the non-transferable arene can be regenerated for use in the synthesis of **1**.



Scheme 1. Synthesis and use of diarylbromanes **3**.

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DEVELOPMENT AND CHARACTERISATION OF FLEXIBLE CNT–CHALCOGENIDE HYBRID THERMOELECTRIC STRUCTURES (Poster)

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Thermoelectric (TE) generators are promising for harvesting low-grade waste heat, especially for wearable and flexible electronics. Conventional inorganic thermoelectric materials such as bismuth selenide (Bi_2Se_3) and antimony telluride (Sb_2Te_3) show good performance near room temperature, but their brittleness limits their use in flexible devices. Hybrid structures based on carbon nanotubes (CNTs) and chalcogenides offer a way to combine good electrical properties with mechanical flexibility. [1].

In this work, flexible CNT– Bi_2Se_3 (*n*-type) and CNT– Sb_2Te_3 (*p*-type) hybrid networks were fabricated on Kapton substrates using CNT spray coating followed by physical vapour deposition. [2,3]. The *p*-type and *n*-type networks were deposited on opposite sides of a single flexible substrate, forming a triangle-like *p*-*n* architecture that was subsequently polymer-encapsulated to improve mechanical stability and thermoelectric performance. This configuration enables the use of hybrid networks with the heat flow perpendicular to the substrate, providing efficient thermal coupling in a compact and flexible device design. Scanning electron microscopy (SEM) and energy dispersive X-ray spectroscopy (EDX) analyses confirmed the formation of continuous hybrid networks.

Thermoelectric and electrical properties of the obtained networks were measured using a laboratory-built experimental setup. Electrical measurements showed linear current–voltage characteristics, indicating ohmic behaviour and good electrical contacts. The results confirmed the expected *p*-type and *n*-type thermoelectric behaviour of the hybrid networks. A flexible two-leg thermoelectric generator was fabricated and tested under different temperature gradients, demonstrating the feasibility of CNT–chalcogenide hybrids for near-room-temperature energy harvesting.

COCRYSTALLIZATION BEHAVIOR OF NITROFURAN ANTIBIOTICS WITH A SERIES OF UREA-BASED COFORMERS

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Cocrystallization is a widely employed solid-state modification strategy for enhancing the physicochemical performance of active pharmaceutical ingredients (APIs), particularly with respect to solubility, stability, and processability.^{1,3} Pharmaceutical cocrystals consist of an API and a pharmaceutically acceptable neutral coformer assembled within a single crystalline lattice through noncovalent intermolecular interactions. This approach enables systematic tuning of solid-state properties without altering the covalent structure or pharmacological activity of the API. In the present study, two structurally related nitrofurantoin (NF) and furazidin (FUR), were selected as model compounds due to their limited aqueous solubility and pronounced solid-state diversity. NF is known to form a cocrystal with urea,⁴ rendering this system suitable for probing coformer selection principles.

The objective of this work was to determine whether the structurally analogous APIs NF and FUR exhibit comparable cocrystallization propensities toward a series of pharmaceutically relevant urea derivatives and to evaluate the implications of these observations for rational coformer selection in cocrystal design.

Nine urea derivatives were screened as potential coformers, yielding seven previously unreported crystalline phases, including four cocrystals of FUR and three of NF. Although unsubstituted urea formed cocrystals with both APIs, modification of the urea scaffold markedly affected cocrystallization outcomes. Structural characteristics of FUR, in particular the extended C–C linkage between heterocyclic fragments, facilitated cocrystal formation with urea derivatives capable of additional aromatic interactions. Monosubstitution at one urea nitrogen remained compatible with cocrystal formation for both APIs, whereas bulkier substituents limited cocrystal formation to NF. Despite the presence of analogous hydrogen-bonding synthons across the systems, relatively minor variations in coformer structure produced distinct solid-state landscapes, underscoring the high sensitivity of cocrystal formation to subtle molecular and steric effects

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STRUCTURAL STUDIES OF SPIDER SILK HYDROGELS (Poster)

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Spider silk is a bio-compatible, bio-degradable, strong and elastic natural material that has a great potential in applications as a natural alternative to synthetic fibres, as well as in the medical field for drug delivery and immobilization, artificial organs etc.

Recently it was discovered that the N-terminal domain of major ampullate spider silk forms self-supporting, transparent hydrogels [1]. Furthermore, other proteins maintain their activity within the hydrogel. It is known that the N-terminal domain undergoes an α -helix to β -sheet transition but is not well understood how this transition occurs structurally beyond this. Herein we perform both solution and solid-state nuclear magnetic resonance (NMR) experiments to elucidate the gelation mechanism of a spider silk hydrogel.

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PYRIDINIUM IONIC LIQUIDS AS CHARGE TRANSFER COMPLEXES (Poster)

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A promising alternative to conventional thermal activation in chemical reactions is the use of light energy. Radicals can initiate chain reactions without the need for toxic and rare metals such as ruthenium.

In this study, we investigate a relatively new class of room-temperature ionic liquids (ILs) composed of substituted pyridinium cations paired with the [TCM]⁻ anion and [NTf₂]⁻ as a reference anion (Figure 1). [RPy][TCM] form electron donor-acceptor complexes that undergo photoinduced charge transfer upon light exposure at room temperature.

Synthetic methods for these ILs have been developed. The measurements of viscosity and density reveal that cyano-group introduction in the anion imparts low viscosity. Cyclic voltammetry studies show that introducing electron-withdrawing groups like cyano groups into the cation shifts the reduction potential to more positive values compared to the unsubstituted analogs. These ILs also demonstrate a new distinct UV-Vis absorbance band that doesn't show up in the spectra of [RPy][NTf₂] or K[TCM] proving the donor-acceptor complex formation.

These findings highlight the potential of [RPy][TCM] ILs as functional materials for applications in photochemistry, offering a more sustainable, metal-free pathway to light-driven chemical reactions.

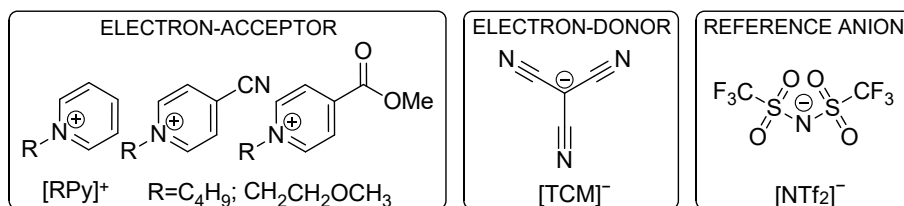


Fig. 1. Ionic liquid ion structures studied in this work

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HEAVY METAL CONTAMINATION IN E-WASTE RECYCLING: AN ANALYSIS OF DUST AND AIRBORNE PARTICULATES (Poster)

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The short lifespan of electronic devices and increasing consumer demand are driving the rapid growth of electronic waste (e-waste). Due to its complex composition, including metals, plastics, glass, and ceramics, e-waste is difficult to process safely. In addition, improper recycling and disposal practices can result in the release of hazardous elements into the environment, posing risks to both ecosystems and human health. Toxic metals such as Pb, Hg, As, Cr, Co, Cd, and Ni may be released during informal or poorly controlled e-waste treatment processes.

The aim of this study was to determine the concentrations of metallic elements in surface dust and airborne particulates at an e-waste recycling site. Samples were collected from three different recycling zones: the grinding zone (ML), the fluorescent bulb crushing zone (LS), the manual disassembly zone (DL) and ink cartridge grinding location (TL). The analytical workflow included sample collection, acid digestion, and elemental determination by ICP-MS (Agilent 8900 ICP-QQQ). Surface dust samples were collected manually using a polyethylene brush, while airborne particulate matter was separated using a purpose-built cyclone system and collected on filters. All samples were subjected to microwave-assisted acid digestion using a mixture of HNO₃, HCl, and HF prior to analysis.

The results showed that Pb had the highest concentration in surface dust across all sampled zones relative to the other analyzed metals (Figure 1).

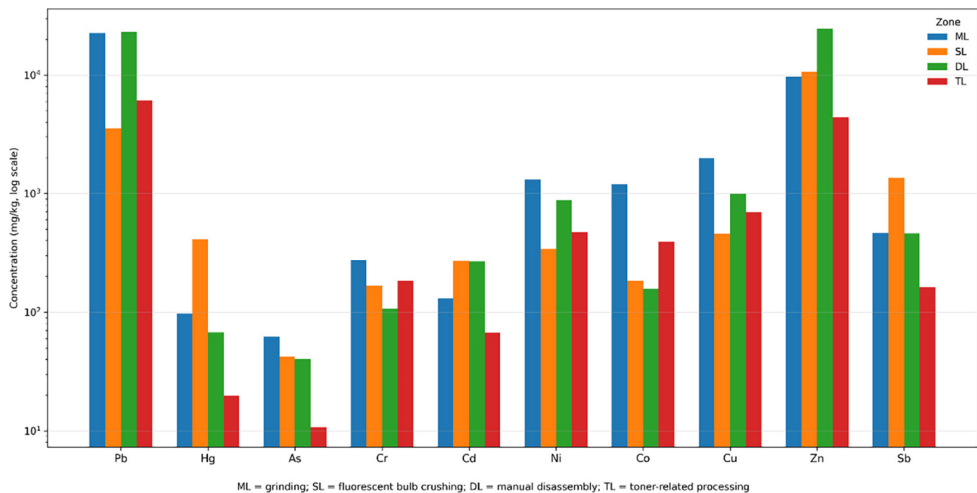


Fig. 1. Concentration of selected metals (µg/g) in surface dust collected from four e-waste recycling zones.

This pattern is consistent with the presence of Pb-containing materials in e-waste, including solder, circuit boards, and certain ceramic components. Although the concentrations of other elements were generally lower than those of Pb, the results also highlighted the potential importance of Hg in areas associated with fluorescent bulb treatment. Differences observed between surface dust and airborne particulates indicated that some elements may be more prone to transfer into the airborne fraction during recycling processes. Although no uniform relationship between specific recycling operations and individual metal concentrations was observed for all elements, the findings demonstrate that e-waste processing can generate metal-bearing dust with potential environmental and occupational health significance.

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INFLUENCE OF CARBON NANOSTRUCTURE-REINFORCED POLYMER ELECTROLYTE MEMBRANES ON TRITIUM SEPARATION IN WATER ELECTROLYSIS (Poster)

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Tritium (^3H) is a radioactive isotope of hydrogen and is used as a fuel in nuclear fusion reactors, as a radiotracer in environmental and biological studies, and in various nuclear research applications. Currently, most of the tritium is produced as a by-product in heavy water moderated fission reactors. Tritium separation is needed for the nuclear fusion fuel cycle, heavy water fission reactor detritiation, radioactive waste management, and environmental studies. The most widely used tritium separation technologies are cryogenic distillation and liquid phase catalytic exchange; however, these methods are complex, energy-intensive, and costly to operate and maintain.

Electrolysis of tritiated water is an approach for tritium separation, in which electrochemically hydrogen gas is generated, and tritium gets concentrated in the liquid phase. Among water electrolysis technologies, proton exchange membrane (PEM) electrolysis offers several advantages, including separate generation of hydrogen and oxygen streams, elimination of explosive gas mixtures, high product gas purity, operation at moderate temperatures, and a compact and scalable cell design suitable for both laboratory-scale and industrial applications.

The efficiency of tritium separation in PEM systems is influenced by the properties of the electrochemical cell components, particularly the polymer electrolyte membrane and the electrocatalysts. Previous studies have shown that a graphene monolayer deposited on a membrane surface can enhance hydrogen isotope selectivity by introducing an energy barrier that differentiates hydron transport [1]. Other carbon nanostructures, such as carbon nanotubes, have demonstrated isotope separation capabilities in non-electrochemical systems [2], although their role in electrochemical isotope separation has not been investigated.

In this study, the effect of used electrolyte membrane on tritium separation during PEM electrolysis was investigated. Nafion™ and sulfonated poly(ether ether ketone) (SPEEK) membranes reinforced with carbon nanotubes (CNTs) and graphene nanoplatelets (GNPs) were fabricated and tested. Tritium separation factors were determined by measuring tritium activity in both the residual water phase and the generated hydrogen. The initial results indicate that incorporation of CNTs modified isotopic selectivity, resulting in a reduced tritium separation factor, whereas GNP addition at various loadings did not significantly change isotope separation performance. These observations highlight the importance of membrane structure in isotope separation within PEM electrolysis systems.

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Acknowledgements. The research was supported by the project No. 1.1.1.8/1/24/I/003 “Strengthening the Research and Development Capacity of Doctoral Studies at the University of Latvia in the Fields of Smart Specialisation”.

DFT MODELLING OF CO₂ ELECTROSORPTION ON METAL-ORGANIC FRAMEWORKS (Poster)

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CO₂ electrosorption is an emerging direct air carbon capture technology. The current challenge is the mechanistic understanding of electrosorption, which can happen through a fractional charge transfer (CT) or an integer CT. CT determines the degree of electronic coupling between CO₂ and the electrode under applied potential, and it is less elaborate to model computationally than to quantify experimentally. In this work, constant-potential density functional theory (DFT) was applied using the solvated jellium method with implicit solvation [1], [2] to study CO₂ electrosorption on two-dimensional Cu-based metal-organic frameworks.[3] Both finite-difference and plane wave modes were tested to scan potential-distance space. Potential-dependent energy surfaces were estimated, and O-C-O angles were evaluated to determine electrosorption. The results quantify charge transfer between the Cu center and CO₂ and explain its role in adsorption stability. This work provides mechanistic insight and supports the rational design of electrosorbent materials.

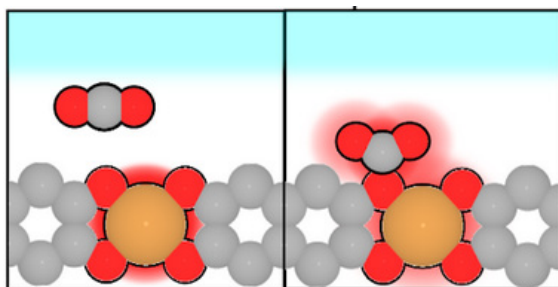


Fig. 1. Electrosorption of CO₂ on a computational Cu-based MOF model.

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ANALYSIS OF SURFACE CHEMICAL PROPERTIES AND FUNCTIONAL GROUPS OF BIOCHAR AND HYDROCHAR (Poster)

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Latvian State Institute of Wood Chemistry

Biochar and hydrochar are environmentally friendly carbon materials produced from biomass and have potential applications in environmental protection, such as soil improvement and pollutant adsorption, and as catalyst support, both in chemical synthesis and electrochemistry. Their properties and effectiveness largely depend on the presence of surface functional groups.

In this study, various carbon materials were obtained from biomass, with hydrochar produced from lignin through hydrothermal carbonization conducted at various temperatures and reaction times to investigate the influence of these conditions, and biochar produced from birch lignocellulose by fast pyrolysis in a superheated steam atmosphere, preserving the complex structure of the lignocellulosic material.

Functional groups of both chars were analyzed volumetrically to evaluate surface chemical properties. In addition, biochar was further characterized using the sulfur content determination, and methylene blue adsorption to assess its surface functionalities and activity, also testing the biochar's catalytic efficiency for anhydrosugar conversion into glucose by hydrolysis. On the other hand, hydrochar was analyzed by FTIR spectroscopy to identify specific chemical bonds on its surface. These complementary analyses provided a comprehensive understanding of the surface chemistry and functional groups of the two chars, including the effects of temperature and reaction time on hydrochar synthesis.

Acknowledgements. The research was funded by project lzp-2024/1-0525 "Lignin-containing products for synthesis of N-doped carbon microspheres as electrochemical catalyst and electrode materials (LIGsp)"

THERMAL PROCESSING PATHWAYS FOR STRUCTURAL TUNING OF TELLURIUM NANOWIRES

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Elemental tellurium (Te) nanowires are intrinsically p-type, chiral one-dimensional semiconductor whose electrical transport is highly sensitive to crystallographic order, chirality and lattice distortions [1-3]. Defect- and surface-chemistry effects (including oxidation and other disorder sources) give rise to non-trivial transport behavior, and developing practical routes for deliberate defect introduction and control is therefore key to the potential of Te nanowires in energy-efficient electronics and optoelectronics.

Here we examine the role of thermal processing in shaping Te nanowire structure. Te nanowires were synthesized via physical vapor deposition (PVD) at ambient pressure while varying the growth temperature, and their morphology and crystal structure were assessed by scanning and transmission electron microscopy (SEM and TEM) and by X-ray diffraction (XRD). Post-growth annealing is additionally performed at ~30 Torr using different annealing temperatures and durations to explore structural modification after synthesis. XRD identifies trigonal Te (PDF 00-004-0554), and TEM of representative nanowires shows predominantly crystalline structures with a preferred growth direction consistent with c-axis alignment (commonly indexed as [0001]) [4].

Across the explored processing conditions, Te nanowires show a pronounced tendency toward well-ordered growth, whereas temperature variation most readily influences nanowire formation and morphology. Together, the results frame temperature as a practical synthesis parameter and motivate pairing thermal processing with other defect-introduction strategies (impurities, oxidation, strain/twist, or post-growth disordering) for transport modulation.

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LIQUID-PHASE PRODUCT CHARACTERIZATION AFTER HYDROTHERMAL PROCESSING OF LIGNIN AND PHENOLIC BIO-OIL RESIDUES (Poster)

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Latvian State Institute of Wood Chemistry

The transition toward a sustainable circular economy necessitates efficient valorization of complex biomass streams into both functional carbon materials and recoverable platform chemicals. Hydrothermal carbonization (HTC) has emerged as a robust thermochemical technology for converting lignocellulosic biomass; however, while the solid hydrochar has been extensively studied, the complex liquid phase generated during the process remains underexplored despite its significant potential for resource recovery and environmental assessment.[1] Addressing this knowledge gap, the present study investigates the hydrothermal degradation pathways and the resulting liquid-phase composition of two poorly water-soluble, phenolic-rich feedstocks: industrial “Fibinol” lignin and a spruce-origin bio-oil residue remaining after the separation of anhydrosugars.

Because the specific chemical environment fundamentally alters depolymerization and solubility, a 2% feedstock suspension is subjected to hydrothermal processing using pure water, a water-ethanol mixture (50:50), and pure ethanol as the reaction media, with ethanol serving as a moderately polar solvent. Following thermal treatment and the physical separation of solid particles, the research focuses on rigorously characterizing the resulting liquid fraction to monitor structural breakdown and compound partitioning. High-performance analytical techniques, specifically UHPLC-UV/ELSD/MS, are utilized to identify and quantify specific low molecular weight compounds solubilized in the liquid fraction.

Furthermore, the continuous liquid phase is monitored for fundamental shifts in chemical composition through dry matter quantification, pH analysis, and acid-base titration, which provide necessary data on the generation of organic acids and the overall severity of the reaction. Crucially, the Folin-Ciocalteu (FC) spectrophotometric method is used to quantify the total phenolic content released into each solvent system, providing key insight into how solvent polarity influences the depolymerization of degradation-resistant lignin and bio-oil components into recoverable liquid by-products.[2]

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DEVELOPMENT OF NEW OPTICAL COMPOSITES FOR DETECTION OF SURFACE DEFECTS

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³Faculty of Medicine and Life Sciences, University of Latvia

The early detection of surface micro-defects is critical for maintaining structural integrity in industrial applications. This study presents the development of a novel optical composite coating designed for high-sensitivity defect visualization. The composite was synthesized by dispersing specific luminophores within an epoxy resin matrix, followed by a controlled curing process to ensure uniform coating thickness.

To evaluate the material's performance, we performed a comprehensive investigation into its structural, thermal, and optical properties by using Raman, FTIR, diffuse reflectance spectroscopy and temperature dependence of photoluminescence. Structural analysis via Raman and FTIR confirmed the homogeneous distribution of the luminophore, while thermal testing defined the operational temperature range of the coating. Spectroscopic measurements revealed strong luminescent responses, providing a high contrast ratio necessary for identifying surface irregularities.

The results demonstrate that the synergy between the luminophore and the polymer matrix allows for a robust sensitive layer. This research culminates in the design of a functional prototype for a non-destructive testing (NDT) system, offering a scalable solution for real-time industrial monitoring of wind blade surfaces.

Acknowledgements. The project results were achieved within BloPhoT project 'Increase wind turbine life time by early detection of blade erosion', OSI_PIP_BioPhoT-2025/1-0014 / VPP2024/51-1-8

OPTIMISATION OF CVD SYNTHESIS FOR FABRICATION OF TUNGSTEN DITELLURIDE HETEROSTRUCTURES (Poster)

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Tungsten ditelluride (WTe₂) is a type-II Weyl semimetal in bulk and a two-dimensional insulator in few-layer limit [1]. h-BN/WTe₂ heterostructures grown by chemical vapor deposition (CVD) offer a scalable platform for investigating topological and low-dimensional quantum phenomena. h-BN is an attractive substrate due to its insulating, chemically inert, dangling-bond free surface, which enables clean van der Waals interfaces with 2D materials [2]. While WTe₂/h-BN heterostructures are commonly fabricated by mechanical exfoliation and stacking of individual layers [3], this approach is inherently limited in scalability and reproducibility, motivating the development of direct CVD growth. However, achieving sufficient density of WTe₂ structures on h-BN remains challenging due to crystallographic mismatch and weak interfacial coupling, which hinder nucleation and oriented growth.

In this study we examine the growth behavior of WTe₂ on h-BN flakes by systematically tuning CVD parameters, using our previously established growth protocol [4]. The synthesis was carried out in a two-zone tube furnace using Si/SiO₂ substrates with mechanically exfoliated h-BN flakes, employing elemental Te and WO₃ with NaCl as growth promoter as precursors. The growth temperature was varied between 815 and 825 °C and the reaction time between 15 and 20 minutes, while systematically modifying the precursor configuration, including the WO₃-NaCl precursor ratio. Increasing temperature and reaction time promoted more continuous WTe₂ growth resembling a thin film, whereas shorter growth time and lower temperature favoured the formation of isolated crystalline domains, which are desirable for device fabrication. Modifications to precursor configuration and their ratio increased the number of individual structures across the substrate and enhanced nucleation on h-BN flakes.

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THERMAL STABILITY CHARACTERIZATION OF 3-AMINO BENZANTHRONE (Poster)

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Benzanthrone (BA) based dyes are characterized by their extended conjugated π - electron system that gives these compounds high photostability and luminescence [1]. These properties have generated keen interest in material science, especially for advanced optical materials [2]. BA derivatives can be widely used in selective heavy metal detection in environmental monitoring sensors and as dyes for high resolution microscopic imaging [3–5]. However, systematic thermal stability characterization and thermal effects on optical properties of fluorescent dyes are still to be described.

In the present work, the molecular structure of 3-aminobenzanthrone (3-NH₂BA) before and after thermal treatment in vacuum was characterized using Fourier transform infrared (FTIR) spectroscopy. The thermal treatment temperatures were specifically selected based on the melting point determined by differential thermal analysis (DTA). Its optical properties were characterized by means of fluorescence spectroscopy.

The obtained results of FTIR spectroscopy show that 3-NH₂BA is thermally stable up to its melting point, approximately 230 °C. During thermal treatment at higher temperatures, only three distinctive vibration bands remain, indicating presence of the aromatic system. In contrast, the fluorescence spectra exhibit pronounced changes, including the formation of additional absorption bands, suggesting the formation and accumulation of emissive compounds due to the thermal decomposition processes.

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Bi₂Se₃ – MWCNT HETEROSTRUCTURE INTEGRATION IN PHOTO – ASSISTED AQUEOUS ZN-ION BATTERIES (Poster)

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Jana Andzane¹, Donats Erts^{1,2}

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Constantly growing demand in safe and reliable energy storage technology results in a need for safer, more environmentally friendly, and affordable solutions compared to currently dominating lithium-ion batteries. A promising alternative to the latter is aqueous zinc-based batteries. The abundance and full recyclability of zinc and the use of water-based electrolytes makes these batteries cost-effective, safe-to-use, and not harmful to humans and environment.

Along with the conventional charging using external power sources, photo – assisted charging allows to partly charge a battery using natural sunlight, thus reducing the need in the external power. In addition, integration of a photocathode in electrochemical energy storage system such as aqueous zinc-based battery could eliminate the need for separate photovoltaic panels and energy storage batteries by combining them into all-in-one device.

Among the materials for battery electrodes, semiconductors such as Bi₂Se₃ are favourable due to the layered structure, allowing effective intercalation of ions in metal-ion batteries. Recently, Bi₂Se₃-single walled CNT heterostructures have proven themselves as perspective electrode material allowing to reach and even exceed theoretical capacity in lithium-ion batteries [1].

In the presented work, the performance of Bi₂Se₃ and multiwall carbon nanotube (Bi₂Se₃-MWCNT) heterostructures as photocathode for zinc-ion batteries with mild acidic electrolyte was explored. The Bi₂Se₃ – MWCNT heterostructures were prepared by physical vapour deposition of Bi₂Se₃ nanostructures on pre-fabricated MWCNT network spray coated on indium tin oxide (ITO) glass substrate. The morphology of the resulting Bi₂Se₃-MWCNT heterostructures and stoichiometry of Bi₂Se₃ nanostructures were examined using scanning electron microscopy and energy – dispersive X-ray diffraction techniques. Cyclic voltammetry and charge/discharge measurements were performed to characterize the electrochemical performance of the Bi₂Se₃-MWCNT heterostructures under dark and illuminated conditions in a custom electrochemical cell. The experimental data showed that Bi₂Se₃ – MWCNT heterostructures ensured an increase in battery capacity under illumination, thus proving their applicability for photo-assisted charging of aqueous zinc-ion batteries

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8.3. sekcija. **MIKROBIOLOGIJA UN
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**MICROBIOLOGY AND
BIOTECHNOLOGY**

PHYSICS-BASED MICROSCOPIC CHARACTERIZATION OF BACTERIAL MOTILITY

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Bacterial motility plays an important role in microbial physiology, community formation, and environmental adaptation. Therefore, understanding how bacteria move can help to clarify their behavior in natural ecosystems, industrial bioprocesses, and medical contexts. Microscopy provides a direct and powerful way to observe and quantify this motion at the single-cell level.

In our recent works [1,2], we use high-resolution optical microscopy combined with physics-based analysis to characterize bacterial motility in a quantitative manner. By tracking individual cells over time, we extract measurable parameters such as swimming speed, trajectory shape, turning behavior, and response to external magnetic fields. Magnetotactic bacteria serve as a model system, as their motion is influenced by intrinsic magnetic properties that can be probed under controlled conditions.

Automated image analysis enables the processing of large datasets and reduces user bias. From recorded trajectories, we determine velocity distributions, magnetic moment scaling, and characteristic dynamics. These measurements allow us to relate physical motion patterns with bacterial phenotype and functional traits.

This microscopy-driven approach provides a robust and scalable framework for motility characterization, offering an additional pathway for studying microbiological and biotechnological aspects of interest.

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MAGNETIC CONTROL OF MAGNETOTACTIC BACTERIA SWARMS

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Controllable swarms of active particles are considered prospective for object manipulation in general and as payload carriers in fluidic microenvironments in particular. However, a theoretical description of finite-sized swarms is missing, as opposed to continuous fields of active particles. Here, we thus develop a torque dipole-based hydrodynamics with spin model for the motion of active particle swarms in an external magnetic field. We apply the developed model to swarms of magnetotactic bacteria. We experimentally observe the motion of magnetotactic bacteria swarms perpendicular to the applied in-plane magnetic field. We use our model to explain that the swarms move according to the left-hand rule in combined vertical and lateral magnetic fields and that this movement originates from hydrodynamic interactions within the torque dipole ensembles. We also report the linear scaling of the swarm motion velocity with the driving magnetic field magnitude, and are able to derive the propulsion torque of the active particles from the experiments. We further showcase our latest proof-of-concept experiments involving object manipulation with swarms, large-scale swarm formation, as well as controlled swarm formation localization via defects. Our results are applicable to other types of active particles and driving fields, and will pave the way for further research into harnessing active particle swarms as collective robots.

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P450 CYPTIDE SYNTHASE KWWB CATALYZES NON-NATIVE CROSS-LINK AT TYR-C3–TRP-N1 AND TOLERATES LEADER PEPTIDE MUTATIONS

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Cyptides refer to a rapidly growing class of ribosomally synthe-sized and post-translationally modified peptides (RiPPs) containing biaryl cyclophanes installed by P450 enzymes. Here, we further investigated P450 cyptide synthase KwwB from *Kitasatospora* sp. GAS204B, which expands the KwwB-catalyzed chemical reper-toire to non-native cross-link at Tyr-C3–Trp-N1. The substrate tolerance of the leader peptide region has not yet been investigated on P450-RiPP enzymes. We demonstrated that the promiscuous enzyme KwwB can tolerate mutations at the leader peptide region, except for the position -4 containing conserved Pro residue. This result provides an additional toolkit for cross-linked peptide modifi-cation.

THE POTENTIAL USE OF TURKEY TAIL FUNGUS (*TRAMETES VERSICOLOR*) MYCELIUM COMPOSITES IN THE DEVELOPMENT OF CONTROLLED-RELEASE FERTILIZERS.

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This study investigates the potential of Turkey tail (*Trametes versicolor*) mycelium composites for the development of innovative controlled-release fertilizers (CRFs), integrating circular economy principles into agricultural nutrient management. The study aims to design and quantitatively evaluate biodegradable fertilizer pellets capable of delaying the release of ammonium nitrate (NH_4NO_3), thereby addressing the low nitrogen use efficiency (NUE) and associated environmental pollution risks characteristic of conventional fertilization. Three lignocellulosic industrial by-products – birch sanding dust, hemp shives, and birch sawdust – were used to synthesize the composite matrix.

The methodology includes assessing the ammonium nitrate (NH_4NO_3) absorption capacity and release dynamics by first soaking the composites in a fertilizer solution and then eluting them in water, along with quantitative determination of nitrogen loading capacity via high-temperature catalytic combustion (CHNS elemental analysis).

Nutrient release dynamics and biological efficacy will be evaluated using the nitrophilous indicator plant *Rumex hydrolapathum*, by analyzing changes in biomass accumulation and chlorophyll content. The results are expected to demonstrate the ability of the mycelial hyphal network to mechanically encapsulate nutrients within a porous structure, providing a fully biodegradable alternative to synthetic polymer coatings and promoting sustainable nitrogen cycling within agroecosystems.

METHODS FOR INDUCING SPORULATION IN ALTERNARIA ISOLATES AND THE IMPACT OF THEIR SPORES ON RYE SEED GERMINATION

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Agrihorts

In this study, fungi of the *Alternaria* genus were evaluated for their sporulation capacity and pathogenic effects on rye seed emergence and early seedling growth. *Alternaria* isolates obtained from rye monitoring studies were cultivated on potato dextrose agar (PDA), malt agar (MA), potato carrot agar (PCA), and sporulation agar (SA) media under different abiotic conditions, including UV radiation, light exposure, and mechanical wounding. The highest spore production occurred on PCA medium with mechanical wounding and UV exposure, followed by MA with UV treatment, producing $12.7 \pm 5.3 \times 10^6$ CFU/mL and $4.8 \pm 3.2 \times 10^6$ CFU/mL, respectively. Rye seeds were surface-sterilized with 1.5% NaOCl and inoculated with spores from 41 *Alternaria* isolates using 1×10^6 CFU/mL suspensions. Germination and seedling growth were assessed 10 and 17 days after inoculation and sowing. Seedling growth did not differ significantly from the control, but germination was delayed in seeds infected with spores of some of the isolates. A Kruskal–Wallis test revealed significant differences in germination among isolates 10 days after sowing ($p = 0.02$), while no significant differences were observed after 17 days ($p = 0.25$), indicating that *Alternaria* mainly affects the early stages of germination.

GENOME-SCALE METABOLIC MODELING OF GALDIERIA SULPHURARIA FOR AGRICULTURAL RESIDUE VALORIZATION AND ENHANCED GLYCOGEN-RICH (FLORIDEAN STARCH) BIOMASS PRODUCTION

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Agricultural residues are a major underutilised biomass resource in the European Union (EU), accounting for approximately 46% of the total 956 Mt/year of agricultural biomass, despite their significant potential as sustainable second-generation feedstocks. Redirecting these residues from low-value applications toward controlled microbial bioconversion offers a promising strategy for producing value-added compounds without competing with food crops. In this context, *Galdieria sulphuraria*, a thermoacidophilic red microalga, has emerged as a robust candidate due to its ability to thrive under extreme conditions, including low pH (0.5–4) and elevated temperatures (up to 56 °C), while utilising more than 50 carbon sources across autotrophic, heterotrophic, and mixotrophic growth modes.

A genome-scale metabolic model (GEM) of *G. sulphuraria* was developed to evaluate its potential for agricultural-residue valorisation and glycogen-rich biomass production. Model optimization was based on glucose derived from pre-treated residues, enabling efficient conversion of complex substrates into biomass and value-added biochemicals. Carbon flux analysis revealed enhanced accumulation of glycogen (floridean starch), a highly branched α -glucan that serves as the principal storage polysaccharide in red algae and is readily convertible into fermentable sugars. The carbohydrate fraction of *G. sulphuraria* biomass is strongly condition-dependent, ranging from 3.9% to 44.2% (w/w) under heterotrophic conditions.

Under NGAM = 3 mmol gDW⁻¹ h⁻¹, the model predicted that a baseline glucose uptake of 0.108 mmol gDW⁻¹ h⁻¹ sustains growth at $\mu = 0.04$ h⁻¹, while additional glucose is redirected toward glycogen synthesis with an average yield of approximately 0.95 mmol⁻¹. These results support a two-stage bioprocess design, where biomass formation is followed by glycogen accumulation, enabling efficient conversion of agricultural residues into glycogen-rich biomass for downstream biorefinery applications.

Keywords: *Galdieria sulphuraria*, genome-scale metabolic modeling, agricultural residues, flux balance analysis, floridean starch

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STREPTOMYCES SPP. FROM THE MICROBIAL STRAIN COLLECTION OF LATVIA AS POTENTIAL BIOCONTROL AGENTS OF TREE PATHOGENS (Poster)

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Streptomyces species are well known for producing diverse bioactive secondary metabolites with wide ranging antimicrobial properties. In this study, 61 strains were evaluated in vitro for their ability to inhibit the tree pathogen fungus *Hymenoscyphus fraxineus* and the bacteria *Gibbsiella quercinecans* and *Brenneria goodwinii* through dual-culture assays. Antagonistic effects were assessed by measuring mean inhibition across all assays. Several strains, notably *Streptomyces* sp. MSCL 344, MSCL 350, MSCL 1721 and MSCL 1723 demonstrated significant and consistent inhibitory activity against multiple tested microorganisms.

Building upon these findings, ongoing work employs whole genome sequencing to investigate secondary metabolite biosynthetic gene clusters and the antagonistic mechanisms that may drive these interactions. The reconstructed genomes were analysed using antiSMASH and its associated databased MIBiG, Pfam, smCOG, and ClusterBlast. Across all sequenced samples, terpenes (isorenieratene, geosmin, hopene, albaflavenone) were the most prevalent, followed by polyketides (alkylresorcinol, naringenin, angolamycin) and RiPP associated clusters.

This study demonstrates the biotechnological potential of MSCL *Streptomyces* strains as sustainable biocontrol agents.

Acknowledgements: This research was funded by the Latvian Council of Science project “Genomics and transcriptomics guided trait stacking of antagonistic mechanisms utilized by Streptomyces spp. in SynComs against pathogens causing ash dieback and acute oak decline”, project No. lzp-2024/1-109.

SCREENING OF SEVERAL MICROALGAL STRAINS FOR UTILIZATION OF CARBOHYDRATES AT MIXOTROPHIC AND HETEROTROPHIC CONDITIONS (Poster)

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During food and plant processing, substantial quantities of low-value, carbohydrate-rich by-products are generated. The valorization of these streams through bioconversion has become an increasingly important challenge. One promising strategy is their use as substrates for microalgal cultivation. Microalgae are capable of synthesizing a wide range of high-value bioactive compounds, including carotenoids such as phycoerythrin and fucoxanthin, as well as lipids enriched in polyunsaturated fatty acids, all of which are in strong demand in the health and cosmetics industries. Therefore, assessing the carbohydrate utilization capacity of different microalgal strains is essential.

To address this, five microalgal strains, including three newly isolated strains, were screened under both mixotrophic and heterotrophic conditions to evaluate their ability to grow on various carbohydrate sources. This comparative analysis enables the identification of candidates capable of efficient growth on industrial by-products.

All tested strains, except *Nannochloropsis oculata*, exhibited growth on glucose under both mixotrophic and heterotrophic conditions. *Graesiella emersonii* demonstrated growth on the majority of the tested carbohydrates, with particularly strong growth on glucose, fructose, and lactose. *Nannochloropsis oculata* did not show growth on any of the tested carbohydrates. The new green algae isolate A13 exhibited growth on maltose, glucose, and galactose under mixotrophic conditions.

Overall, these findings deepens the understanding of carbohydrate utilization by microalgae.

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ASSESSMENT OF LENTINULA EDODES EXTRACT EFFECTS IN A DROSOPHILA MELANOGASTER INFECTION MODEL: SURVIVAL OF LARVAE EXPOSED TO PSEUDOMONAS AERUGINOSA AND BEAUVERIA BASSIANA (Poster)

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Lentinula edodes (Berk.) Pegler, commonly known as shiitake, is an edible basidiomycete cultivated worldwide. It contains bioactive compounds, including β -glucans, that act as biological response modifiers and influence various physiological processes such as the innate immune response [1].

Drosophila melanogaster is a widely used model organism for studying biologically active compounds due to its well-characterized biology and low maintenance requirements. Its innate immune system includes cellular and humoral responses, such as haemocyte activity, antimicrobial peptide (AMP) production, and melanisation [2].

A hot water extract (HWE; 18 h, 80 °C) was prepared from fruiting bodies of *L. edodes* DSM 3565. The extract was quantified by dry weight (measured at 100°C), pasteurized, lyophilized and stored at 4 °C. Beta-glucan content (20–35%) was determined using the Glucan Enzymatic Method, and the extract was characterized by FTIR analysis.

Wild-type *D. melanogaster* fertilized eggs (10–12 cm²) were reared on corn–sugar–yeast medium with or without HWE at 25 ± 1 °C (12:12 h light–dark cycle, 60% RH). Development assays (0.5–8 mg/mL) assessed body weight and survival; 2 mg/mL was selected for infection experiments. HWE-fed and control L3 larvae were starved for 2h and exposed to natural infection either by immersion in a *Pseudomonas aeruginosa* suspension for 16 h (OD = 12.5) or by brief exposure to a sporulating culture of *Beauveria bassiana* to allow spore attachment. Infection was confirmed by plating surface-sterilized larval homogenates on LB agar or pupae on PDA. Survival was assessed after 7 days (larva–pupa) and 14 days (larva–imago).

In the infection model, HWE increased the proportion of larvae reaching the imago stage, although differences between the *D. melanogaster* lines were observed. Further studies will investigate additional immune response markers that may explain the observed effect of HWE and the line-specific variation, including haemolymph antimicrobial activity, AMP expression, changes in gut microbiota composition (CFU proportions), and melanisation-related traits such as sessile crystal cell number and phenoloxidase activity.

Keywords: *Lentinula edodes*, β -glucans, *Drosophila melanogaster*, biological response modifiers; infection model; innate immunity

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WHEY VALORIZATION USING FERMENTATION-BASED TECHNOLOGIES FOR THE PRODUCTION OF BIOACTIVE PEPTIDES (Poster)

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A significant by-product of the production of cheese, whey is both a rich source of nutrients and, if improperly handled, a major source of pollution for the environment. About half of the 400,000 tons of whey produced by Latvia's dairy industry each year are processed into higher-value products; the remaining portion is thrown away, causing environmental problems and financial losses. The needs of regional industries, which are dominated by small and medium-sized businesses (SMEs) with limited capital expenditure capacity, are not met by current valorization technologies.

Our aim is to create a microbial fermentation process that is optimized for converting whey protein into bioactive peptide preparations on an industrial scale. We have examined the propensity for peptide accumulation in over 20 strains of lactic acid bacteria (LAB) and lactose fermenting yeast (LFY). The strains were obtained from natural isolates maintained in the Microbial Strain Collection of the University of Latvia (MSC UL, International Depository Authority, ERIC MIRRI member). Natural strain isolates were compared to the industrial strains used in cheese processing; an optimized whey-based cultivation medium and fermentation parameters were developed. Peptide accumulation was described and peptides were profiled using ninhydrin, and SDS-PAGE after preliminary experiments on skim-milk agar. In order to eventually develop additives for food and hygiene products, bioactivity tests addressing antioxidant properties were conducted. The LAB and LFY strain screening results are provided, with particular focus on the relationship between the biochemical and bioactivity test results.

Keywords: whey valorisation, bioactive peptides, lactic acid bacteria, fermentation.

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DEVELOPING VALUE-ADDED APPLICATIONS FOR CHEESE WHEY THROUGH EXTENDED FERMENTATION PROCESSES (Poster)

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Cheese whey is a byproduct of cheese production that is rich in organic and mineral substances. About 70–90% of the milk is converted to whey in cheesemaking [1]. Overproduction of cheese whey strains wastewater treatment facilities due to high BOD and increasing disposal costs for industry, which is a serious problem since nearly half of the cheese whey produced in Latvia is discarded [2,3]. Lactic acid bacteria (LAB) are added to milk as a starter culture, along with calcium chloride and a rennet complex, during the cheese-making process [4]. The capital expenditure (CAPEX) required to establish modern whey processing lines to produce high-value-added products is too costly for many SMEs in the dairy industry [5]. In this report, we leverage the potential of LAB retained in whey after curdling to reduce processing costs and reliance on complex equipment for producing new fermented, whey-based beverages.

Non-pasteurized whey (NPW) containing starter cultures BS-30 and DCC-265 (Chr. Hansen) – a blend of *Lactococcus*, *Lactobacillus*, *Leuconostoc*, and *Streptococcus* strains – was obtained from the first stage of milk coagulation in cheese production (JSC "Cesvaines piens"). A significant amount of starter culture (4×10^7 CFU/mL) remains in the NPW, which can be used for continued fermentation if the proper physicochemical conditions and nutrients are available. The LAB starter culture in the NPW has acidified the initial sweet cheese whey and partially converted lactose to lactic acid, consuming nutrients that limit bacterial growth. To enable LAB to grow again by replenishing essential resources, we used a complex LAB growth medium, De Man-Rogosa-Sharpe agar (MRS), and a K-Na-phosphate buffer to raise the pH of the acidified NPW.

Raising the pH and supplementing acidified NPW with 50% MRS restored bacterial growth and enzyme production. The temperature and time dependence of these features was characterized. Testing the capacity of NPW to stimulate enzyme synthesis on carbon-based substrates showed potentially positive results with D-xylose, Itaconic acid, Tween 40, Tween 80, and alpha-cyclodextrin using Ecoplate™ (Biolog, USA) tests. To assess antioxidant properties and the production of biologically active compounds in three-hour-supplemented NPW, fluorescein diacetate hydrolysis, quinone reductase activity, and L-DOPA accumulation were measured. The results suggest that a practical, affordable method for dairy producers to better utilize cheese whey is possible; with optimization, it could lead to a simple, fermented whey-based beverage and reduce waste without requiring major investments or complex equipment.

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8.4. sekcija. **KLIMATA PĀRMAIŅAS UN VIDES
ILGTSPĒJA DAŽĀDĀS NOZARĒS UN
DISCIPLĪNĀS /**

**MULTIDISCIPLINARY PERSPECTIVES
ON CLIMATE CHANGE AND
ENVIRONMENTAL SUSTAINABILITY**

ANALYTICAL TOOLS FOR ASSESSING GREENHOUSE GAS EMISSION REDUCTION PATHS TO ACHIEVE LATVIA'S CLIMATE NEUTRALITY GOAL

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Background. Essence of European Green Deal (EGD) is to ensure that Europe achieves climate neutrality by 2050. Being part of the EGD, the European Climate Law (European Parliament & Council, 2021) legally binds reducing of GHG emissions to net-zero at the latest by 2050 aiming achieving negative emissions thereafter and establishes binding intermediate decade targets, compared to 1990, for 2030 (net domestic reduction by at least 55%) and 2040 (net reduction by at least 90%, of which 85% by domestic target and 5 % by high-quality international carbon credits, under final approval). In its turn, being collective participant of UNFCCC Paris agreement, European Union has approved (Nov 2025) EU's indicative contribution of 66.25 to 72.5% GHG emission reduction, compared to 1990, for 2035. Thus currently Europe has defined clear climate-neutrality targets, at the same time the detailed implementation mechanisms for 2040 and 2050 (like *Fit-for-55* package for 2030) is under development. Thus research in analytical tools for assessing GHG emission paths, policies and measures has received additional push both at European scale (e.g., Capros et al., 2019; Clora & Yu, 2020; Thimet & Mavromatidis, 2022; Charalampidis et al., 2026; Salim et al., 2026) and national scale, including EFTA countries and UK (e.g., Gaur et al., 2022; Dixon et al., 2022; Johnson et al., 2023; Guire et al., 2023; Inderber et al., 2024; Norvaiša et al., 2024; Jacquier et al., 2025; Pastore & Santoli, 2025). Latvia has strengthened the climate neutrality objective in the national legal system by the Latvian Climate Resilience and Economic Sustainability Law (Saeima, 2025) aiming to promote a balanced move towards climate neutrality by 2050 in line with the sustainability and competitiveness of the national economy and by taking into account social and environmental aspects. However, up to now not much research has been conducted in Latvia on paths modelling for achieving climate neutrality.

Methods. There are several principal paths to achieve the climate-neutrality goal, which include different contributions to be provided by particular GHG emission inventory sectors (Energy sector, including transport; Industrial processes and product use; Agriculture; Waste; Land use, land use change and forestry). To assess the impact of different development paths of such a complex system on the technologies employed, reduction of GHG emissions and the costs of achieving the climate neutrality goal, the TIMES-Latvia energy-environment model is applied, which includes a detailed description of the Latvian energy system. TIMES is a technology rich, bottom-up model generator, which uses linear-programming to produce a least-cost energy system, optimized according to a number of user constraints, over medium to long-term time horizons (IEA-ETSAP, 2025) and is applied for local, national and multi-regional energy systems. E.g., large-area multi-regional models are TIMES-Europe (Luxembourg et al., 2025), North American TIMES (Kouchaki-Penchah et. al., 2022),

Times-based China-MAPLE model, TIMES-India, and others. European Nordic states for national studies employ both open TIMES-Nordic (Wrake *et al.*, 2023) and national state TIMES models. TIMES explores the “possible energy futures, based on contrasted scenarios” (Loulou *et al.*, 2005). Use of TIMES provides well-argued analysis of the six principal factors (Majidi *et al.*, 2025) which determine the transformative changes towards smart energy systems: (i) *greater reliance on renewable energy sources (including variable ones)*, (ii) *widespread use of energy storage technologies*, (iii) *more distributed energy systems*, (iv) *smarter energy grids*, (v) sector coupling, (vi) more flexibility. Based on general TIMES platform, EDI researchers team has developed its original TIMES-Latvia which allows both to optimise the entire Latvia’s energy system and model the links with other sectors. Namely, the TIMES-Latvia is supplemented with particular modules for non-energy sectors (agriculture, industrial processes and waste management) which provide integrated assessment capabilities for optimal paths to reduce GHG emissions. Particular recent improvements in TIMES-Latvia relate to new options for sector coupling – inclusion of electricity storage technologies, incorporating diverse heat pump technologies into the model across various sectors, and inclusion of carbon capture technologies from industrial processes (CCS) and direct air (DAC). In order to ensure more detailed analysis and comparison of different policies and their impacts, the level of detail of energy demand sectors (residential, tertiary and industry) has been increased in TIMES-Latvia. This process involves disaggregating the end-use demand into specific sub-sectors by defining new sets and mapping them to distinct demand commodities and technologies.

Results. The modelling results reveal the potential contributions of particular sectors for reducing GHG emissions and the costs of implementing Latvia’s climate neutrality goal. Specifically, the main outcome relates to GHG emission projection calculation in all GHG inventory sectors and particularly energy subsectors for both the baseline scenario and selected climate neutrality paths until 2050. The structures of primary energy and electricity supply and final energy consumption have been calculated. Secondary analysis shows to meet climate neutrality goal, GHG emission reductions in GHG inventory sectors, in 2050, compared to 2020, have the different scale, in the amplitude 16 % to 96 %; the largest reduction has to be achieved in the Energy, including transport, sector.

Conclusions. The findings provide new evidence that strengthens the existing research. By addressing previous methodological limitations, this work contributes to a more detailed and nuanced understanding of the phenomenon of meeting climate neutrality goal and its practical implications. Future research should build on these results by further improving modelling methodology and assessing the impact of more diverse GHG emission reduction policy measures.

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PERCEPTION AND IMPLEMENTATION OF ENVIRONMENTAL SUSTAINABILITY MEASURES IN LATVIAN STATE-SECTOR HOSPITALS

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Background. While being responsible for the health of human society, the healthcare system inadvertently advances degradation of the environment. The global healthcare sector contributes approximately 4.4 % of global CO₂ emissions, equal to the amount emitted by 514 coal-fired power plants. If it was a state, global healthcare sector would be the 5th biggest polluter in the world (Karliner *et al.* 2021, 17). This creates a basis for the twofold burden that climate change puts on the healthcare system. On the one hand, the healthcare system must adapt to rising numbers of climate change-induced diseases and disorders. On the other hand, the European Green Deal (EGD) policies require that the healthcare sector reduces its carbon footprint by 2050 along with the other sectors (European Commission n.d.).

Despite increasing attention by academics, policy makers and society in general, research on green and sustainable healthcare remains fragmented. This study addresses the research gap by examining how environmental sustainability and green transition are understood, operationalized, and experienced within hospitals in Latvia.

Methods. This study utilizes mixed-methods, interdisciplinary design combining quantitative data collected via a nationally representative sociological survey and qualitative data obtained in case studies and ethnographic fieldwork. Four hospitals in Latvia were selected for comprehensive case studies to represent diverse institutional profiles (regional, university-affiliated, and specialized facilities). For each case, document analysis of strategies and reports was conducted to assess the extent to which environmental sustainability issues are formally addressed in the given institution. In addition, more than 40 semi-structured interviews were carried out with board members, hospital administrators, healthcare practitioners, and support staff to explore their perceptions of sustainability, knowledge of climate change and health linkages, as well as lived experiences of the changes introduced by the green transition measures. Ethnographic observation in one of the hospitals complemented interviews by capturing everyday practices, interactions among the staff members, and constraints shaping the implementation of green measures.

Results. Research findings indicate that environmental sustainability in Latvian hospitals is predominantly framed in narrow operational terms, most often associated with waste sorting and energy efficiency, rather than systemic decarbonization, climate resilience or far-reaching changes in work routines. Perception of the urgency of green transition in healthcare varies significantly across professional groups: administrative leaders demonstrate strategic awareness, whereas frontline practitioners often perceive sustainability measures as externally imposed and insufficiently aligned with the clinical priorities. Financial constraints, regulatory complexity, lack of governmental guidance, and inflexible organizational culture emerge as key barriers to implementation. In some cases, hospital staff report tensions triggered by the green innovations, especially in contexts where

sustainability measures are perceived as imposed from above. In other instances, however, examples of bottom-up innovation such as informal energy-saving practices and local waste recycling initiatives demonstrate the potential of participatory approaches.

Conclusions. While green transition in healthcare may seem like a predominantly technical process of emission monitoring and reduction, this study reveals it as a complex socio-institutional transformation shaped by systemic factors, and professional cultures. In the Latvian context, implementation of the EGD in hospitals highlights the need for clearer policy guidance, dedicated funding mechanisms, multidirectional intra-hospital communication channels, and inter-hospital experience exchange. This research contributes to multidisciplinary debates on climate change mitigation and adaptation, emphasizing that environmentally sustainable healthcare must also be institutionally feasible.

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DOES THE AIRBORNE POLLEN SPECTRUM OF ALPINE SITES REFLECT LOCAL VEGETATION?

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Background. Alpine protected areas function as key refuges for biodiversity and thus play an essential role in the stability of ecosystems. However, the pressures associated with global environmental change increasingly threaten these ecosystems. Habitats included in the Natura 2000 network are regularly monitored to ensure a good conservation state (Council Directive on the conservation of natural habitats and of wild fauna and flora, 1992).

The aim of the study was to investigate the relationship between airborne pollen and vegetation at four Alpine sites in Trentino, Italy, to evaluate the role of pollen biodiversity as a proxy for plant biodiversity across different spatial scales.

Methods. Airborne pollen was collected with Sigma-2 passive samplers at four Natura 2000 Alpine sites in Trentino, northern Italy: Rifugio Val di Fumo (1906 m a.s. l., Parco Naturale Adamello-Brenta), Rifugio Altissimo (2057 m a.s. l., Parco Naturale Locale Monte Baldo), Rifugio Rosetta (2577 m a.s. l., Parco Naturale Paneveggio-Pale di San Martino), and Rifugio Cevedale (2608 m a.s. l., Parco Nazionale dello Stelvio). Pollen was identified morphologically using optical microscopy and reference pollen from local flora, while vegetation was surveyed at 10 m, 100 m, and 1000 m around each sampler. Pollen and plant richness, abundance and derived biodiversity metrics were used in the analysis. NMDS (Non-metric Multidimensional Scaling) was used to visualize similarities of pollen between sites.

Results. No statistically significant correlations were found between pollen taxon richness and either plant species richness or pollen-equivalent plant taxa at the spatial scales examined. The mean Jaccard similarity indices of four sites at three distances from the aerobiological sample between the pollen taxa and the pollen-equivalent plant taxa were 0.19 ± 0.052 , 0.22 ± 0.063 , 0.26 ± 0.080 . NMDS showed that the pollen composition overlaps across all four sites, without forming distinct clusters.

Conclusions. While the similarity between pollen and vegetation was weak at the local scale, the pollen spectra of the sites were largely similar in composition at the regional scale. We therefore hypothesize that Alpine airborne pollen samples may reflect vegetation patterns beyond the local scale and could be suitable for regional-scale assessments.

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CASCADING VALORISATION OF CONIFEROUS LOGGING RESIDUES WITHIN A CIRCULAR FORESTRY BIOREFINERY

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Background. The transition toward a circular bioeconomy requires efficient valorisation of forestry biomass and its processing residues. Coniferous logging residues, including needles and extraction by-products, represent an underutilised resource rich in biologically active compounds and valuable biochemical components. Previous studies have highlighted the potential of forest biomass as a source of phytochemicals, natural pigments, and bioactive compounds suitable for food, pharmaceutical, and material applications. However, the systematic integration of extraction, fractionation, and cascading valorisation approaches for such biomass streams remains insufficiently explored (Pandey et al. 2024). The present study investigates the chemical composition and valorisation potential of coniferous biomass residues, with a focus on Norway spruce (*Picea abies*) needles and their extract fractions, aiming to demonstrate their applicability within a biorefinery framework supporting circular forestry practices.

Methods. Biomass from coniferous logging residues was processed using extraction and fractionation techniques designed to obtain lipophilic and other phytochemical fractions (Zommere et al 2024; Gaižauskaite et al. 2025). Short-path distillation and other biorefinery approaches were applied to refine crude extracts and produce fractions with increased purity. Chemical characterisation of the obtained fractions was conducted using analytical techniques including GC–MS, enabling identification of major compound groups such as terpenoids, diterpenoids, long-chain aliphatics, and phytosterols. In parallel, optimisation of chlorophyll extraction from spruce and pine needles was performed to evaluate their potential as natural pigments for the food industry. Residual biomass remaining after extraction was further valorised through granulation into pellets to demonstrate cascading biomass utilisation.

Results. The analysis confirmed that coniferous needle extracts contain a diverse range of lipophilic compounds with potential biological activity (Klavins et al. 2023). Fractionation allowed the isolation of chemically distinct fractions enriched in terpenoid and phytosterol compounds (Klavins et al. 2025). Preliminary biological screening indicated antioxidant activity, antimicrobial and antifungal effects, and cytotoxic activity against melanoma cells in selected fractions. Additionally, extraction residues were successfully converted into biomass pellets, illustrating the feasibility of cascading utilisation and supporting circular economy principles in forestry biomass management (Vincevica-Gaile et al. 2025).

Conclusions. The results demonstrate that coniferous logging residues can serve as a valuable feedstock for integrated biorefinery processes, enabling the production of bioactive compounds, natural pigments, and energy products. Such cascading valorisation approaches contribute to increased resource efficiency and reduced waste in the forestry sector. The study supports the development of circular bioeconomy strategies that maximise the value derived from forest biomass streams while promoting sustainable resource management.

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A VALORISATION-BASED APPROACH TO INVASIVE PLANT CONTROL: PELLET FUEL AND BIOCHAR PRODUCTION

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Background. Invasive plant species represent a major environmental and economic challenge, threatening biodiversity and ecosystem functioning while generating substantial management costs (Bellard et al., 2016; Senator & Rozenberg, 2017). Despite extensive eradication efforts, long-term control success remains limited (Weidlich et al., 2020; Gioria et al., 2023). Biomass utilisation for energy production has been proposed as a safe and sustainable pathway that prevents further propagation while creating added value (Klavins et al., 2024). Pelletization improves biomass handling and combustion efficiency (Garcia-Maraver & Carpio, 2015), while slow pyrolysis enables conversion into carbon-rich biochar suitable for soil amendment and carbon sequestration (Chatterjee et al., 2020; Lin et al., 2025). The present study demonstrates a valorisation-based invasive plant control approach through pellet fuel and biochar production.

Methods. Three invasive plant species abundant in Northern Europe: *Solidago canadensis*, *Reynoutria japonica*, and *Helianthus tuberosus*, were processed into pellets using sapropel (5%) and peat processing residues (10%) as organic binders. Raw pellets were characterised for elemental composition (C, H, N, S), ash and moisture content, calorific value (LHV), heavy metal concentrations, and thermogravimetric behaviour. Pyrolysis was conducted at 600 °C under a nitrogen atmosphere (5 °C min⁻¹ heating rate, 60 min residence time) to obtain biochar. Biochar samples were analysed for carbon content, ash, moisture, higher heating value (HHV, calculated according to Qian et al., 2020), surface morphology, and compliance with EN ISO 17225-6 (2014) and European Biochar Certificate (EBC) criteria (Lin et al., 2025).

Results. Raw invasive plant pellets exhibited LHV values between 16.4 and 18.0 MJ kg⁻¹, comparable to herbaceous biomass fuels reported in the literature (Miranda et al., 2015; Kamperidou, 2022). Moisture content remained below 7%, and all samples complied with Class B requirements for non-woody pellets according to EN ISO 17225-6 (2014). Heavy metal concentrations in plant biomass were below regulatory thresholds, with elevated levels primarily associated with binders but remaining within acceptable limits in final pellets.

Pyrolysis increased carbon content to 78–85% and HHV to 27–31 MJ kg⁻¹, reflecting carbon enrichment during thermal conversion (Reza et al., 2020). Biochar yields ranged from 32–34%. All pyrolysed samples met EBC requirements for heavy metals and exceeded the minimum 50% carbon threshold for certified biochar (Lin et al., 2025). Nutrient elements (Ca, K, Mg, P) were retained in biochar, indicating additional agronomic value.

Conclusions. The results demonstrate that invasive plant biomass can be transformed into standardised pellet fuel and high-quality biochar, integrating eradication measures with renewable energy production and circular economy principles. Pelletization enhances fuel properties and handling efficiency, while pyrolysis produces carbon-rich material compliant with international biochar standards. This valorisation-based strategy provides

a safe, sustainable, and economically promising pathway for invasive plant management, simultaneously contributing to bioenergy generation and soil improvement.

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REFRAMING PEAT SOILS IN TRANSBOUNDARY RIVER BASINS AS CRITICAL CLIMATE, HYDRO-ENVIRONMENTAL AND SOCIO-ECONOMICAL INFRASTRUCTURES

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Background. The European Green Deal and related climate and biodiversity strategies position carbon-rich ecosystems at the centre of Europe's transition toward climate neutrality (Gierbergen et al., 2025). Peat soils, commonly referred as peatlands, formed under prolonged water saturation and oxygen-deficient conditions, are among the most climate-relevant terrestrial systems (Licite et al., 2022). While accounting for approximately only 8% of agricultural land in Europe, peat soil (mis)management generates nearly half of land-use-related greenhouse gas (GHG) emissions estimated at around 580 Mt CO₂ equivalent annually (UNEP, 2022; Gierbergen et al., 2025). When drained for agriculture, these organic soil territories shift from long-term carbon sinks to persistent emission sources, while simultaneously altering hydrological regimes, degrading water quality, and weakening ecosystem services provision (Palmer et al., 2025; Heindorf, Plieningen & Schuler, 2025). Such dynamics at play are not confined to local scales exclusively. It is argued that drained peatlands can be viewed as spatially clustered and hydrologically interconnected emission and pollution hotspots that are interconnected within broader river basin systems (Müller et al., 2024). Within catchments, soil properties, land use, and water flow settings jointly regulate carbon fluxes and water cycling processes, shaping both atmospheric emissions and downstream impacts (Stachowicz et al., 2022). In hydrologically sensitive regions, such as the Baltic Sea basin, characterised by slow water exchange, pronounced precipitation seasonality, vulnerability to diffuse pollution and increasing climate extremes (Nilsson & Langaas, 2006), agricultural peat soils become critical nodes linking climate mitigation, overall ecosystem quality, and socio-economic resilience.

Methods. The research applies a mixed-method synthesis centred around the case study of the transboundary Venta River basin (Latvia-Lithuania). The methodological design combines systematic literature analysis for identifying assessment criteria and spatial mapping of peat soil territorial distribution following baseline data of the LIFE OrgBalt project. Alternative land-use trajectories under varying ecological, hydrological and socio-economic conditions are evaluated, namely: (1) continuation of conventional drainage-based agriculture scenario; (2) reduced drainage by adaptive water-level management scenario; (3) multifunctional high-groundwater level land use management combining paludicultural production and wetland buffer zones scenario; (4) full-scale revitalisation through rewetting and ecological restoration scenario.

Results. The assessment suggests that rewetted peat soils substantially reduce emission intensity while enhancing ecosystem services overall functioning at the catchment level.

Moreover, findings indicate that multi-functional approaches to sustainable peatland management could generate substantial biomass-based and wetland-typical food systems expansion of value chains while reducing long-term climate and infrastructure risks, offering viable economic alternatives for land owners (Temmink et al., 2023; Wichmann et al., 2024).

Conclusions. Reframing agricultural peat soils as climate, hydro-environmental, and socio-economic infrastructures enables integrated planning beyond sectoral land-use approaches. As such, river basins may provide an operational scale for aligning atmosphere-biosphere interactions, land-use policy and water management. Targeted restoration of hotspot-areas combined with economically viable wetland introduction represents an opportunistic and policy-aligned pathway to agricultural peatland sustainment.

Future research should advance climate-hydrology modelling and long-term GHG emissions monitoring to improve basin-scale carbon accounting and sustainable peatland management. Enhanced governance coordination is also needed to support cross-border cooperation and agro-ecological transitions towards necessary transformative landscape configurations.

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AIRBORNE FUNGI IN PANNONIAN PLAIN – ASSESSMENT OF DIFFERENT ANALYTICAL APPROACHES

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Background. Characterisation of bioaerosols is significant from both agricultural and public health perspectives, as they can contribute to the spread of phytopathogenic fungi and act as potent allergens in humans. The standard aerobiological method (CEN, EN16868) relies on morphological identification of bioaerosols, which limits its ability to reveal the diversity of airborne fungi. This study aimed to evaluate various sampling and analytical approaches for assessing the diversity of airborne fungi.

Methods. 24-hour samples of airborne fungal spores were collected at the roof level in Novi Sad (Serbia) during September 2024 by using the standard Hirst volumetric method on transparent tape (EN 16868) and the high-volume total suspended particles (TSP) sampling method on glass fiber filters (240 mm diameter, pore size 1.6 µm). From approximately 2300 mm² of filter, particles were extracted in 10 ml of sterile distilled water (Han et al., 2018), 100 ml were used for microscopical analysis, and 3 ml were used for inoculation onto nutrient media (dichloran-rose bengal agar and malt extract agar) to quantify viable fungi (Lee et al., 2006). A subsample from approximately 1256 mm² of filter was subjected to DNA extraction (Salokas et al., 2026) and Nanopore sequencing (Sofiev et al., 2022). Fungi were identified by morphological identification of their spores and colonies. Taxonomical annotation of fungal DNA reads was obtained by aligning to the NCBI referent sequences database (RefSeq) and protein sequences database (UniProt).

Results. Morphological analysis of microscopic slides obtained from both methods revealed qualitative similarity in the recorded groups of pollen and fungal spores, while quantitative values vary. In general, spores of *Cladosporium*, *Alternaria*, *Ganoderma* and smuts were dominant in all samples collected by both samplers. Although enough genetic material was extracted from TSP samples, Nanopore sequencing yielded mostly short reads (median read length per sample < 100 bp) and with rather low quality scores (average per sample < 8). Bioinformatic analysis of reads remaining after filtering out those with suboptimal quality identified more than 42 fungal species from the RefSeq database and 83 from the UniProt database. It is interesting to note that aligning to the RefSeq failed to detect *Cladosporium* and *Epicoccum*, while those taxa were detected when aligning to the protein sequence database (UniProt). Neither database enabled the identification of *Ganoderma*, which was regularly present in the samples. Both databases identified fungi with small spores

that are often missed by microscopy (e.g., *Aspergillus*, *Penicillium*) but can be detected by cultivation.

Conclusions. This study demonstrates that using a single method may not capture the full complexity of the analyzed samples. Applying multiple methods and analyses yields a more comprehensive understanding of fungi suspended in the atmosphere.

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COMPARATIVE ANALYSIS OF SOURCE APPORTIONMENT IN URBAN AND REMOTE MARINE ENVIRONMENTS

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Background. Standardized aerosol classification is vital for global climate and air quality modeling. However, many existing classification schemes rely on threshold-based algorithms, that are fixed sets of rules based on optical parameters like Aerosol Optical Depth (AOD) and the Angstrom Exponent (AE). A critical question is whether these rigid thresholds can be used universally. An algorithm optimized for an urban environment with high anthropogenic loading, such as Rome, may lead to significant misclassification when applied to a remote marine site like Lampedusa. This study evaluates the limitations of “one-size-fits-all” threshold methods and proposes machine learning as a more robust, adaptive alternative for multi-site monitoring.

Methods. The study uses optical data (2014–2020) from the AERONET stations in Rome (urban) and Lampedusa (remote marine). Several threshold-based classification algorithms (e.g., Annappurna et al., 2024; Stefan et al., 2020) were tested at both locations to assess whether they perform consistently across locations. The performance of these traditional methods was compared against a supervised Decision Tree machine learning (ML) model trained on standard optical inputs (AOD and AE). The validity of the classifications was independently verified using in-situ chemical speciation data at the Lampedusa site (tracers such as Al, Na, and Cl) to identify where optical thresholds fail to represent the physical and chemical reality of the atmosphere.

Results. The analysis reveals that threshold-based algorithms exhibit significant performance gaps between the two environments. In Lampedusa, traditional methods can misclassify coarse-mode marine aerosols as mineral dust due to overlapping optical signatures in low loading conditions, a condition that is less prevalent in the higher AOD environment of Rome. Preliminary results indicate that while a specific threshold may work for urban pollution in Rome, it leads to a high rate of false positives for “mixed” aerosols in Lampedusa. The machine learning model demonstrates adaptability, achieving higher accuracy by learning the site-specific distribution of optical data.

Conclusions. The findings suggest that fixed threshold-based algorithms are not universally applicable across diverse locations. The geographic and environmental context significantly shifts the optical boundaries of aerosol types, making “universal” rules prone to misclassification. This research demonstrates that machine learning can offer a more reliable framework for harmonized monitoring.

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SUSTAINABILITY DATA MODELLING USING SYSTEM DYNAMICS MODEL

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Background. Sustainable development has become an important component of business in various industries, where the balance between economic growth, environmental protection, and social responsibility is increasingly being assessed. The complexity of sustainability challenges at the corporate level – encompassing greenhouse gas emissions reduction, energy efficiency, innovation investment, and stakeholder trust – requires analytical frameworks that move beyond linear or static approaches. System dynamics with its foundations in feedback structures and stock–flow representation (Sterman, 2000), provides a powerful methodology to capture interdependencies, delays, and non-linear effects that shape a company’s long-term sustainability trajectories (Jonsdarottir et al. 2024). In the business context, system dynamics can be applied to model corporate environmental strategies (González et al., 2008), supply chain sustainability (Georgiadis et al., 2008), and the diffusion of cleaner technologies (Bai et al., 2019).

Methods. The model was developed using the InsightMaker system dynamics platform. Modelling process consisted of system boundary definition, indicator selection, causal structure development, data normalisation and simulation. The selection of indicators is based on ESRS requirements. A risk-based materiality matrix was applied by evaluating the likelihood and impact of each ESG aspect. The empirical analysis is based on a ten-year dataset covering all structural units of a large fuel retail company in Latvia. The sector is characterised by high resource intensity, significant environmental impact and increasing regulatory pressure, which makes it a suitable case for sustainability modelling. The overall sustainability index consists of seven sub-indices: climate; pollution; environment; circular economy; resource use; social environment; working environment.

Results. When analysing the created conceptual model, it can be concluded that it is functional and is able to model changes in sustainability indicators over time. Also, the tested input data shows that it is possible to model future development scenarios. The randomized data model shows that even without knowing the exact values of the input data, it is possible to model the preliminary trend of sustainability indicators, which can help in the initial assessment of the situation, or when starting to set future goals in cases where the specific organization has not yet had such goals.

Conclusions. Systematizing and placing sustainability-related parameters into a unified model is a good solution for analysing and improving a company’s sustainability indicators, as well as for developing much more accurate future strategies. Sustainability data model created in the InsightMaker program is functional and capable of performing successful sustainability data simulations as well as it allows adaptation to different industries and organisational contexts.

The developed model:

- reproduces historical trends;

- reveals interdependencies among ESG indicators;
- enables scenario analysis for long-term target setting;
- identifies leverage points for strategic decision-making.

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FROM FORESTRY RESIDUES TO FOOD COLOURANTS: OPTIMISED EXTRACTION AND ENCAPSULATION-BASED STABILIZATION OF CHLOROPHYLL FROM CONIFER NEEDLES

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Background. Large volumes of conifer needle biomass are generated during forestry logging and remain underutilised despite containing valuable bioactive compounds, including chlorophyll (Kļaviņš et al., 2023). Synthetic dyes widely used in food industry are associated with environmental persistence and toxicological concerns (Ardila-Leal et al., 2021; Mota et al., 2023), driving the development of sustainable pigment alternatives. However, efficient recovery and stabilisation strategies are required to transform forestry side-streams into industrially viable natural pigment ingredients. This study evaluated optimised extraction and stabilisation of chlorophyll from Norway spruce (*Picea abies*) and Scots pine (*Pinus sylvestris*) needles as a resource-efficient valorisation strategy.

Methods. Chlorophyll extraction from fresh and dried needles was compared using ultrasound-assisted extraction (UAE), maceration, and Soxhlet extraction with different solvent systems. Chlorophyll-a concentration (g/100 g DW) was determined spectrophotometrically. Solvent mixtures and extraction parameters were optimised using mixture design approach and Response Surface Methodology (RSM). Extracts obtained under optimised conditions were encapsulated in food-grade polysaccharide carriers and incorporated into yoghurt as a representative acidic food matrix. Colour stability during storage at 4 °C and 21 °C was assessed using CIELAB ΔE values.

Results. Fresh spruce needles yielded the highest chlorophyll-a concentration (0.31 g/100 g DW), exceeding pine (0.24 g/100 g DW) and dried biomass. Acetone combined with UAE provided higher chlorophyll concentrations compared to conventional methods, while reducing extraction time. RSM identified biomass-to-solvent ratio as the dominant factor influencing pigment yield ($p < 0.05$), with increasing sample mass in a fixed solvent volume reducing extraction efficiency due to solvent saturation. Encapsulation enabled uniform incorporation into yoghurt; refrigerated storage limited colour changes ($\Delta E < 7$), whereas storage at room temperature resulted in substantial colour change (ΔE 10-24), highlighting temperature as a key factor affecting pigment stability.

Conclusions. Efficient chlorophyll recovery and stabilisation from conifer needles make their use as natural colourants technically achievable. The findings highlight the importance of extraction optimisation and storage control in maintaining pigment quality and suggest a practical use for forestry residues beyond low-value disposal. This approach supports circular bioeconomy objectives and promotes more efficient use of forest-based resources.

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SEASONAL DYNAMICS OF AGRICULTURAL RUNOFF AND ITS IMPLICATIONS FOR CLIMATE-RESILIENT AND SUSTAINABLE WATER GOVERNANCE IN LATVIA

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Background. Climate change is altering hydrological regimes across Northern Europe, with projected increases in winter precipitation and runoff in the Baltic region (IPCC, 2021; EEA, 2022). In drainage influenced agricultural landscapes, such shifts can significantly intensify plant nutrient transport to surface waters (Olesen et al., 2021; Wang et al., 2022). Despite the implementation of the Nitrates Directive and the Water Framework Directive, diffuse agricultural pollution remains one of the main pressures preventing good ecological status in European surface waters (EEA, 2022). Previous studies emphasize that plant nutrient export patterns are shaped by interacting climatic, hydrological, and land management factors, highlighting the need for seasonally resolved analyses to support adaptive governance (Ebeling et al., 2022; Wang et al., 2022).

This study contributes to this discussion by assessing seasonal nitrogen dynamics in agriculture dominated catchments in Latvia and interpreting the results within a climate adaptation and environmental sustainability framework.

Methods. The analysis is based on monitoring data collected within the LIFE GoodWater IP project between 2020 and 2024, in the V093 Slocene river catchment. The study focused on total nitrogen (TN), nitrate-nitrogen ($\text{NO}_3\text{-N}$), and ammonium-nitrogen ($\text{NH}_4\text{-N}$). Seasonal variability was assessed using descriptive statistical analysis, comparing winter runoff conditions with the active vegetation period. The analytical framework links hydrological seasonality with climate resilience and adaptive water governance principles.

Results. The results reveal pronounced seasonal variability. Mean TN concentrations during winter reached approximately 0.4–0.5 mg L⁻¹, while summer concentrations decreased to around 0.1 mg L⁻¹. $\text{NO}_3\text{-N}$ constituted the dominant fraction of TN across all seasons, whereas $\text{NH}_4\text{-N}$ concentrations were low and episodic. The highest TN export occurred outside the vegetation period, coinciding with elevated runoff. These findings are consistent with recent European studies showing increased winter driven plant nutrient losses under changing climatic conditions (Olesen et al., 2021; Ebeling et al., 2022).

Conclusions. Seasonal hydrological variability plays a decisive role in plant nutrient export from agricultural systems. Projected increases in winter runoff may further amplify diffuse nitrogen losses in the Baltic region. Regulatory approaches focused solely on fertilizer input control may therefore be insufficient under future climate conditions. Strengthening environmental sustainability requires spatially and seasonally targeted measures, integration of nature-based solutions, and environmentally friendly drainage elements within adaptive governance frameworks. Long-term monitoring remains essential for evidence-based climate resilient water management.

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SYNERGISTIC IMPACT OF PLEOSPORALES ON SEASONAL ALLERGEN EXPOSURE IN VINNYTSIA DUE TO SPORE CROSS-REACTIVITY

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Background. Fungal aeroallergens, particularly those from the order Pleosporales, represent a primary source of respiratory hypersensitivity worldwide (Simon-Nobbe *et al.*, 2008). Genera such as *Alternaria* and *Epicoccum* are known to share a high degree of biochemical allergenicity, characterized by homologous proteins such as the Alt a 1 protein family and conserved enzymes like enolase (Alt a 6) and glutathione-S-transferase (Alt a 13) (Bisht *et al.*, 2002; Gupta *et al.*, 2002; Saenz-de-Santamaria *et al.*, 2006). Clinical evidence demonstrates that IgE from sensitized patients frequently cross-reacts between these taxa (Ouyang *et al.*, 2024), suggesting that the total Pleosporalean spore load is a more accurate predictor of clinical symptoms than single-genus monitoring (Gabriel *et al.*, 2015).

Methods. This study analyzed daily aerobiological data from Vinnytsia, Ukraine, for the 2020-2025 seasons using a volumetric Hirst-type trap. Concentrations of *Alternaria*, *Epicoccum*, *Curvularia*, *Dreschlera/Bipolaris/Helminthosporium*, *Pleospora*, and *Stemphylium* were recorded. A clinical threshold of 100 spores per cubic meter of air was applied to determine the duration of the high-risk season for sensitized individuals (Ščevková, J. *et al.*, 2026; Rodinkova *et al.*, 2018).

Results. During the analyzed years, *Alternaria* concentrations exceeded the 100 spores/m³ threshold from approximately June 29 to October 15. However, when *Epicoccum* was considered a cross-reactive component, the high-risk period expanded significantly. *Epicoccum* displayed spikes exceeding the threshold as early as July 7, effectively contributing to the total allergenic spore load. Furthermore, *Epicoccum* maintained concentrations above the symptom threshold until the final monitoring day on November 12, adding 27 days to the end of the season. Overall, the consideration of *Epicoccum* cross-reactivity resulted in a almost one-month prolongation of the high-risk period in Vinnytsia. Other Pleosporales also contributed to the risk with occasional spikes exceeding 100 spores/m³ during the season.

Conclusions. The biochemical overlap between *Alternaria* and *Epicoccum* leads to a substantially extended period of atmospheric allergenicity that is not accounted for when monitoring *Alternaria* in isolation. For optimal allergy management and forecasting in Vinnytsia, clinical thresholds should consider the combined load of taxonomically related cross-reactive fungi. These findings support the implementation of earlier prophylaxis and extended immunotherapy periods for patients exhibiting the Pleosporalean-allergic phenotype (Chruszcz *et al.*, 2012; Skóra *et al.*, 2015).

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WATER REUSE AS A TOOL FOR BALTIC SEE POLLUTION REDUCTION AND CONSERVING WATER RESOURCES

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The use of treated wastewater is becoming increasingly important due to rising water consumption and, consequently, water scarcity, as well as the impacts of climate change. The primary area of application for treated wastewater is agriculture, but it is also used for irrigation for recreational purposes, urban landscaping, and for other uses.

Nutrients present in treated wastewater can promote crop growth and yields while simultaneously reducing pollution of surface waters, thus reclaimed water can be vital in agriculture. This aspect is particularly important for decreasing nutrient loads to the Baltic Sea. Despite its relevance, the use of treated wastewater in Northern Europe remains very limited. Therefore, it is important to demonstrate its feasibility and promote public acceptance.

Research on the use of treated wastewater in Latvia shows its efficiency and feasibility in agricultural applications. The presence of major groups of pollutants (nutrients, heavy metals, pharmaceuticals, and others) in treated wastewater has been analyzed. The transfer of metals and nutrients from treated wastewater to plants has been studied, and no significant risks associated with its use have been identified. The quality of treated wastewater corresponds to a low to moderate risk level for its application, while the assessment of its potential clearly demonstrates broader regional use opportunities.

THE FORMATION OF *HOMO CLIMATICUS* THROUGH NORMATIVE AND ETHICAL TRANSFORMATION AS A PREREQUISITE FOR SOCIALLY RESPONSIBLE HEALTHCARE SYSTEMS (Poster)

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Background. Debates on sustainable healthcare are increasingly framed not only as technical or economic matters, but as questions of fundamental human rights. The protection of the right to life constitutes the normative core of this discussion, establishing positive obligations for states to organise systems capable of preventing avoidable risks to human existence, health, and dignity. Article 2 of the European Convention on Human Rights and Article 6 of the International Covenant on Civil and Political Rights articulate this guarantee as a binding legal commitment that extends beyond the prohibition of arbitrary deprivation of life and reaches the architecture of public governance.

Methods. The present research applies normative legal analysis and conceptual interpretation in order to examine how the jurisprudence of the right to life interacts with sustainability requirements in healthcare governance. The study synthesises human-rights doctrine and environmental responsibility discourse to conceptualise the educational formation of *Homo Climaticus* as a structural response to emerging climate-related risks.

Results. Within conditions of climate change, environmental degradation, and resource scarcity, the content of the protection of life acquires new dimensions. The survival and resilience of populations depend on the capacity of healthcare institutions to adapt, mitigate ecological harm, and maintain continuity of care in crisis situations. Consequently, sustainability becomes inseparable from the legal duty to secure life. In this context emerges the idea of *Homo Climaticus* – a normative and educational construct describing a person whose knowledge, behaviour, and professional decision-making are shaped by awareness of planetary limits and intergenerational responsibility. Education functions here as the transformative mechanism through which legal principles are translated into everyday institutional practice.

Conclusions. By cultivating climate literacy, ethical sensitivity, and governance competence among healthcare professionals, societies create the preconditions for systems that are both environmentally responsible and compliant with human-rights standards. Thus, the formation of *Homo Climaticus* should be understood as a prerequisite for the future viability of sustainable healthcare, linking the jurisprudence of the right to life with long-term ecological stewardship and embedding legal accountability within professional culture.

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PRELIMINARY STUDY OF MERCURY CONCENTRATIONS IN RAINWATER (Poster)

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Mercury (Hg) is a globally recognized environmental contaminant due to its toxicity, persistence, and ability to travel long distances in the atmosphere. As a volatile element, mercury can be emitted into the air and subsequently deposited onto terrestrial and aquatic ecosystems through wet deposition, such as rain or snow (Driscoll et al., 2013). Once in the environment, mercury can undergo transformation into more toxic forms, bioaccumulate in organisms, and biomagnify through food chains, posing significant risks to both ecological and human health (Dang & Wang, 2012).

This study focuses on analysing total mercury concentrations in rainwater collected from several locations in Riga, the capital of Latvia, and its surrounding districts during the summer and autumn seasons of 2025. Rainwater samples were analyzed using a Zeeman atomic absorption spectrometer (RA-915M) coupled with a cold-vapour atomization attachment. Prior to analysis, part of the samples underwent chemical treatment to break down any mercury compounds, followed by reduction of Hg ions to elemental mercury using a SnCl solution. This procedure ensures that all organic mercury compounds in the samples are broken down. All of the samples were also measured without chemical pre-treatment, thus allowing for some comparison between the results of both measurement techniques.

Preliminary results indicate that mercury concentrations in rainwater vary slightly between sampling sites and precipitation dates but generally remain below 10 ng/l. Continuation of the monitoring is planned to evaluate seasonal trends and possible meteorological influences (e.g., wind, air temperature, etc.). The findings will contribute to a better understanding of atmospheric mercury deposition patterns in the Baltic region.

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HYDROTHERMAL CARBONIZATION AS A TOOL FOR BIOMASS WASTE TREATMENT TO OBTAIN NEW VALUABLE PRODUCTS (Poster)

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Background. Hydrothermal carbonization (HTC) is a thermochemical biomass conversion process performed in water at subcritical temperatures (180-250 °C) and autogenous pressure. Under these conditions, water exhibits properties similar to organic solvents due to its reduced dielectric constant and increased ionisation, promoting acid- and base-catalysed reactions (Khan et al. 2019, Khandelwal et al. 2024). During HTC, biomass macromolecules such as cellulose, hemicellulose, and lignin undergo hydrolysis, dehydration, decarboxylation, and polymerisation reactions, leading to the formation of hydrochar (HC), process water (PW), and minor gaseous products, mainly CO₂ (Picone et al. 2021). Compared with conventional thermal treatment methods such as incineration or pyrolysis, HTC offers several advantages, including lower processing temperatures, reduced greenhouse gas emissions, and the ability to process wet biomass without energy-intensive drying.

HTC can be applied to a wide range of biomass feedstocks, including agricultural residues, forestry by-products, food waste, and invasive plant species. The process enables sustainable biomass waste management while simultaneously producing value-added materials with potential applications in environmental technologies (Ansone-Bertina et al. 2022) and agriculture (Arbidans et al. 2025). In recent years, HTC research has expanded rapidly, as reflected by the increasing number of scientific publications addressing its applications in biomass valorisation.

Methods. Two biomass types were investigated: stems of Sosnowsky's hogweed (*Heracleum sosnowskyi*) and spruce (*Picea abies*) greenery, representing invasive plant biomass and forestry by-products, respectively. Finely ground and dried biomass samples were treated in Teflon-lined hydrothermal autoclaves with deionised water at temperatures of 180, 205, and 230 °C for 4–24 h. After the reaction, the autoclaves were cooled to room temperature, and the solid hydrochar was separated and washed with deionised water and acetone (Klavins et al. 2024).

To optimise product yield and properties, HTC experiments were performed under neutral, acidic (4% H₂SO₄), and alkaline (0.65 M KOH) conditions. Additional modification and activation procedures, including chemical activation and nitrogen doping, were applied to obtain materials with tailored physicochemical properties (Ansone-Bertina et al. 2024). The liquid fraction produced during HTC of spruce greenery was further investigated to evaluate the formation of artificial humic substances via hydrothermal humification (Arbidans et al. 2025).

Results. The results demonstrate that invasive plant biomass can be effectively converted into carbonaceous materials through HTC (Klavins et al. 2024). For Sosnowsky's hogweed, the optimal conditions for hydrochar production were treated at 200 °C for 24 h in an acidic medium. The obtained hydrochar can be further modified to produce tailored sorbents

for environmental applications. Among the tested modification approaches, cold chemical activation with KOH yielded materials with high sorption capacities toward metallic ions and organic pollutants (Cu: 18 mg g⁻¹; methylene blue: 146 mg g⁻¹). In addition, nitrogen-doped hydrochars activated with KOH demonstrated enhanced CO₂ adsorption capacities of up to 3.9 mmol g⁻¹ (Ansone-Bertina et al. 2024).

In the second research direction, HTC of spruce greenery enabled the conversion of forestry by-products into artificial humic substances. The hydrothermal humification process was optimised to maximise the formation of humic acids, fulvic acids, and related low-molecular-weight by-products in the liquid phase. The structure and formation dynamics of the artificial humic substances were characterised using FTIR, ¹³C-CPMAS-NMR, and EPR spectroscopy, while spectrophotometric methods were applied to study fulvic acid and other low molecular byproduct formation. The results confirm the potential of HTC for producing humic-like substances from low-value forestry biomass, with prospective applications such as soil amendments or fertilizers in agriculture (Arbidans et al. 2025).

Conclusions. Hydrothermal carbonization is a versatile and sustainable technology for the valorisation of diverse biomass resources, including invasive plants and forestry residues. By adjusting process conditions and applying targeted modification methods, HTC can produce materials with specific functional properties suitable for environmental remediation or agricultural applications. The presented results highlight the potential of HTC to convert low-value biomass into valuable products such as carbon-based sorbents and artificial humic substances, contributing to sustainable resource management and circular bioeconomy development.

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ATMOSPHERIC CIRCULATION AND AIR-MASS CHANGES DURING THERMAL ANOMALY DAYS IN THE SOUTHEASTERN BALTIC (1951–2020) (Poster)

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Background. This study investigates the influence of atmospheric circulation on air mass properties and their variability during thermal anomaly days in the southeastern Baltic region for the period 1951–2020. Atmospheric circulation patterns were analyzed using ERA5 reanalysis data and the Hess-Brezowsky (H-B) atmospheric circulation classification. While the H-B framework has been widely applied across Europe and the North Atlantic (Sýkorová & Huth, 2020), this study focuses on identifying the dominant circulation types associated with extreme warm and cold events in the southeastern Baltic during winter and summer.

Methods. Thermal anomalies were identified from regionally averaged daily 2 m air temperature (53.75°–56.5° N, 21°–26.75° E). The 10th and 90th percentiles were used as thresholds for cold- and warm-anomaly days, respectively. To evaluate potential climate change influences, atmospheric parameters associated with anomaly days were compared between two climatic periods, 1951–1985 and 1986–2020. Statistical significance of the differences between periods was assessed using Welch's *t*-test ($p < 0.05$).

Results. During the later climatic period, the mean air temperature on warm summer anomaly days (WSD) increased by 1.1 °C relative to the earlier period, while cool summer anomaly days (CSD) exhibited an increase of 0.7 °C. In winter, temperatures increased by 2.0 °C on warm winter anomaly days (WWD) and by 1.6 °C on cold winter anomaly days (CWD). Compared with the earlier period, the 500–1000 hPa thickness and the height of the 0 °C isotherm increased for most anomaly types, except for CWD, where the changes were not statistically significant ($p > 0.05$). The largest changes in geopotential height (GPH) anomalies and specific humidity were observed during winter anomalies. The mean positive GPH anomaly on WWD increased nearly 2.5 times (from 22 to 54 gpm), while the mean negative GPH anomaly on CWD weakened by 62% (from –73 to –28 gpm). Specific humidity increased by 7% during CWD and by 10% during WWD, whereas summer anomalies were associated with increases of approximately 5–6%.

Conclusions. Thermal anomaly days during 1986–2020 were characterized by systematically higher values of all analyzed atmospheric variables compared with 1951–1985. These changes include increased 2 m air temperature, higher 500 hPa geopotential height, greater 500–1000 hPa atmospheric thickness, a higher 0 °C isotherm level, and increased specific humidity. The magnitude of these changes was more pronounced in winter than in summer, indicating a stronger atmospheric response during cold-season circulation regimes.

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CITIZEN-BASED AIR QUALITY MONITORING IN RIGA: INSIGHTS FROM THE “ELPO, RIGA!” PROJECT (Poster)

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Background. Air pollution is widely recognized as one of the most significant environmental health risks globally, particularly in urban areas where high population density and transport-related emissions [4; 5]. Exposure to particulate matter (PM_{2.5} and PM₁₀), nitrogen dioxide (NO₂), and other traffic-related pollutants has been associated with a wide range of adverse health outcomes, including respiratory and cardiovascular diseases, contributing substantially to global mortality and disease burden [1; 5]. Traffic-related emissions are therefore considered a key target for urban climate and air quality policies aimed at reducing environmental and health impacts [2].

In Riga (Latvia), road transport represents a major contributor to urban air pollution, particularly in densely populated areas and along major traffic corridors [3]. The increasing reliance on private vehicles contributes both to greenhouse gas and particulate emissions and to local air pollution, affecting urban environmental quality and public health. Addressing transport-related pollution is therefore an important component of sustainable urban development and climate mitigation strategies.

The pilot project “Elpo, Riga!” was initiated to improve understanding of urban air pollution patterns and to engage local communities in environmental monitoring and awareness-raising. The project is implemented by the Riga Energy Agency and the NGO Green Liberty in cooperation with the University of Latvia as part of the NetZeroCities PilotCities programme.

Methods. A citizen science approach was applied to collect spatially detailed air quality data. Mobile air quality sensors (Sensirion SPS30 optical sensors for PM_x measurements) were used by approximately 100 pupils from five schools located in central Riga. Sensors were attached to students’ backpacks and recorded air pollution levels during daily mobility patterns such as commuting to and from school. The collected sensor data were processed and analyzed to identify spatial and temporal patterns of air pollution in different urban locations. In addition to environmental measurements, social research methods (two focus groups, pupils survey (n=117), and representative survey (n=1208)) were employed to better understand perceptions and behavioral aspects related to mobility and air pollution. The combined methodological approach allowed for integrating environmental monitoring with social data, providing a multidisciplinary perspective on urban air quality and sustainability.

Results. The preliminary results indicate that road traffic is a dominant source of air pollution in the monitored areas of central Riga, as expected. Higher pollution levels were observed in locations with intense vehicle traffic and during peak commuting hours. The mobile monitoring approach provided high-resolution spatial data that complement existing stationary monitoring systems. The findings also highlight the potential of

citizen-based monitoring initiatives to raise awareness about air quality issues among young people and their families.

Survey responses show that participation in the project was associated with higher levels of awareness among pupils regarding environmental challenges related to air quality and transport. At the same time, reported travel behavior and expectations about future mobility remained largely unchanged across the survey waves. Results from the wider survey of Riga and Pierīga residents ($n = 1208$) indicate that mobility choices are strongly associated with travel time and convenience: car use represents the most common mode of transport in both territories and increases with longer commuting distances. Public transport is used regularly by a substantial share of respondents in Riga, while in Pierīga it appears more often as an occasional or supplementary mode of travel.

Conclusions. The “Elpo, Rīga!” project demonstrates the potential of citizen science approaches in urban environmental monitoring and climate action. The findings indicate that road transport remains a key factor shaping urban environmental conditions and everyday mobility patterns in the Riga metropolitan area. Air quality measurements highlight the influence of traffic intensity on pollution levels in different parts of the city, while survey results show that mobility choices are primarily driven by travel time, convenience and accessibility. The data suggests that structural factors such as commuting distances, urban density and the availability of public transport strongly influence transport behavior, with car use becoming more prevalent as travel distances increase and public transport playing a more central role in denser urban areas. At the same time, the results point to growing awareness of environmental issues related to transport and air quality, particularly among younger participants, indicating that improved information and visibility of environmental impacts can contribute to greater public engagement with sustainable mobility challenges.

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ATMOSPHERIC BIOAEROSOLS AND CANINE ATOPIC DERMATITIS: A BIOMETEOROLOGICAL APPROACH TO UNDERSTANDING ENVIRONMENTAL ALLERGEN EXPOSURE (Poster)

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Background. Climate change and changing environmental conditions can affect the amount and movement of bioaerosols in the atmosphere, including pollen. Changes in pollen production, transport, and persistence influence interactions between the atmosphere and living organisms and may affect both human and animal health. Canine atopic dermatitis is a chronic inflammatory skin disease caused by allergic reactions to environmental allergens such as pollen. Previous studies have shown that allergy symptoms in dogs often follow seasonal changes in pollen levels. However, allergic flare-ups can also occur outside the main pollen season, which suggests that other exposure pathways may exist. One possible explanation is that pollen can settle and remain on animal skin or fur, creating an additional source of allergen exposure. This study aims to examine the relationship between airborne pollen levels, weather conditions, and pollen found on canine skin.

Methods. A laboratory examination was carried out for 100 healthy and atopic dogs from Riga (Latvia) and Ljubljana (Slovenia). Pollen deposition on canine skin was measured using adhesive tape impressions collected from the interdigital, axillary, and inguinal areas. Background pollution aerobiological data were obtained from a pollen monitoring station, while meteorological information – including temperature, humidity, precipitation, and wind – was collected from local environmental monitoring databases.

Results. Pollen grains were detected on canine skin samples throughout the entire year, including periods when airborne pollen concentrations were not detected in the atmosphere. Preliminary analyses indicate that meteorological conditions influence both airborne pollen levels and the persistence of pollen on biological surfaces. Warm and dry conditions were associated with higher pollen concentrations in the air, but this pattern was not clearly reflected in pollen presence on canine skin. Rainfall reduced airborne pollen concentrations; however, it did not completely remove pollen already deposited on the animals. An important limiting factor was dog bathing, which significantly reduced the persistence of both pollen grains and fungal spores on canine skin.

Conclusions. The findings indicate that dogs may act as natural collectors of atmospheric bioaerosols and can therefore serve as a useful model for studying interactions between the atmosphere and biological systems. Combining knowledge from aerobiology, veterinary medicine, and biometeorology can help improve understanding of how environmental changes influence allergic diseases. Such interdisciplinary research also contributes to broader studies of environmental sustainability and climate-related changes in bioaerosols, with possible implications for both animal and public health.

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THE COPERNICUS ECMWF ATMOSPHERIC MONITORING SERVICE NATIONAL COLLABORATION PROGRAMME FOR LATVIA (Poster)

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Background. European Commission's Copernicus Atmosphere Monitoring Service (CAMS) provides global and regional information on atmospheric composition, air quality, and solar radiation, supporting environmental policy, public health protection, and climate action across Europe. To strengthen the practical use of CAMS products at the national level, the CAMS National Collaboration Programme (CAMS NCP) was established. Latvia joined this initiative in 2026 to improve the uptake and use of CAMS data and services across government institutions, research organisations, and economic sectors. Despite the availability of high-quality atmospheric data, their operational use in national decision-making and sectoral applications often remains limited due to insufficient awareness, technical capacity, and adaptation to local needs. The CAMS NCP Latvia addresses these challenges by promoting direct use of CAMS products, developing high-resolution air quality modelling capabilities, and strengthening national expertise through training and user engagement activities.

Methods. The project is implemented through a collaborative framework led by the University of Latvia in partnership with the Latvian Environment, Geology and Meteorology Centre. Activities are organised into several work packages addressing direct use of CAMS products, air quality downscaling, communication and user engagement, and training. A national air quality modelling system based on the SILAM model will be developed to downscale CAMS regional forecasts to a spatial resolution of 2.4 km for Latvia. In parallel, CAMS solar radiation datasets will be used to explore applications in renewable energy forecasting, including the development of demonstrator tools using machine learning techniques. Stakeholder needs are assessed through surveys and consultations with representatives of public administration, municipalities, academia and industry. Training activities include workshops and the development of university-level courses to support long-term capacity building in the use of CAMS data.

Results. The implementation of CAMS NCP in Latvia is expected to raise national capabilities in atmospheric data analysis and modelling. The high-resolution air quality forecasting system will improve the existing operational services provided by the Latvian Environment, Geology and Meteorology Centre and support compliance with European air quality legislation. Demonstration activities using CAMS solar radiation datasets will

provide new opportunities for improving renewable energy forecasting and supporting the transition towards climate-neutral energy systems. Training and outreach activities will increase awareness of CAMS services among stakeholders and contribute to the development of practical skills needed to access and interpret atmospheric data.

Conclusions. The CAMS NCP initiative in Latvia represents an important step toward integrating European Earth observation services into national environmental monitoring and decision-support systems. By combining atmospheric modelling, applied data analysis, and targeted stakeholder engagement, the project contributes to strengthening scientific capacity and promoting the practical use of Copernicus services in Latvia

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DETERMINATION OF SOLAR ACTIVITY CYCLES IN THE CLIMATIC SERIES OF AVERAGE AIR TEMPERATURE IN VILNIUS (Poster)

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The aim of this study was to determine the solar activity cycles in the climatic series of average monthly air temperatures. Since the analyzed climatic series of average air temperature cover the period from 1778 to 2024, the dependence of average air temperature fluctuations on solar activity was identified using the epoch composition method and the Wilcoxon pair test. The data analysis and the study were carried out in the following steps:

- Calculation of the averages of the Vilnius air temperature climatic series;
- Determination of air temperature anomalies relative to the long-term (1778–2024) average;
- Formation of samples of temperature anomalies based on the dates of solar activity minima and maxima. One sample (epoch) consists of a 7-year sequence – the reference year and 3 years before and after it ($n - 3$, $n - 2$, $n - 1$, n , $n + 1$, $n + 2$, $n + 3$). Considering the recurrence of solar activity minima and maxima during the study period, 21 samples were created for solar minima and 21 for solar maxima;
- For each month, pairs of temperature anomaly samples (49 pairs per month) were tested using the Wilcoxon paired test to assess whether the differences in temperature anomalies during solar activity minima and maxima were statistically significant.

After evaluating the differences in monthly average air temperature anomalies between solar activity minimum and maximum periods at the Vilnius meteorological station, the highest number of statistically significant differences was found from October to January, two years before the solar minimum ($n - 2$). In this period, 10 to 14 out of the 49 sample pairs showed statistically significant differences. The highest number of significant pairs was found in December (14 out of 49), and the lowest – in March and September (3 out of 49). From October to February, the dominant confidence level for the Wilcoxon test was 95%, while in other months it was 90%.

The higher reliability of significant anomaly differences from October to January correlates with the more frequent occurrence of significant sample pairs during these months. This suggests that the solar activity cycle in the climatic series of average monthly air temperature at the Vilnius meteorological station can be identified two years ($n - 2$) before the solar activity minimum, when the average air temperature anomaly in October and January reached $+0.6\text{ }^{\circ}\text{C}$ and $+1.7\text{ }^{\circ}\text{C}$ respectively, and is more pronounced during the autumn–winter period.

It should be noted that in November and December, the $n - 2$ anomaly before the solar minimum was $-0.2\text{ }^{\circ}\text{C}$, but it was $0.2\text{--}0.5\text{ }^{\circ}\text{C}$ lower compared to the $n - 2$ anomaly before the solar maximum.

From March to September, only individual sample pairs showed statistically significant differences (mostly at the 90% confidence level). Therefore, it is presumed that solar activity cycles cannot be identified in the Vilnius meteorological station's climatic series of average air temperature for this period.

8.5. sekcija. **ŪDEŅU EKOSISTĒMAS LATVIJĀ: IZPĒTE
UN ILGTSPĒJĪGA APSAIMNIEKOŠANA /**
AQUATIC ECOSYSTEMS IN
LATVIA: RESEARCH AND
SUSTAINABLE MANAGEMENT

25 YEARS OF WG ECOSTAT: ACHIEVEMENTS, LESSONS, AND FUTURE DIRECTIONS

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Over the past 25 years, the Working Group on Ecological Status (WG ECOSTAT) has delivered core scientific and technical outputs underpinning implementation of the EU Water Framework Directive (WFD). A central achievement has been the development and intercalibration of biological quality element methods, which established common assessment frameworks and class boundaries across Member States, enabling comparable ecological status classification at the European scale.

ECOSTAT has also produced operational guidance for hydromorphological assessment and for the designation and evaluation of heavily modified water bodies, translating the concept of good ecological potential into practical assessment approaches. These outputs have supported more consistent implementation of the WFD and improved the robustness of ecological status reporting.

In addition, the group has facilitated the gradual integration of emerging tools, including remote sensing, ecological modelling, and large-scale data analysis, contributing to more efficient and scalable monitoring strategies. Through its work within the Common Implementation Strategy, ECOSTAT has played a key role in aligning scientific methods with policy needs and fostering cooperation among Member States, the European Commission, and scientific experts.

This presentation synthesizes ECOSTAT's main achievements from 2000 to 2025, drawing on technical guidance, intercalibration outputs, and long-term expert engagement. It highlights measurable progress in method harmonization, comparability of assessments, and the operationalization of key WFD concepts.

At the same time, persistent challenges remain, including uneven implementation across countries, gaps in data availability for certain biological elements, and limited uptake of innovative monitoring technologies. Looking ahead to the 2027 WFD milestone, the presentation outlines priorities for the next phase, including improving methodological consistency, strengthening ecological relevance, and accelerating the integration of new data sources.

The talk aims to share lessons learned and inform future developments in European ecological assessment and water management.

EFFICIENCY OF PRACTICES TO IMPROVE WATER QUALITY IN THE DEMONSTRATION WATER BODIES OF THE LIFE GOODWATER IP PROJECT

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The practical actions carried out within the framework of the LIFE programme integrated project “Implementation of River Basin Management Plans of Latvia towards good surface water status” (LIFE GOODWATER IP) consist targeted planning, implementation and monitoring of practices of sustainable and environmentally friendly land drainage systems such as constructed wetlands (6 sites), sedimentation ponds (9 sites), woodchip bioreactors (6 sites), controlled drainage (1 site) and saturated buffers (1 site). The demonstration sites are located in the selected water bodies at risk with previously identified pressures from agricultural sources (G264 Age, V093 Slocene, L118 Auce and V046 Eda).

Water samples have been collected at the inlets and outlets of practices implemented at 13 demonstration sites on a monthly basis using a grab sampling approach and analyzed for concentrations of ammonium nitrogen (NH₄-N), nitrate nitrogen (NO₃-N), total nitrogen (TN), orthophosphate phosphorus (PO₄-P), total phosphorus (TP) and total suspended solids (TSS). The nutrient removal efficiency is calculated based on the average concentrations monitored at the inlets and outlets.

The monitoring results indicate the reduction of PO₄-P and TP concentrations at three sedimentation ponds established in the V093 Slocene ranging from 24% to 62% for PO₄-P and from 6% to 46% for TP. Two constructed wetlands implemented in the water body of V093 Slocene show inconsistent results in nutrient removal efficiency. Two woodchip bioreactors constructed in the V046 Eda have reduced the concentrations of NO₃-N on average by 96% and 98%, while the concentrations of TN have been reduced by 84% and 88%.

This work was supported by the integrated project “Implementation of River Basin Management Plans of Latvia towards good surface water status” (LIFE GOODWATER IP, LIFE18 IPE/LV/000014) financed by the LIFE Programme of the European Union and the Ministry of Smart Administration and Regional Development of the Republic of Latvia.

SEASONAL NITRATE DYNAMICS AND NITROGEN FORM STRUCTURE IN A DRAINED AGRICULTURAL CATCHMENT: THE EXAMPLE OF THE SLOCENE RIVER

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Nitrate nitrogen ($\text{NO}_3\text{-N}$) is a sensitive indicator of agricultural pressure on surface water quality. While total nitrogen (TN) provides a general overview of nutrient load, the relative structure of nitrogen and seasonal variability more accurately reflect transport mechanisms and catchment responses to environmental pressure.

Water quality monitoring was conducted in the V093 Slocene water body at 15 sampling points within the catchment. The study was based on monitoring data from the integrated LIFE GoodWater IP project covering the period from 2020 to 2025, with detailed analysis focused on the upstream section (GWSLA) and the downstream outlet (GWSLI3). The assessment included TN, $\text{NO}_3\text{-N}$, and ammonium-nitrogen ($\text{NH}_4\text{-N}$) concentrations to characterise seasonal behaviour and spatial distribution patterns of nitrogen forms.

The results demonstrated pronounced seasonal variability in nitrogen concentrations. Higher TN values were observed during winter and early spring, reaching approximately $0.4\text{--}0.5\text{ mg L}^{-1}$, whereas summer concentrations decreased to around 0.1 mg L^{-1} . This pattern corresponds to discharge-controlled nitrate export processes typical of agricultural catchments. Regarding nitrogen structure, $\text{NO}_3\text{-N}$ was the dominant nitrogen fraction across all seasons, while $\text{NH}_4\text{-N}$ concentrations remained consistently low and episodic ($<0.05\text{ mg L}^{-1}$).

These findings highlight the importance of considering seasonal hydrological variability and nitrogen structure in water quality management of agricultural landscapes. The results support the development of site-specific nutrient management strategies aimed at reducing diffuse agricultural pollution in agricultural runoff, rivers and the Baltic Sea.

This research was conducted within the framework of the integrated project "Implementation of River Basin Management Plans of Latvia towards good surface water status" (LIFE GOODWATER IP, LIFE18 IPE/LV/000014), which has received funding from the European Union's LIFE program and the State Regional Development Agency (www.goodwater.lv).

BEFORE–AFTER ASSESSMENT OF THE BIOLOGICAL QUALITY ELEMENTS IN THE LIFE GOODWATER IP PROJECT DEMONSTRATION STREAMS FOLLOWING MANAGEMENT MEASURES

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The aim of the study is to evaluate the impact of management measures on the ecological status of rivers using two Water Framework directive biological quality elements – macrophytes and benthic invertebrates. Monitoring was conducted in the Āģe and Slocene streams in 2020 (pre-management) and 2025 (post-management). Benthic macroinvertebrates were sampled in spring (April or May) using a multi-habitat approach. In Āģe sampling was done at 5 sites, but in Slocene – at 3 sites. Macrophyte monitoring was carried out in July and August at the same sites.

Ecological quality was assessed using the Latvian Macroinvertebrate Index (LMI) multimetric index, as well as Latvian National Macrophyte Index for Rivers.

Implemented management measures: Āģe – removal of aquatic vegetation and accumulated silt; addition of pebble substrate; construction of an artificial wetland. Slocene – construction of an artificial wetland; removal of fallen trees and large woody debris.

In the lower reaches of the Āģe ecological quality according to macroinvertebrate metrics was classified as high. However, in the upstream section where management measures were recently implemented, sediment accumulation contributed to a decline in ecological status from good to moderate. Macrophytes indicated good ecological quality at all reaches, however species typical for eutrophic waters were present.

Following the removal of fallen trees in Slocene near Sloklejas, the benthic invertebrate indices indicated an improvement in ecological quality (from poor to moderate), but upstream in recently managed sections quality was moderate. Macrophytes indicated good quality near Sloklejas, however, species typical of eutrophic waters dominate in the upper reaches.

This study was supported by the integrated project “Implementation of River Basin Management Plans of Latvia towards good surface water status” (LIFE GOODWATER IP, LIFE18IPE/LV/000014), funded by the European Commission’s LIFE Programme and the Ministry of Smart Administration and Regional Development of Republic of Latvia.

ASSESSMENT OF THE ECOLOGICAL POTENTIAL OF HEAVILY MODIFIED WATER BODIES USING MACROPHYTES AND BENTHIC INVERTEBRATES IN LATVIA

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Accurate assessment of river water quality is often hindered by the inherent uncertainty of environmental data and the limitations of rigid classification standards. Since fuzzy mathematics was specifically developed to manage imprecise or vague information, it presents an intuitive framework for modelling these complexities. This study applies an implicative fuzzy rule-based system to improve upon the currently used “one-out-all-out” principle. The main drawback of the mentioned principle is that its non-compensatory nature often results in a “failure” if even a single indicator crosses a crisp threshold, ignoring the broader ecological context.

We propose a fuzzy inference system that incorporates expert judgment to evaluate key chemical indicators such as phosphorus, nitrogen, ammonium, and dissolved oxygen. By replacing crisp boundaries with fuzzy membership functions, our approach smoothens the transition between quality classes and preserves critical information near decision boundaries.

A defining feature of this system is its adherence to monotonicity. This ensures that the model is logically consistent: any improvement in specific water quality measurements is strictly and accurately reflected in a higher final evaluation. Furthermore, the framework generates outputs for payoff functions, allowing for the estimation of economic costs related to water degradation. The developed approach contributes to developing the theory of Value of Information in the fuzzy framework.

This research is funded by the Latvian Council of Science, project “A fuzzy logic-based approach to the value of information estimation in optimal control problems under uncertainty with applications to ecological management”, Project No. lzp-2024/1-0188.

ASSESSMENT OF THE ECOLOGICAL POTENTIAL OF HEAVILY MODIFIED WATER BODIES USING MACROPHYTES AND BENTHIC INVERTEBRATES IN LATVIA

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Hydromorphological pressures continue to be among the primary factors degrading freshwater ecosystems. The Water Framework Directive introduced the concept of Heavily Modified Water Bodies (HMWBs) to classify water bodies that have been substantially altered by such pressures. When a water body is classified as heavily modified, its management objective shifts from achieving Good Ecological Status (GES) to attaining Good Ecological Potential (GEP). Although GEP is conceptually comparable to GES, it explicitly accounts for constraints arising from the water body's designated uses. As in natural systems, the ecological potential of HMWBs must be determined through the assessment of biological quality elements. Furthermore, the Directive requires the implementation of mitigation measures aimed at reducing the adverse impacts of hydromorphological pressures.

Altogether, 9% of the 785 water bodies in Latvia are classified as HMWBs. These water bodies include modified streams and rivers, small and large reservoirs, and lakes with altered water levels. This study aims to develop national methods for assessing the ecological potential of HMWBs based on macrophytes and macroinvertebrates. In addition, a set of mitigation measures is proposed for each group of water bodies.

The assessment of ecological potential in HMWBs requires a differentiated approach depending on the water body type, applying adapted macrophyte and macrozoobenthos monitoring methods and accounting for the impacts of hydromorphological alterations. After analyzing the available monitoring data, two indices were identified as the most suitable for further monitoring of HMWBs: for the macroinvertebrates, the ASPT and BMWP indices showed significant differences between natural water bodies and HMWBs according to the Mann–Whitney U test.

GOOD PRACTICES IN ECOSYSTEM MANAGEMENT IN EUROPE: EXPERIENCE FROM THE RIWET PROJECT

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Rivers and wetlands play a fundamental role in maintaining biodiversity, regulating water flows, and supporting ecosystem services such as flood mitigation, carbon storage, and water purification. However, the extent and ecological quality of these ecosystems have significantly declined across Europe during recent decades due to land-use change, drainage, urbanisation, and increasing pressure from climate change. Addressing these challenges requires not only local restoration measures but also effective exchange of knowledge and management approaches across regions.

The Interreg Europe project RIWET (Restoring Rivers and Wetlands) aims to strengthen governance and policy instruments related to river and wetland restoration through the exchange of good practices among European regions. Within the project, partners collect, analyse, and share practical examples of ecosystem management that demonstrate effective approaches for restoring and protecting blue-green infrastructure. At present, more than 20 good practices from different European countries have been identified, covering themes such as nature-based solutions, catchment-scale planning, stakeholder engagement, ecological monitoring, and wetland restoration.

This study presents an overview of the RIWET good practice exchange framework and highlights several examples. These include water buffering and raised bog restoration in the Bargerveen peatland (Netherlands), citizen science monitoring of groundwater springs, multidisciplinary ecosystem research in the Vjosa River basin (Albania), and catchment-based planning and modelling of water retention measures in Ostrobothnia region (Finland). Together, these cases demonstrate diverse approaches to improving ecosystem resilience while balancing ecological, social, and water management objectives.

This research is supported by the Interreg-Europe project “Public-Private Governance of Rivers and Wetlands Restoration and Conservation”, RIWET (Nr. 02C0317).

FRESHWATER HABITAT CONSERVATION PLANS – A ROADMAP FOR MORE TARGETED NATURE CONSERVATION

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LatViaNature is an EU LIFE Integrated Project implemented by the Nature Conservation Agency of Latvia to strengthen biodiversity conservation and data-driven nature management across Latvia. In 2025, the project developed a total of 21 habitat conservation plans for 56 habitats of European Union importance, combining the plans into five habitat groups: coastal, freshwater, grassland, marsh, and forest habitat conservation plans. Three protection plans have been developed for freshwater habitats – flowing freshwaters, standing freshwaters and dystrophic lakes. Habitat protection plans have been developed for the period from 2025 to 2037. Their aim is to provide recommendations for the conservation, management and restoration of freshwater habitats of European Union importance included in Annex I of the Habitats Directive in Latvia. Habitat protection plans assess the protection status of habitats and determine the protection and management measures necessary for habitats to ensure a favourable protection status, as stipulated in the European Union Habitats Directive, which is binding on Latvia. Habitat conservation plans are the next step in Latvia's nature conservation system, following the data obtained during the Nature Census project, its analysis, and the quantitative habitat and species conservation targets developed in the LatViaNature project.

In line with the European Commission's recommendations on linking the Water Framework Directive and the Habitats Directive, freshwater habitat protection plans have been developed, establishing the necessary preconditions to ensure that in the future habitat protection plans and river basin management plans are fully integrated and mutually coherent documents.

Habitat protection plans are an important contribution to the development of the national nature restoration plan required for the implementation of the Nature Restoration Regulation. Similarly, habitat protection plans will be used to attract funding for habitat management and restoration, proposals for amendments to regulatory acts, amendments to the boundaries of Natura 2000 sites, etc.

DESIGN MATTERS: A DECADE OF LESSONS FROM ARTIFICIAL RIFFLES IN RIVER RESTORATION

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In lowland countries such as Latvia, rivers are largely dominated by slow-flowing reaches, while habitats with fast current and cobble-pebble substrate suitable for spawning of salmonids and lampreys are limited. Consequently, artificial riffles are often considered an attractive and relatively simple river restoration measure.

This study summarizes electrofishing survey results collected over the last decade in artificial riffles, including both targeted monitoring and incidental observations. The strongest positive responses were recorded in two trout streams. In one case, a riffle created in a slow-flowing reach of a natural river led to a substantial increase in brown/sea trout parr density within seven years (up to 13.3 ind./100 m²). In another, constructed under LIFE GoodWater IP project in a degraded, straightened stream, parr densities reached 22.4 and 72.8 ind./100 m² after one and two years, respectively. Increased parr densities (10 ind./100 m²) were also recorded in a riffle formed unintentionally during road reconstruction downstream of a culvert in a straightened stream.

In contrast, no improvements were detected in three riffles intentionally created in a large natural river or in small, straightened stream. These failures were associated with siltation caused by insufficient gradient and to structural instability where cobble layers were too thin to resist disturbance by spawning fish.

Based on LIFE Goodwater IP results, effective artificial riffles for salmonid restoration should have a slope of 0.3–0.5% and a substrate layer >30 cm thick composed of 2–5 cm pebbles supplemented with several boulders (>0.5 m diameter). Although such structures can provide suitable spawning habitat and support ecological recovery, they remain artificial elements. Therefore, we recommend applying artificial riffles only in watercourses that have been altered or degraded by human activity, while in natural rivers restoration should prioritise protecting and restoring existing natural riffles rather than constructing new ones.

JAUNUPE RIVER AS AN IMPORTANT PART OF THE SALACA–SVĒTUPE HYDROECOLOGICAL SYSTEM

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With the start of the LIFE is SALACA project, hydroecological studying of the rivers of the Salaca basin began in 2024. Jaunupe was designated as a separate water body only in 2024, directly as a result of the hydromorphological assessment carried out within this project.

Although Jaunupe is a man-made channel created several centuries ago, its overall hydromorphological quality is good – even high – and only slightly lower than that of the other natural rivers studied in the project. Jaunupe is also one of two exceptions where an artificially dug canal complies with the status of freshwater habitat 3260, listed in the Habitat Directive. Over time, the river has acquired the characteristics typical of natural watercourses and corresponds to a biologically diverse river, in which several significant natural values have been identified, including specially protected invertebrate species – *Unio crassus*, *Ancylus fluviatilis*, and *Theodoxus fluviatilis*.

The ecological quality based on macroinvertebrates corresponds to a high/good status. The largest proportion of organisms consists of Chironomidae larvae and *Gammarus pulex*. Jaunupe is characterised by fast-flowing macroinvertebrate species, e.g., *Ancylus fluviatilis*, *Aphelocheirus aestivalis*, *Cheumatopsyche lepida* and others.

Despite being an artificial channel, the Jaunupe River is an important migration, spawning, and rearing habitat for migratory fish. Electrofishing surveys conducted during the project recorded mean densities of 3.3 sea trout and 15.0 salmon per 100 m², reaching up to 26.7 and 93.3 ind./100 m⁻² in optimal habitats.

Hydrological measurements show that Jaunupe diverts a part of the Svētupe River into the Salaca River, increasing the Salaca catchment area by approximately 450 km². Depending on the season, as much as 30–70% of the Svētupe discharge is redirected to the Salaca.

In total, the ecological quality of Jaunupe River is good – better than that of the majority of natural rivers in the Gauja RBD.

SMALL AND MEDIUM-SIZED RITHRAL STREAMS ARE CRITICAL FOR LAMPREY REPRODUCTION: EVIDENCE FROM LARVAL POPULATION STRUCTURE

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Effective protection of vulnerable fish species requires comprehensive knowledge of their habitat preferences. The spawning and larval stages of the European river lamprey (*Lampetra fluviatilis*) and brook lamprey (*L. planeri*) encompass a variety of habitats, ranging from fast-flowing sections of small streams to the potamal reaches of large rivers. While many studies have focused on specific local habitat parameters, information on broader-scale environmental and anthropogenic factors remains limited

In this study, we analysed larval lamprey population structures across river reaches differing in large-scale environmental parameters such as stream gradient, temperature class, catchment area, and river order, as well as human impacts, including migration barriers and riverbed straightening. Data comprised total lengths of more than 14,500 larvae collected from 2014 to 2025 at sampling sites across 59 rivers in Latvia draining into the Baltic Sea and the Gulf of Riga.

Our results show that suitability for reproduction and early larval development increases with higher riverbed gradient, lower water temperature, smaller catchment area, and lower river order. In contrast, larger rivers are more important for the feeding and growth of larger larvae. Larval populations in anthropogenically impacted reaches often did not follow these expected patterns, highlighting the influence of human modifications.

These findings emphasize that small and medium-sized rivers play a critical yet underrecognized role in lamprey reproduction. Many of these rivers have been affected by hydropower development and drainage maintenance since the early 2000s and remain inadequately protected. To secure a favourable conservation status for both river and brook lampreys, enhanced attention is needed on protecting small and medium-sized cold-water rithral-type rivers. Preserving these habitats is essential for sustaining reproduction, larval growth, and overall population resilience.

LOST PARADISE – FOR WHOM? INTERACTIONS BETWEEN BEAVERS AND ECOLOGICALLY VULNERABLE FISH IN THE PAKSĪTE RIVER

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Beavers are known for being ecosystem engineers as they maintain river habitats' heterogeneity. However, excessive beaver population can significantly alter small lowland streams, thus reducing habitats' suitability for ecologically vulnerable fish species. Here we analyse the changes of the sea/brown trout population in Paksīte river, a small lowland stream, where activities for the reduction of beaver population have been implemented. The river has been surveyed before management in 2019, then in 2021 and 2025 focusing on the assessment of river parameters for sea/brown trout reproduction using the Trout Habitat Score (THS) index.

The results show that the past management activities have allowed to reduce the beaver impact in the most vulnerable area of the river. Measures achieved their goals: in the lowest 2 km, where dam density had been highest, dam numbers declined from 15 in 2019 to 1 and 4 in 2021 and 2025 accordingly, while the average THS value increased from 5.5 in 2019 to 6.4 and 5.8 in 2021 and 2025. Further upstream changes were smaller. The fish community responded accordingly: sea/brown trout were first recorded in 2021, and by 2025 both their distribution and abundance had increased.

Our findings confirm a negative correlation between uncontrolled beaver population growth and ecologically vulnerable fish abundance in a river. Regulating beaver populations in beaver rich lowland rivers can serve as an effective river management measure. Further research is needed to understand the interaction between beavers and river biota and estimate the acceptable number of beaver dams per kilometre in different types of rivers to establish evidence based guidelines for sustainable river management.

FOOD WEB INTERACTIONS, HABITAT COMPLEXITY, AND HUMAN PRESSURE AS KEY DETERMINANTS OF FISH COMMUNITY DYNAMICS IN TEMPERATE LAKES

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This study investigates the ecological drivers of fish community dynamics and food web stability across northern temperate lakes in Latvia and Estonia. By examining the interplay between habitat complexity, food availability, and anthropogenic pressures, the research evaluates the factors shaping fish growth and recruitment. Central to the study are young-of-the-year (YOY) fish; their physiological vulnerability and reliance on specific nursery habitats make them sensitive early-warning indicators of ecosystem health and shifts in trophic regulation.

The findings demonstrate that littoral zooplankton biomass and composition are fundamental determinants of YOY diet and condition, establishing a definitive bottom-up link between primary productivity and fish recruitment. Furthermore, the study identifies the structural role of diverse macrophyte assemblages, particularly floating-leaved vegetation, in providing essential refugia and modulating planktonic interactions. These vegetated habitats enhance ecological resilience by facilitating resource partitioning and buffering against environmental disturbances.

Conversely, the research highlights the destabilizing effects of human activities, such as overfishing and poaching, which disproportionately target large piscivores. The loss of these keystone predators triggers a trophic cascade, leading to an overabundance of planktivorous fish and a subsequent decline in water quality via increased nutrient resuspension. The study concludes that ensuring long-term lake sustainability requires an integrated management approach that prioritizes the conservation of complex littoral habitats alongside rigorous fisheries enforcement to safeguard top-down regulatory mechanisms.

FUNCTIONAL STRUCTURE OF ZOOPLANKTON IN THE RIPARIAN ZONES OF THE MIDDLE DAUGAVA RIVER DURING THE SUMMER LOW WATER PERIOD

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Zooplankton communities are essential for the functionality and sustainability of aquatic ecosystems. The diversity and functional structure of zooplankton, along with their changes, is crucial for understanding the role of these organisms in aquatic ecosystems, including rivers. This knowledge has significant potential for applications in water quality monitoring and ecological research. Consequently, zooplankton are widely used as indicators in environmental assessments. In rivers, zooplankton is influenced by various environmental factors (water flow, turbidity, riparian zones etc.). Riparian zones characterised by slow water current velocity or stagnant waters significantly impact zooplankton diversity and functional structure. This influence is linked to the heterogeneity of these zones, which includes varying substrates, macrophyte cover, sedimentation, organic matter, water quality, land use, run-off and other abiotic, biotic factors. This study aimed to determine spatial distribution of zooplankton functional (trophic) groups within riparian zones, both with and without macrophyte cover, in the Daugava River middle stretch from Tabore to Gostiņi. The study was conducted in the riparian zones in July 2025. The basic structure of zooplankton by biomass in the Daugava River riparian zones was formed by functional groups of microfilter-feeders rotifers, cladocerans (ineffective microfilter-feeders, macrofilter-feeders and predators) and copepods predators. Biomass of large-sized crustaceans, mostly macrofilter *Sida crystallina* and predators increased toward the lower stretches. Replacement functional groups of zooplankton in the river stretch indicate food resource diversification. The rise of macrofilters in biomass in vegetated zones may indicate an increase in suspended materials (fine organic-matter-rich, chlorophyll- α), creating a favourable food environment.

DRIFTING DOWNSTREAM: LAGRANGIAN STUDIES OF PHYTOPLANKTON AND ZOOPLANKTON COMMUNITIES OF THE MIDDLE DAUGAVA RIVER

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This report summarizes results of seven complex drift expeditions conducted on the Middle Daugava River during the spring floods and summer low-water period since 2007 by the Department of Environment and Technologies and the Laboratory of Hydroecology, Daugavpils University (DU). During each expedition, downstream transformation of the Daugava's phytoplankton and zooplankton communities has been investigated in real-time mode by using a drifting research platform and the Lagrangian sampling strategy.

Phytoplankton samples were collected during the I, III, VI, VIII and IX DU Drift Expedition from the water surface every 30 or 60 minutes. Sample analysis was carried out according to the Utermöhl method using an inverted microscope. The basic counting unit was the cell, except for the blue-green and green algae, for which it was a filament or colony. Zooplankton samples were collected during the I, II, III, IV, VI, VIII and IX DU Drift Expedition once an hour using an Apstein-type sampling net. At each sampling site, 100 litres of water were filtered through the net. Sample analysis was carried out according to standard methods by using the microscope "ZEISS Axioskop 40" and the Sedgewick Rafter counting chambers 1 ml in volume. Six subsamples were analysed for each collected sample.

Several real-time data records were obtained after each expedition regarding the downstream changes in composition, abundance and biomass of the phytoplankton and zooplankton and their main taxonomic groups. Statistical significance of downstream changes of each community parameter was determined by applying the Mann-Kendall Trend Analysis. The obtained results were compared to the main hydraulic parameters of the stream (i.e. depth, discharge, velocity and turbulence), and possible impact of each parameter was analysed. In result, a crucial role of spatial and temporal scale of hydrological processes that affect downstream transformation of the Daugava's phytoplankton and zooplankton was revealed.

THE RIGHT APPROACH FOR THE RIGHT RESULT: COMBINING EDNA, MODELLING AND ELECTROFISHING TO STRENGTHEN CONSERVATION REPORTING OF LATVIAN FISH SPECIES

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Article 17 of the Habitats Directive requires Member States to report on the conservation status of species listed in the directive. Preparation of conservation status assessments for fish species in Latvia has long been hindered by insufficient information, mainly due to gaps in monitoring caused by limited spatial coverage and inadequate integration of modern techniques.

In this study, we reviewed the methodology used in the most recent conservation status assessment for fish species in Latvia and evaluated the potential application of environmental DNA (eDNA) and other modern approaches. We also propose actions to improve the accuracy and reliability of future assessments.

The latest report relied primarily on two data sources: species distribution modelling, used to estimate the occupied area of each species, and electrofishing surveys. However, neither of these datasets was collected specifically for the preparation of the report. These data provide valuable insights into species distribution and status, but modelling may not always reflect actual occurrences, and electrofishing data can be biased if collected in suboptimal habitats, potentially leading to inaccurate population estimates. Our results indicate that eDNA provides more reliable information on species distribution than electrofishing, although consistent detection still requires at least 12 samples per lake or per 10 km of river. Electrofishing remains important when quantitative estimates of population density are required.

To improve conservation status reporting, we recommend broader adoption of eDNA monitoring combined with targeted electrofishing and distribution modelling. In addition, integrating independent research data on fish and lamprey populations can enhance the completeness and reliability of future assessments. Implementing these approaches is essential to strengthen the evidence base for conservation decisions and ensure more accurate evaluations of species status under the Habitats Directive.

IMPROVING BALTIC SALMON (*SALMO SALAR*) AND PIKEPERCH (*SANDER LUCIOPERCA*) REARING TOWARDS MORE SUSTAINABLE, RESILIENT, AND HEALTHY FISH POPULATIONS

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The future of pikeperch (*Sander lucioperca*) and Atlantic salmon (*Salmo salar*) Baltic Sea population resources is a pressing concern for both Latvia and Lithuania, arising from anthropogenic effects and climate change, pollution in natural water bodies, disease outbreaks in fish farms that perform restocking, growth of antimicrobial resistance, and unsustainable rearing practices.

Recognising these challenges, Institute of Food Safety, Animal Health and Environment "BIOR" (Latvia) and Fisheries Service (Lithuania) implemented the Interreg Lat-Lit project "SPPwelfare" (LL-00133) and carried out valuable knowledge transfer in a field of pikeperch artificial reproduction and salmon restocking, and conducted research in the estimation of the effectiveness of probiotics application for juvenile salmon and pikeperch rearing.

The project findings reveal that the effectiveness of probiotics composed from lactic acid bacteria, *Sporolactobacillus spp.* and *Weizmannia spp.*, is strongly influenced by water temperature, and probiotic application is different for every salmon juvenile developmental stage. For the fry and parr stage, probiotic baths may be safer and more beneficial than feeding, as amendments elevate fry survival. But at the presmolt stage, dietary probiotics ingested with feed showed statistically significant growth benefits.

As other major results of the project, Biosecurity guidelines for fish farms were created and Fish Health Index Model (FHIM) for salmon was developed to serve as a genuine source of information about fish health and welfare. Project activities and results contributed significantly to the conservation and sustainable management of salmon and pikeperch resources in the cross-border region of Latvia and Lithuania.

EFFECTS OF ENVIRONMENTAL FACTORS ON COASTAL FISH COMMUNITIES IN THE LATVIAN COAST OF THE EASTERN BALTIC SEA FROM 2015 TO 2025

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In the Baltic Sea region coastal fish community dynamics and the conservation of essential habitats have become key concerns under climate warming and increasing anthropogenic pressure. In the Eastern Baltic Sea, these stressors are affecting unique coastal ecosystems in brackish waters that connect freshwater and marine species and provide important nursery grounds for Baltic fishes. Here we examined how environmental variables effect coastal fish community dynamics in relation to key physical factors (water/air temperature, wind speed and direction) along the north–south gradient in 2015–2025. Physical conditions were characterized using curated hydrological and meteorological records (local agencies and research surveys) combined with model products from the European Earth Observation Programme “Copernicus”. Fish were sampled at five Latvian coastal stations representing contrasting habitats, including sandy sites at Kolka (Gulf of Riga/Irbe Strait) and Lielirbe in the north and more rocky shores at Jūrmalciems and Pape in the south. Fish were sampled each year with a beach seine (5–10 mm mesh) over an area of ~4,000 m², focused on juveniles and young-of-year (typically <15 cm total length) in spring (May–June) and summer (July–August). In surveys fish communities comprised species from marine, diadromous, and freshwater ecological guilds. Northern habitats showed higher proportions of benthic species like flounder (*Platichthys flesus*), migratory species such as vimba (*Vimba vimba*), and freshwater representatives like three-spined stickleback (*Gasterosteus aculeatus*), whereas southern sites were dominated by juvenile clupeids and other marine fishes, including lesser sandeel (*Ammodytes tobianus*). We observed pronounced seasonal and interannual shifts in species relative abundance (%), driven mainly by temperature variability and wind-driven upwelling events. This highlights that short-term physical fluctuations can strongly structure coastal fish communities across different habitats. This may have implications for predicting shifts in the distribution of fish stocks and for managing socio-economic activities in the coastal zone.

MORPHOLOGY AND SEDIMENT COMPOSITION OF THE ALKI BANK NEAR THE COAST OF PĀVILOSTA (KURZEME REGION)

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The Alki Bank is located near the Kurzeme coast, opposite to Pāvilosta, within one of the potential MPA areas. During previous research activities at sea, the unique, large hard-bottom sea structures – moraine formations were uncovered. These unique structures form the reef (1170) biotope complex. In the summer of 2025, glacial till and rock samples from moraine formations were collected by diving.

Determining the composition of the glacial till from the Alki Bank provides valuable insight into the geological structure of the specific area, the direction of glacial movement, and the conditions of sediment formation. Glacial till is glacially deposited material composed of rocks of various sizes, ranging from clay and sand particles to gravel and pebble fractions. Its composition and provenance provide information about past ice sheet advancement direction in the Baltic region.

During the study, pebble and gravel sized rocks were selected and classified by their structures, textures, mineralogical composition, lithological type and other properties. The samples are dominated by granites, gneiss, dolomite, and limestones, including specimens containing fossil inclusions. Determining the overall lithological type of the rocks helps assess whether the glacial material was transported from more distant regions. In contrast, sedimentary rocks point to erosion of local bedrock.

A more detailed analysis of the glacial material was carried out using X-ray diffraction (XRD) to determine its mineral composition. Preliminary results indicate that material collected near Ulmale is compositionally similar, showing a dominance of high calcium carbonate concentrations, which is less characteristic of other areas in Latvia. It is assumed that the glacial ridge fragmentation was predominantly influenced by seabed currents that eroded channels, consistent with the prevailing current directions along the Kurzeme coast.

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8.6. sekcija. **EKOLOĢISKĀ MODELĒŠANA UN
TELPISKĀ PLĀNOŠANA DABAS
KAPITĀLA SAGLABĀŠANAI UN
PĀRVALDĪBAI /**

**ECOLOGICAL MODELLING
AND SPATIAL PLANNING FOR
CONSERVATION AND MANAGEMENT
OF NATURAL CAPITAL**

HIGH-RESOLUTION SPECIES DISTRIBUTION MODELLING AND SPATIAL PRIORITISATION TO SUPPORT CONSERVATION PLANNING IN LATVIA

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Effective conservation planning requires spatially explicit, ecologically robust information on species and habitat distributions. We present a workflow developed to support conservation of biodiversity and inform management of natural capital. The project integrates species distribution modelling, bias-corrected presence-background approaches, and systematic spatial prioritisation to inform protected area management and natural capital assessments.

We compiled expert-validated occurrence data from national repositories and citizen science platforms, harmonised taxonomy in all data sources, and filtered records for spatial precision and land-use change. More than 500 species across multiple taxonomic groups were selected as conservation indicators. For environmental predictors, we developed 538 ecogeographical variables at 1 ha resolution and across multiple spatial scales (500, 1,250, 3,000 10,000 m radii), capturing climate, hydrology, terrain, soils, habitats, and landscape structure. Species-specific variable selection combined expert knowledge, variance inflation filtering, and iterative model simplification.

Species distributions were modelled using maximum entropy (MaxEnt) with spatially independent training-validation-test partitions and block cross-validation to reduce spatial autocorrelation bias. During model training and evaluation, both presence and background locations were withheld to ensure transferability. We extended the target-group approach to correct sampling effort bias by incorporating seasonal and activity-overlap weights and kernel density-based effort layers for background selection. Model complexity was evaluated using multiple metrics (CBI, TSS, AUC, and omission rates) and compared against null models. Final outputs include habitat suitability maps, response curves of environmental predictors, uncertainty diagnostics, and expert review.

Habitat suitability layers are rescaled and integrated into spatial conservation prioritisation using Zonation tool, allowing identification of high-value biodiversity areas and evaluation of existing protected networks. This reproducible, open-access workflow provides high-resolution decision support for conservation planning, ecosystem management, and climate adaptation strategies, and demonstrates how expert knowledge and advanced species distribution modelling practices can be combined at national scale.

FROM SUITABILITY MAPS TO PRIORITY SITES: A MULTI-SPECIES APPROACH TO BIRD CONSERVATION PLANNING

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Species distribution models (SDMs) are widely used to describe species' ecological niches and their geographic distributions and can directly support systematic conservation planning. In this work, we employed SDMs to map the distributions of 116 forest, farmland, and wetland bird species in Latvia at a fine spatial resolution of 1 ha. The focal species set comprises recognised biodiversity indicators, conservation umbrella species, and nationally red-listed or legally protected taxa.

The resulting maps were used to prioritise conservation sites across multiple species. We compiled all available bird records collected from 2017 to 2023 and retained only reliable breeding-related observations from sites that had not undergone substantial land-use or land-cover changes since the time of recording. Based on an extensive literature review, species were classified by home-range size, and environmental predictors were calculated at the site, home-range, and landscape scales.

We calibrated SDMs using maximum entropy analysis to obtain species-specific habitat suitability maps, which were subsequently combined in a weighted multi-species prioritisation framework. Species weights were derived from several criteria, including national population size, the share of the European population breeding in Latvia, recent population trends, lifetime reproductive output, extent of occurrence and area of occupancy, association with existing protected areas, and the breadth of their ecological niche. Finally, we compared single-species and multi-species prioritisation results to examine current conservation coverage, assess the performance of the existing protected area network, and reveal spatial gaps and opportunities to strengthen bird conservation planning in Latvia.

BIAS-AWARE SPECIES DISTRIBUTION MODELLING OF WILD BEES TO INFORM LAND-USE PLANNING AND ECOSYSTEM SERVICE RESILIENCE IN LATVIA

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Land-use intensification and landscape homogenization are major drivers of the decline of wild pollinators. Within the European Union, the conservation of biodiversity and the management of habitats under the Habitats Directive, the Nature Restoration Regulation and related policy frameworks require the use of spatially explicit tools to support evidence-based decision-making. However, data on the occurrence of wild bees in Latvia is scarce, heterogeneous, and spatially biased, which limits their direct application in land-use planning.

We developed nationwide species distribution models (SDM) for a range of wild bee species using maximum entropy analysis, integrating structured research data with citizen science observations. To address uneven sampling effort and spatial clustering, we implemented a bias-aware workflow utilising the target-group approach. Model tuning and validation incorporated spatially structured cross-validation and independent testing, withholding background points in both sets to enhance robustness and transferability. The results were evaluated based not only on statistical properties, but also on the ecological meaning of the response curves and the reliability of the predicted habitat suitability maps, with input from species experts.

The resulting habitat suitability maps provide a national-scale assessment of species–environment relationships and identify landscapes and features with high potential for sustaining diverse wild bee communities. By linking advanced SDM methodology with land-use analysis, this study supports the identification of priority areas for habitat management and contributes to the maintenance of pollination services. It also provides a transferable framework for integrating biodiversity modelling into conservation planning under EU habitat regulations.

NATIONAL-SCALE HIGH-RESOLUTION HABITAT SUITABILITY MODELLING OF GRASSLAND BUTTERFLIES IN LATVIA: FROM A REGIONAL INDEX TO LOCAL CONSERVATION SOLUTIONS – PRELIMINARY RESULTS

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Butterflies constitute a critically important component of natural ecosystems, providing pollination services and playing a significant role in terrestrial trophic networks. Their high sensitivity to habitat changes makes them key indicators for assessing environmental health. Since 1991, the Grassland Butterfly Index in the EU has declined by 50%, highlighting the urgent need for action under the EU Nature Restoration Regulation (2024/1991). The Regulation obliges Member States to halt pollinator decline and to ensure population recovery, with the Grassland Butterfly Index serving as one of the key indicators.

According to assessments undertaken within the LIFE for Species project, one grassland butterfly index species in Latvia is classified as Endangered and two as Near Threatened. The main reasons for the decline are habitat loss, fragmentation, and degradation associated with agricultural intensification, land-use change, and the abandonment of traditional management practices, such as grazing. These changes lead to overgrowth, landscape homogenisation, reduced structural diversity and diminished suitability for grassland specialist species.

Although the Grassland Butterfly Index provides an overall indication of national-scale trends, the spatial coverage of the underlying monitoring scheme may be insufficient. Moreover, a notable lack of research on these species in Latvia constrains the development of targeted, evidence-based conservation planning.

We present preliminary results from national-scale species distribution models developed for 11 grassland butterfly index species. Using high-resolution spatial modelling and analysing species-specific responses to environmental predictors, we can implement the index concept at a local scale. The resulting models enable the identification of priority areas for targeted management interventions, thereby facilitating the effective implementation of the EU Habitats Directive and Regulation of the Cabinet of Ministers of the Republic of Latvia No. 396, 14.11.2000. They also provide a robust scientific basis for sustainable, evidence-informed land-use planning, supporting the prevention of further degradation of high-value habitats within the Latvian landscape.

SPECIES DISTRIBUTION MODELLING AND PROJECTED HABITAT SUITABILITY FOR CRYPTOGRAMS: IMPLICATIONS FOR EU PROTECTED HABITAT CONSERVATION

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Understanding the spatial patterns and ecological requirements of cryptogams: poroid fungi, lichens, and bryophytes is critical for the effective conservation management of protected forest habitats. This study employs species distribution modelling (SDM) to identify the environmental factors influencing the occurrence cryptogams organisms across diverse landscapes. By combining occurrence data with environmental predictors (ecogeographical variables; EGVs), and advanced modelling techniques, we generate projected habitat suitability maps for each species. These maps provide insights into current distributions, highlighting regions of high conservation value and potential vulnerability of EU protected habitats.

Our approach integrates field survey data and high-resolution purpose-created EGVs to maximise model accuracy and ecological relevance. We demonstrate how projected suitability maps can be used to infer the locations of potential protected habitats and their quality and connectivity. Our results reveal distinct distributional patterns driven by microclimate, substrate-related variables, and anthropogenic pressures. Furthermore, we discuss the implications of our findings for conservation planning, emphasising the role of SDM in cumulative impact assessments and in management strategies.

This research underscores the usefulness of species distribution modelling for informing conservation decisions regarding cryptogams and their habitats. By linking projected habitat suitability to the conservation regimes and protected habitats, our study contributes to a more refined understanding of biodiversity persistence and the challenges of safeguarding natural capital in a rapidly changing world.

PRIORITISATION OF CONSERVATION AREAS FOR EU FOREST HABITATS AND THREATENED SAPROXYLIC BEETLES IN LATVIA

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The conservation status of European Union forest habitats in Latvia has been assessed as unfavorable–bad. The EU Biodiversity Strategy for 2030 and the European Green Deal set ambitious targets to improve habitat condition by expanding protected areas and enhancing habitat quality. Identifying priority areas for conservation and management is therefore essential.

Saproxylic beetles (species dependent on dead and decaying wood) are key indicators of forest ecosystem quality and continuity. According to the new Latvian Red List (Teļnovs 2025), of 117 assessed saproxylic beetle species, 44 (38%) are classified as threatened, 14 (12%) as Near Threatened, 44 (38%) as Least Concern, and 15 (12%) as Data Deficient under IUCN criteria. Ensuring habitat protection is crucial for their conservation.

To support decision-making on new protected areas and habitat management, we developed a spatial prioritization framework for EU forest habitat polygons in Latvia. The prioritization was based on equally weighted criteria: habitat area, habitat quality, distance to the nearest forest habitat, distance to habitats of different quality classes, hotspot analysis results, number of invasive species records within the polygon, inclusion within Natura 2000 sites or micro-reserves, and distance to Natura 2000 areas. Each criterion was scored from 1 to 4, and cumulative scores were used to classify polygons into four conservation priority levels: very high, high, medium, and low.

This approach identifies the most valuable areas for forest habitat conservation. However, since saproxylic beetles are closely associated with EU forest habitats, it is essential to assess whether habitat-based priority areas coincide with priority areas for threatened beetles.

To address this, we are conducting species distribution modelling for selected threatened saproxylic beetles. The results will enable spatial comparison between habitat- and species-based prioritization, supporting more integrated and effective conservation planning.

SPATIAL MODELLING OF BAND-WINGED GRASSHOPPERS AS INDICATORS FOR XERIC HABITAT QUALITY AND RESTORATION PLANNING

Rūta Starka, Ainars Auniņš, Andris Avotiņš

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Characteristic species are essential indicators for assessing the conservation status of EU-protected habitat types under Article 17 of the Habitats Directive. In Latvia, the status of xeric habitats – heathlands, open dunes and sand grasslands – is currently classified as unfavourable (U1, U2), underscoring the need for spatially explicit, evidence-based tools to identify which characteristic species are most threatened by habitat degradation, and the areas where least restoration efforts will yield the highest ecological return. We focus on two xeric-habitat indicator grasshoppers: *Psophus stridulus*, which is declining across Europe and is an endangered species in Latvia, and *Oedipoda caerulescens*, which is legally protected species characteristic to six EU habitat types. We develop high resolution species distribution models based on nationwide ecogeographical variables using maximum entropy methods that explicitly account for observation bias.

These spatial models identify local and landscape-scale features that determine habitat suitability. They reveal patterns that are indicative of fragmentation, insufficient connectivity, and the reduced long-term sustainability of heathland and dune ecosystems. Interpreting these patterns within a spatial planning context highlights priority areas where targeted management and restoration could most effectively enhance biodiversity.

We further evaluate the role of opportunistic citizen science data, emphasising its growing importance for rare species research while acknowledging uncertainties related to sampling effort and spatial coverage. This work demonstrates the importance of species distribution modelling as an operational tool for conservation planning for species lacking monitoring coverage. Our approach supports informed decision-making and strengthens the integration of biodiversity considerations into national land-use planning and management.

MULTI-SCALE, HIGH RESOLUTION TERRAIN COMPLEXITY, GEOMORPHON AND PARENT MATERIAL EFFECTS ON AGRICULTURAL LAND SOIL TAXONOMIC DIVERSITY IN LATVIA

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While soil diversity and its controlling factors have been widely discussed conceptually, quantitative, high-resolution, data-driven assessments remain scarce, particularly in Eastern Europe. Although pedodiversity is known to be closely linked to biodiversity (Rannik et al., 2016; Ferré et al., 2025), biodiversity has received considerably more research attention (Soms et al., 2017). Therefore, our aim was to quantify soil taxonomic diversity (STD) in Latvia at high spatial resolution across multiple landscape scales and to evaluate the spatially non-stationary relative influence of terrain complexity variables, geomorphons, and soil parent material on STD.

To characterise STD, we applied a moving-window approach using legacy soil mapping data and calculated five diversity indices: Shannon diversity (regular and spatially weighted), Pielou's evenness (regular and spatially weighted), and soil taxon richness. Focal window sizes ranged from 0.3×0.3 km to 9×9 km. Terrain complexity indices were derived from a digital elevation model at corresponding scales, including relative height difference, mean and median slope, terrain roughness index, vector ruggedness measure, and terrain position index. Geomorphons were calculated following Jasiewicz and Stepinski (2013). Soil parent material information was obtained from a digitised geological base map (1:200,000 scale) issued in 1997 by the State Geological Service.

To account for spatial non-stationarity and enable efficient processing of large datasets, we developed CUDA-enabled geographically weighted regression models across multiple scales and variable combinations.

Preliminary results indicate that STD is highest on slopes and in valleys at smaller landscape scales, while at broader scales higher overall values occur in upland regions compared to flatlands. The explanatory power of variable combinations varies spatially; however, classified geomorphons appear to be the most influential factor determining STD.

FROM SPECIES DISTRIBUTION MODELS TO ECOSYSTEM SERVICE POTENTIAL: A BIODIVERSITY-GROUNDED INDICATOR FRAMEWORK FOR NATIONAL-SCALE ES ASSESSMENT (Poster)

Ivo Vinogradovs, Anita Zariņa

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Ecosystem service assessments routinely use land use/land cover as the primary proxy for service supply, treating ecosystem type as a sufficient condition for service provision. This approach cannot capture variation in ecological quality within ecosystem types or connect service potential to the species-level processes that underpin it. We present a conceptual framework developed within the HiQBioDiv project (VPP-VARAM-Daba-2024/1-0002) that integrates high-resolution species distribution models and spatial prioritisation outputs into ecosystem service assessments, replacing land cover heuristics with ecologically explicit, species-validated indicators.

The framework identifies three mechanisms through which biodiversity information enters ES analysis: as a direct proxy for service potential where specific functional groups are the service providers; as an indicator of ecosystem condition where multi-species ecological integrity determines service capacity; and as a spatial constraint defining conservation priority zones in scenario analysis. All indicators operate at the level of ecosystem service potential, explicitly distinguished from realised supply or service flows.

The framework is operationalised for six CICES v5.2 classes: pollination, habitat maintenance, pest control, seed dispersal, passive observational interactions, and scientific investigation. Indicator components are defined from 300+ species distribution models across birds, bees, butterflies and other taxa, combined with 538 ecogeographical variables at 1 ha resolution covering Latvia. Zonation-based spatial prioritisation provides composite biodiversity value surfaces integrating conservation importance weights across all modelled taxa.

SPATIAL APPROACHES TOWARD SUSTAINING AGRICULTURAL PEAT SOILS AT THE RIVER-BASIN SCALE: SCENARIOS FOR THE NATURAL CAPITAL (Poster)

Annija Danenbergā

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Peat soils represent high-density natural capital within European agricultural landscapes, functioning as major carbon stock, hydrological regulators and biodiversity habitats. Despite covering only around 8% of agricultural land in Europe, drained peatlands generate nearly half of land-use-related greenhouse gas (GHG) emissions, marking these territories disproportionately important for climate mitigation and ecosystem stability. The European Green deal and the Nature Restoration Regulation prioritise peatland restoration; however, effective governance interventions require spatially explicit understanding of peat soil emission hotspots and ecosystem service trade-offs. When viewing river basins as operational planning scales, peatlands function as spatial control points linking atmosphere-biosphere dynamics, therefore necessitating ecological modelling approaches to inform land-use planning.

The study applies a mixed-method approach based on a landscape-level case study of the transboundary Venta River basin (Latvia-Lithuania). The methodological design combines systematic literature analysis for identifying assessment criteria and GIS-based spatial mapping of peat soil territorial distribution following baseline data of the LIFE OrgBalt project. Four spatially differentiated management scenarios of peat soils are modelled: (1) continuation of drainage-based agriculture; (2) adaptive reduced drainage; (3) multifunctional high-groundwater level land use management combining paludicultural production and wetland buffer integration; (4) rewetting and ecological restoration scenario.

Spatial mapping identified peatland clusters revealing spatial prioritisation opportunities within the Venta river basin that may act as high-impact carbon and water cycle regulation nodes. Rewetting scenarios showcase significant emission reduction, whilst enhancing catchment-level ecosystem service performance. Multifunctional management scenarios demonstrate potential to balance climate mitigation with wetland-type of biodiversity enrichment, whilst balancing economically viable agricultural production suitable with a high water table.

Integrating ecological modelling and spatial scenario analysis enables peat soils to be operationalised as natural capital within transboundary basin action plans. Targeted restoration of spatial emission hotspots, combined with economically feasible wetland management, supports development pathways that respect ecological limits while enabling socio-economic adaptation.

WETLAND VERTIGO SPECIES (MOLLUSCA: VERTIGINIDAE) WITH UNFAVOURABLE-BAD CONSERVATION STATUS: INSIGHTS FROM HABITAT SUITABILITY MODELS (Poster)

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Wetland conservation is an urgent global priority, as the ecological condition of wetlands continues to decline. Species with limited dispersal abilities, such as *Vertigo* snails, are particularly vulnerable to environmental changes at fine spatial scales. In Latvia, calcareous fens (EU habitat type 7230) and three of the four *Vertigo* species associated with this habitat and reported under Article 17 of the Habitats Directive currently hold an Unfavourable–Bad conservation status. Moreover, their status has shown no improvement over the past two reporting periods. Understanding species distribution patterns and identifying the environmental variables that drive habitat suitability is therefore essential for effective conservation planning.

We applied maximum entropy modelling following the workflow developed in the State Research Programs' "Development of Research Defined in the Priority Actions for Biodiversity" project "HiQBioDiv: High-resolution quantification of biodiversity for conservation and management" (No. VPP-VARAM-Daba-2024/1-0002), to develop high-resolution, nationwide habitat suitability models for two mire-specialist species – *Vertigo angustior* and *Vertigo geyeri*. Using a selection from 538 ecogeographical variables describing Latvia, we assessed species–environment relationships across multiple spatial scales, ranging from 100 m grid cells to 500 m and 1250 m radii around the center of any particular cell.

The resulting models delineate areas of high conservation importance for both species and reveal key environmental gradients influencing habitat suitability. These findings provide spatially explicit guidance for targeted habitat management, including restoration and maintenance of favourable conditions for specialist *Vertigo* species within calcareous fens. The modelling framework also offers a replicable approach for assessing habitat suitability for other small, low-mobility wetland invertebrates of conservation concern.

MODELLLED HABITAT SUITABILITY OF RHINANTHUS SPECIES FOR GRASSLAND HABITAT RESTORATION (Poster)

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Rhinanthus spp. are widely used as “ecosystem engineers” in grassland restoration because they suppress competitive grasses and promote plant diversity. In Eastern Europe, restoration often relies on locally collected seed and opportunistic target sites; therefore, information on where habitat suitability is highest can support efficient donor-site selection and targeted sowing. We modelled habitat suitability for two common hemiparasites, *Rhinanthus minor* and *R. serotinus*, and compared the resulting models to inform restoration planning.

We built MaxEnt species distribution models using a set of ~500 ecogeographical variables. Species occurrences were filtered to observations since 2016, excluding obvious location errors and duplicate records within 1 ha analysis grid cells. This resulted in 1,969 occurrences for *R. minor* (from 2,105 initial records) and 176 occurrences for *R. serotinus* (from 185). Due to identification difficulties, we also built an additional model pooling observations of both species to provide a broader perspective on *Rhinanthus* habitat suitability. Models were developed following the workflow of the HiQBioDiv project (High-resolution quantification of biodiversity for conservation and management; No. VPP-VARAM-Daba-2024/1-0002), funded by the Ministry of Smart Administration and Regional Development under the State Research Programme “Development of Research Defined in the Priority Actions for Biodiversity”. The workflow included a spatially independent test set and the withholding of background points during model evaluation. The species differed markedly in spatial predictions, indicating a broader predicted suitable area for *R. minor* than for *R. serotinus*: at the “maximum test sensitivity plus specificity” threshold, the fractional predicted area was 0.244 for *R. minor* versus 0.167 for *R. serotinus*. Test omission rates were consistently lower for *R. serotinus* across common threshold rules, suggesting sharper discrimination despite a more spatially restricted suitability pattern; nonetheless, both models showed acceptable discriminatory performance.

Overall, *R. minor* appears to have suitable habitats across a wider range of landscapes, while *R. serotinus* shows a narrower, more selective suitability signal. These contrasts can guide restoration actions. *R. minor* may be appropriate for broad-scale sowing opportunities, whereas *R. serotinus* may benefit from more targeted site selection where predicted suitability is the highest.

WHERE THE SAND MEETS THE WATER: HABITAT SUITABILITY OF *ARCTOSA CINEREA* ALONG MARINE AND RIVER SHORES (Poster)

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The northern bear spider *Arctosa cinerea* is a legally protected and near-threatened spider species in Latvia, characteristic of open embryonal and grey dune habitats. Historical records, together with a recent observation from a sandy bank of the River Gauja in the protected landscape area “Ziemeļgauja”, suggest that large sandy river shores may be an under-recognised but suitable habitat for this species. The national Red List assessment also highlights the need for systematic research on the species’ distribution and habitat requirements.

Following the workflow developed in the State Research Program’s “Development of Research Defined in the Priority Actions for Biodiversity” project “HiQBioDiv: High-resolution quantification of biodiversity for conservation and management” (No. VPP-VARAM-Daba-2024/1-0002), we developed a preliminary habitat suitability model based on 23 expert-verified occurrences recorded between 2016 and 2024. As the observations originated from opportunistic, non-systematic sources – primarily citizen-science platforms – we corrected for sampling bias using the target-group method, incorporating all non-synanthropic spider observations from the same period. We applied an exploratory variable-selection approach to evaluate species – environment relationships across multiple spatial scales: 100 m (analysis cell), 500 m (home-range) and 1250 m (dispersal radius).

The resulting habitat suitability map indicates a strong association with marine and large river coastal systems. Despite limited occurrence data, but with clear knowledge on species ecology guiding the choice of ecogeographical variable selection, model performance demonstrates that species distribution modelling is a valuable tool for studying rare and protected species lacking structured monitoring schemes. Our results substantially improve current knowledge of the potential distribution of *A. cinerea* and the environmental factors shaping it. The habitat suitability map provides a spatial basis for targeted field surveys and future conservation planning, contributing to a better understanding of this shoreline-associated species’ ecology.

8.7. sekcija. **INOVATĪVIE UN LIETIŠĶIE PĒTĪJUMI
BIOLOĢIJĀ /**

**INNOVATIVE AND APPLIED
RESEARCH IN BIOLOGY**

RADIOECOLOGICAL STATE OF FISH POPULATIONS IN THE CHORNOBYL EXCLUSION ZONE: CURRENT LEVELS OF RADIONUCLIDE CONTAMINATION AND ABSORBED DOSE RATE ASSESSMENT

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The activity concentrations of Sr-90 and Cs-137 data and absorbed dose rate in fish inhabiting the water bodies of the Chornobyl Exclusion Zone (CEZ) over the period 2020–2025 are presented herein. The studies were carried out in lakes of western and northwestern radioactive traces that are most contaminated with radionuclides – Azbuchin, Vershina, Glyboke, Yanovsky Backwater, as well as in various parts of the Chernobyl NPP cooling pond (CP) and the Pripjat River (nearby Chornobyl city). The highest levels of the activity concentration (AC) of the main dose-forming radionuclides were noted for fish from lakes Azbuchin, Vershina and Glyboke: Sr-90 – on average 16350; Cs-137 – 45670 Bq/kg. In the Yanovsky Backwater, the concentration of Sr-90 and Cs-137 in fish was, respectively, 1510 and 1254 Bq/kg. In the CP, the AC of Sr-90 and Cs-137 was, respectively, (134) and 2729 Bq/kg. The lowest concentration of radionuclides, among the studied water bodies, was noted for fish from the Pripjat River within the CEZ: Sr-90 – 35 and Cs-137 – 70 Bq/kg. The AC of Sr-90 in prey fish of the stagnant water bodies of the CEZ was 1.6–1.8 times higher than in predatory species, while Cs-137 was 2.4–2.8 times lower. Among the studied fish of the CEZ, the highest concentration of Sr-90 was noted for the common rudd and Prussian carp. Different fish species in descending order of average AC of Sr-90 in the CEZ water bodies form the following series: Prussian carp > common rudd > roach > tench > bream > bleak > asp > perch > pike > pike-perch > wels catfish, and in descending order of Cs-137 – perch > pike-perch > pike > asp > wels catfish > bleak > rudd > Prussian carp > roach > bream. The highest dose rates in the water bodies of the CEZ were observed in benthic fish species, including tench, Prussian carp, and European wels catfish, whereas the lowest dose rates were recorded in pelagic species such as bleak and sabrefish. Among the investigated water bodies, the greatest absorbed dose rates were registered in Lakes Vershina, Glubokoe, and Azbuchin for tench (50.2–118.5 µGy/h) and Prussian carp (30.8–101.7 µGy/h). In contrast, absorbed dose rates for fish inhabiting the Yanovsky backwater and the CP ranged from 2.35–17.58 and 6.18–32.43 µGy/h, respectively. Ichthyofauna from the channel section of the Pripjat River exhibited substantially lower dose rates, within the range of 0.06–0.12 µGy/h.

Keywords: radioactive traces; Sr-90 bioaccumulation; Cs-137; ichthyofauna, Yanovsky Backwater, Pripjat River

Acknowledgements: This study was supported by the Latvian Council of Science and Ministry of Science and Education of Ukraine in frame of the Joint Latvian-Ukrainian Project (No. M/09-2025).

THE POSSIBLE IMPACT OF CHRONIC IONIZING RADIATION ON GENETIC DIVERSITY OF EUROPEAN PERCH (*PERCA FLUVIATILIS*) AND ROACH (*RUTILUS RUTILUS*) POPULATIONS FROM CHERNOBYL EXCLUSION ZONE AND LATVIA

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The abundant freshwater fish species could be used as a valuable model organism to study different factors of natural and anthropogenic origin by tracking changes of intraspecific genetic diversity. Comparison of the parameters of genetic diversity while studying populations exposed to varying levels of ionizing radiation provides a framework for investigating fundamental evolutionary processes. Ionizing radiation may increase mutation rates and generate novel genetic variation, while simultaneously acting as a selective pressure or reducing population size, thereby influencing genetic drift and overall genetic diversity (Goodman et al., 2022). Although genetic studies in the Chernobyl Exclusion Zone remain limited, available evidence suggests elevated genetic damage and reduced population densities across multiple taxa inhabiting highly contaminated areas (Mousseau et al., 2014).

In this study, we assess genetic diversity and population structure in two freshwater fish species, European perch (*Perca fluviatilis*) and roach (*Rutilus rutilus*), sampled from water bodies within the Chernobyl Exclusion Zone (Ukraine) representing contaminated by radionuclides populations. The intact fish samples collected in different lakes and rivers in Latvia represent control populations. A total of 130 perch and 57 roach specimens from contaminated areas were analyzed alongside 67 perch and 24 roach individuals collected from Latvian freshwater systems, with additional control roach samples from the Ros River (Ukraine). Total genomic DNA was extracted from muscle samples using a modified salting-out protocol described by Aljanabi and Martinez (1997). Genetic variation was evaluated through mitochondrial D-loop and ATP6 gene sequencing in combination with nuclear retrotransposon-based iPBS markers (2080, 2081, 2239), providing complementary insights into haplotype diversity and potential radiation-associated genomic structural variation. Preliminary phylogenetic analysis of mitochondrial haplotypes distributed fish haplotypes among two moderately supported clades (bootstrap 68–72), showing partial geographic clustering between Latvian and Ukrainian perch populations. The first results based on genetic markers used in the current study revealed the potential to determine whether long-term environmental radiation is associated with detectable changes in genetic diversity and population differentiation in natural fish populations.

Keywords: Chronic ionizing radiation, fish genetic diversity, population structure, Chernobyl Exclusion Zone.

Acknowledgements: This work is funded from Latvian-Ukrainian Joint Programme of Scientific and Technological Cooperation (contract number LV-UA 2025/11) entitled “Assessment of the impact of radio-contamination on perch and roach genomes based on sensitive genetic markers”.

GENETIC DIVERSITY OF *SALMO TRUTTA* SUBSPECIES IN THREE LITHUANIAN RIVERS

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Salmo trutta is a polymorphic fish species naturally found in Europe. In Lithuanian rivers, there are anadromic (sea trout, *Salmo trutta trutta*) and sedentary (brown trout, *Salmo trutta fario*) forms, which have morphological differences between adults. However, 0+ juveniles do not exhibit such differences in appearance until smoltification process begins in sea trout juveniles (ages 2+ – 3+) while they are migrating towards the sea.

Both subspecies are part of fish restocking programs in Lithuania, where thousands of fry, parr or smolts (sea trout that have undergone smoltification) are released into rivers each year. These juveniles or smolts have been grown in local fisheries from fertilized eggs which were obtained from wild reproducers caught in spawning grounds. Therefore, unnaturally maintained population may have low genetic diversity, even though the number of individuals released may be high. The aim of this study was to analyze intraspecific genetic diversity and determine whether it is possible to distinguish parr by subspecies using molecular methods.

A total of 106 0+ juvenile sea trout and brown trout specimens was collected from Mera and Vokė rivers in 2025 and from Žalesa river in 2023. To analyse genetic diversity, DNA was extracted using Aljanabi and Martinez methodology and 2 mitochondrial DNA (D loop and ATP6) regions were amplified using polymerase chain reaction (PCR) technique. Then, electrophoresis in an agarose gel was performed to check for correct PCR product length. Amplified DNA was sequenced by Sanger method and obtained sequences were analysed in MEGA and Network programs.

For comparison, sea and brown trout reference sequences from NCBI database (NC_010007.1, NC_024032.1, respectively) were used. In addition to these, sequences obtained from dried fins of 14 adult fish from both subspecies of Žalesa river were analysed. So far, the findings revealed low genetic diversity within studied fish samples that does not allow to discriminate different *Salmo trutta* subspecies. The gene flow between river fish populations is also suggested. The additional genetic markers were designed based on genotyping data of *Salmo trutta* and currently the informativity of molecular data that will make discrimination of brown and sea trout juvenile forms undoubted is tested.

Keywords: mitochondrial haplotypes; population connectivity; juvenile identification; genetic monitoring

THE INTRASPECIFIC GENETIC DIVERSITY OF EURASIAN WOODCOCK (*SCOLOPAX RUSTICOLA*) USING MITOCHONDRIAL DNA CONTROL REGION SEQUENCES

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Genetic diversity at the molecular level provides essential insights into population structure, evolutionary history, and connectivity among populations. In this study, the intraspecific genetic diversity and population structure of the Eurasian woodcock (*Scolopax rusticola*) were investigated using mitochondrial DNA markers. A total of 92 individuals sampled in Spain and Lithuania were analyzed, representing breeding, migratory, and wintering populations.

Mitochondrial DNA control region and cytochrome b sequences were selected as genetic markers due to their differing evolutionary rates. DNA was extracted from heart and liver tissue samples and amplified using the polymerase chain reaction. In addition to previously established primers, newly designed and tested primer pairs targeting the mitochondrial control region were evaluated for their suitability and amplification efficiency in Eurasian woodcock. Amplified fragments were sequenced and analyzed using standard molecular and bioinformatic approaches, including sequence alignment and haplotype network reconstruction.

The analyses revealed the presence of two distinct haplogroups across the studied samples, indicating detectable intraspecific genetic structuring. The mitochondrial control region showed high variability and proved to be particularly informative for assessing genetic diversity and haplotype relationships. The successful application and evaluation of control region primers highlight their potential for future population genetic and migratory studies of *Scolopax rusticola*. These findings contribute to a better understanding of Eurasian woodcock population structure across different geographic and migratory contexts and provide a methodological basis for further genetic research on this species.

Keywords: haplotype diversity; mitochondrial markers; population genetic

STABLE ISOTOPES REVEAL LOW PREVALENCE OF MOULT MIGRATION OF COMMON STARLINGS (*STURNUS VULGARIS*) IN THE BALTIC

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Moult strategies, particularly the timing and location of feather replacement, can vary substantially within bird species. Yet the prevalence of moult migration, defined as the temporary movement to a secondary site to replace feathers before continuing migration, remains unclear in many populations. Using stable hydrogen ($\delta^2\text{H}$) and sulphur ($\delta^{34}\text{S}$) isotopes in feathers of Common Starlings breeding in Latvia, we show that moult migration is rare in this short-distance migrant. Most individuals (86.2%) moulted near their breeding grounds, while only a small proportion (4.5%) moved to alternative moulting sites. A further 9.2% were unassigned, meaning their isotope values could not be confidently linked to either known moulting region. Combining $\delta^2\text{H}$ and $\delta^{34}\text{S}$ provided strong discrimination between moulting regions, and isotope-based classifications were supported by tracking data. Moult strategies were consistent across age groups and years. Our results demonstrate that integrating $\delta^2\text{H}$ and $\delta^{34}\text{S}$ effectively resolves fine-scale variation in moult behaviour and highlight the growing value of $\delta^{34}\text{S}$ as a tracer in avian movement ecology.

Keywords: geolocator tracking, moult strategies, feather replacement

INVOLVEMENT OF VOLUNTEERS AND SCHOOLS IN RESEARCH OF COMMON STARLING (*STURNUS VULGARIS*) IN LATVIA STEPS FROM CITIZEN TO FUNDAMENTAL SCIENCE

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We used action of the bird of the year 2025 in Latvia – the Common Starling (*Sturnus vulgaris*) to raise public awareness of citizen science research in schools and volunteers of the Latvian Ornithological society. Starling nest-box plots were created in 13 localities in Latvia, 6 of those include schools or teenage birdwatchers as care-takers and gathered data on phenology and breeding demography of Starling in 2025. We also analysed data gathering in open call by the “Calendar of Nature and History” (*Dabas un Vēstures kalendārs*, in Latvian) or the period of 1971–2013. The recognition among other phenological events for first starling observation in spring were very high (92,4% on average), but overall observer activity dropped considerably from 1971 to 2013. The Common Starling has also been selected as one of the nest-box monitoring species by the Latvian Ornithological Society in the 1980s (Čauns, 1987). Some of today’s professional ornithologists have started their career as teenage observers in that program.

Keywords: citizen science; volunteer engagement, nest-box monitoring, long-term datasets

ASSESSING THE DIVERSITY PATTERNS OFF MARINE COASTAL BUILDING VERMETIDS ACROSS CYPRUS' COAST, BASED ON GENETIC DATA

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Marine coastal ecosystems of the eastern Mediterranean represent biodiversity hotspots that provide critical ecological services, including habitat complexity, nutrient cycling, and coastal protection. Sessile gastropods of the family Vermetidae, particularly the genus *Vermetus*, act as ecosystem engineers by forming reef-like bioconstructions through the aggregation of calcareous tubes. These vermetid reefs enhance habitat complexity, provide shelter for associated fauna, and contribute to the stabilization of rocky shores. Despite their ecological importance, the genetic diversity of *Vermetus* species in Cyprus remains poorly studied, limiting our understanding of their distribution, and potential as biological indicators for sustainable coastal management. This study aimed to characterize the genetic diversity of *Vermetus* populations along the Cypriot coastline. Sampling was conducted across multiple rocky shore sites representing a gradient of environmental conditions, including differences in wave exposure and substrate type. Genetic diversity was evaluated using mitochondrial (16s, COI) and nuclear (ITS) markers, through phylogenetic reconstructions and calculated genetic divergence metrics. Genetic analyses reveal distinct clusters among sampled individuals, suggesting potential cryptic diversity and some level of site-specific differentiation. Genetic variation appears to be influenced by local environmental conditions, including substrate type and hydrodynamic exposure, highlighting the interaction between ecological factors and population structure. Observations also suggest that more structurally complex reefs harbor higher abundances of associated fauna, supporting the role of *Vermetus* as ecosystem engineers.

Overall, these findings provide a study of the genetic diversity of *Vermetus* in Cyprus, emphasizing their ecological significance in coastal ecosystems. The observed variation underscores the importance of local environmental conditions in shaping reef structure and population resilience. These results establish a baseline for future monitoring and highlight the potential of vermetid reefs as biological indicators for sustainable management and conservation of Mediterranean rocky shore habitats.

Keywords: genetic diversity, vermetid reefs, population structure, Mediterranean rocky shores

PREVALENCE OF *SARCOCYSTIS* SPP. IN THE BLOOD OF YELLOW-NECKED MOUSE AND COMMON VOLE FROM LITHUANIA

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Rodents represent the most species-rich order of animals worldwide. Their high diversity as intermediate hosts corresponds to a large number of *Sarcocystis* spp. that use them in their life cycles. Currently, over 40 *Sarcocystis* species are known to use rodents as intermediate hosts and snakes, birds or carnivorous mammals as definitive hosts (Dubey et.al, 2015). However, there is a significant lack of data on *Sarcocystis* spp. prevalence in wild rodents worldwide. One reason may be attributed to methodology: traditional *Sarcocystis* research relies on relatively large tissue samples, which are difficult to obtain from small-bodied rodents. Another one is typically low prevalence of *Sarcocystis* spp., meaning that scientifically robust studies require large sample sizes, which are both time and labour intensive. In recent years, several authors have proposed conducting PCR analysis using blood samples from intermediate hosts (Martin et al., 2016; Moustafa et al., 2017).

As such, the objective of our work was to evaluate the presence of *Sarcocystis* spp. and to molecularly identify parasite species in the blood samples of yellow necked mouse (*Apodemus flavicollis*) and common vole (*Clethrionomys glareolus*) from Lithuania. A total of 357 blood samples were analysed using nested PCR targeting *cox1* and 28S rRNA, followed by Sanger sequencing of positive samples. *Sarcocystis* spp. were statistically ($p < 0.01$) more frequently detected in the bank vole (6.3%) than in yellow-necked mice (0.9%). Common voles were positive for *S. funereus*, *S. glareoli* and *S. myodes*. Meanwhile, only *S. myodes* was detected in yellow necked mice. Presence of the parasite was observed in samples collected from four different habitats: arable land, bog, natural meadow and deciduous forest.

These findings are important for understanding *Sarcocystis* spp. prevalence and species richness in the wild rodents, as well as for developing molecular identification methods for *Sarcocystis* parasites in live animals and those with low body mass.

Keywords: *Sarcocystis*, blood, rodents, *cox1*, 28S rRNA.

PRELIMINARY STUDY ON THE ENVIRONMENTAL OCCURRENCE OF *TOXOCARA CANIS* EGGS IN SOIL AND SAND SAMPLES FROM LITHUANIA

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Toxocara canis are globally distributed zoonotic roundworm of major veterinary and public health importance, posing a risk to dogs, other canids, and humans. Domestic and wild canids act as definitive hosts, shedding environmentally resistant eggs that can persist in soil, sand, and water for prolonged periods. Soil represents the principal reservoir of infective embryonated eggs, particularly in areas with high densities of carnivores, increasing the risk of transmission to animals and accidental infection in humans.

Twenty-four soil samples were collected in autumn 2025 from urban parks in Druskininkai, Kaunas, Molėtai, and Vilnius. In addition, 17 sand samples were obtained from various districts of Vilnius, including public recreational areas, using a standardized sampling methodology. Samples were dried for 48 hours and subsequently mixed with a Tween 80 solution to facilitate the separation of *T. canis* eggs. The prevalence of roundworm infection was determined using Sheather's sugar flotation technique and examined under a light microscope (LM). The detected eggs were morphologically characterized and subsequently subjected to DNA extraction. Further molecular analysis was performed by amplifying and analyzing the internal transcribed spacer regions (ITS1-ITS2) to enable species-level identification of *Toxocara*. Under LM, *T. canis* eggs were detected in a single soil sample (2.4%) collected from Vingis Park in Vilnius. Eggs of *T. canis* detected in the sand samples were measured and found to be 75 µm × 60 µm in size. Whereas the investigated roundworm was not detected using molecular methods. The results suggest that additional genetic targets should be included and that PCR protocols require further optimization.

These findings represent the initial phase of the research project funded by the Research Council of Lithuania (LMT, project No. S-MIP-25-45). Future stages will include seasonal sampling (winter, spring, summer, and autumn) over four years to assess temporal dynamics of environmental contamination.

Keywords: environmental contamination; soil-transmitted helminths; zoonotic parasites; microscopy; molecular diagnostics

DETECTION OF TICK-BORNE BACTERIA IN AMERICAN MINK (*NEOGALE VISON*) IN LITHUANIA

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The American mink (*Neogale vison*, formerly known as *Neovison vison*), a non-native species originally from North America, has successfully established wild populations across Europe, largely displacing the native European mink (*Mustela lutreola*). Assessing the presence of zoonotic pathogens in invasive populations provides valuable insight into their potential role in the maintenance and transmission of diseases affecting humans and domestic animals (Paulauskas et al., 2025; Bonesi & Palazon, 2007).

A total of 61 American mink spleen samples collected from different regions of Lithuania were analyzed. Genomic DNA was extracted and screened using duplex and triplex real-time PCR assays targeting *Rickettsia* spp., *Borrelia* spp., *Bartonella* spp., *Anaplasma* spp., and *Candidatus Neoehrlichia mikurensis*. Samples positive by real-time PCR were further analyzed using nested PCR targeting the 16S rRNA, groESL, and msp4 gene fragments, followed by agarose gel electrophoresis and sequencing. Phylogenetic analysis was performed using MEGA software and comparison with GenBank database sequences.

Real-time PCR screening detected *Anaplasma* spp. DNA. Nested PCR and sequencing confirmed the presence of *Ehrlichia muris* in one sample, corresponding to a prevalence of approximately 1.6%. Phylogenetic analysis showed clustering with strains previously identified in rodents and ticks in Europe, suggesting ecological linkage between small mammal reservoirs and mink exposure through tick vectors or predation.

These findings indicate that invasive American mink populations may act as potential hosts of tick-borne bacteria. Understanding these dynamics is important for developing One Health surveillance strategies aimed at monitoring pathogen circulation and mitigating the impacts of invasive species on public health and native biodiversity.

Keywords: Lithuania, *Neovison vison*, *Ehrlichia muris*, tick-borne bacteria

MOLECULAR DETECTION OF *BARTONELLA* SPP. AND *RICKETTSIA* SPP. IN *CTENOCEPHALIDES FELIS*

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Ctenocephalides felis, commonly known as the cat flea, is a widely distributed flea species and a recognized reservoir of zoonotic pathogens, including *Bartonella* spp. and *Rickettsia* spp., which pose potential risks to animal and human health. However, information on the circulation of these pathogens in cat flea populations from certain regions remains limited. The aim of this study was to detect the presence of *Bartonella* spp. and *Rickettsia* spp. in *C. felis* and to evaluate their occurrence in the context of previously published data. Fleas were collected from domestic cats in Algeria and Spain by veterinary practitioners. Morphological identification confirmed the presence of *C. felis*, as well as *Ctenocephalides canis*. DNA was extracted from each specimen using a 2.5% ammonium hydroxide. Real-time PCR assays targeting the *ssrA* gene for *Bartonella* spp. and the *gltA* gene for *Rickettsia* spp. were performed. Molecular analysis revealed the presence of both pathogens in *C. felis* specimens. *Bartonella* spp. were detected in 18.2% of the analyzed samples, while *Rickettsia* spp. were identified in 9.1%. Coinfection with both pathogens was observed in 9.1% of the specimens. These findings are consistent with previous reports demonstrating the circulation of *Bartonella* and *Rickettsia* species in cat flea populations and further support the role of *C. felis* as a potential vector of zoonotic pathogens. Although based on a limited sample size, this study underscores the importance of continued molecular surveillance of ectoparasites to better understand pathogen dynamics and associated public health risks.

Keywords: vector-borne pathogens; ectoparasites; zoonotic risk; coinfection; health risks

INFLUENCE OF INTRACELLULAR MOLECULE ENRICHED DIFFERENT PULSING MEDIA ON CELLULAR SURVIVAL AFTER ELECTROPORATION

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Electroporation is a well-known technique for delivering molecules into cells; however, the post-electroporation effect on cell survival remains a major limiting factor (Neumann et al., 1982). It is known that factors such as pulse parameters are critical influencers of membrane permeabilization, though the influence of the surrounding pulsing medium, particularly after membrane disruption, requires further investigation. To fulfil this, our study examined how the composition of electroporation buffers and the resulting post-pulse supernatant affect cellular recovery (Rajeckaitė et al., 2018; Jakstys et al., 2020).

Chinese hamster ovary (CHO) cells were electroporated in three different pulsing solutions: a conventional electroporation medium, a HEPES-based buffer, and a HEPES buffer supplemented with calcium ions. After the pulse application at varying field strengths, cells were either transferred to fresh culture medium or maintained in the corresponding electroporation supernatant. And the cell survival was measured 24 hours post-treatment using flow cytometry and MTS metabolic assays.

The observed results suggest that the exposure to supernatant derived from the standard electroporation medium resulted in enhanced cell viability, particularly at higher electric field intensities. In contrast, cells maintained in supernatants from HEPES-based buffers with or without calcium supplementation have reduced survival compared to cells placed in fresh medium. These observations indicate that pulsing buffer composition significantly influences post-electroporation cellular recovery to an extent (Rajeckaitė et al., 2018; Jakstys et al., 2020).

Overall, the findings underscore the importance of optimizing not only pulse parameters but also buffer formulation to improve cell survival following electroporation. Ongoing investigations are focused on correlating these effects with gene transfer efficiency and examining associated morphological changes to refine electroporation-based delivery strategies.

Keywords: Chinese hamster ovary (CHO) cells, pulsing media composition; cell viability, post-electroporation cellular recovery

SUBSTRATE MOISTURE AND NUTRIENT SUPPLY EFFECTS ON CLOUDBERRY PROPAGATION

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Propagation is an important step in the commercial cultivation of cloudberry (*Rubus chamaemorus* L.), as seedling development determines the quality of planting material. Optimizing nutrient supply and growing conditions during propagation can improve plant growth; however, information about the effects of different substrates on cloudberry remains scarce. This study assessed the effects of substrate composition and moisture level on the development of the cloudberry cultivar 'Nyby' during propagation. Rhizome cuttings were planted in spring 2025 in a total of 240 pots. A two-factor experimental design with twelve treatment combinations was applied: three substrate types and four moisture levels (50%, 65%, 80%, and 95%). Substrates consisted of unfertilized milled peat (K) and fertilized seedling substrate (F) mixed in different ratios: K (100% peat), KF1 (2:1, K:F), and KF2 (1:1, K:F). Seedlings were grown for one season under partly controlled conditions. At the end of the growing season, nutrient status and growth parameters were assessed. Higher moisture levels (95%) resulted in significantly increased Ca and Mg concentrations, likely due to the mineral content of calcareous (hard) tap water, but reduced N content, likely due to nutrient leaching. Fertilized substrates at 95% moisture showed a slight reduction in growth parameters and nutrient status. Fertilized peat substrates, particularly KF1, in combination with 80% substrate moisture, performed better than other treatment combinations in terms of nutrient availability, as additional nutrients significantly improved new rhizome and winter bud formation, an important characteristic for planting material selection. Based on these results, we recommend: 1) filtered water to maintain stable (acidic) substrate pH level, 2) moisture levels between 80% and 95% to support proper rhizome development. The higher peat density in fertilized treatments, combined with excessive moisture, may reduce oxygen availability and increase the risk of rhizome rot.

Keywords: peat substrate, Nyby, nutrient analysis, rhizome propagation

Acknowledgements. The study was supported by the European Agricultural Fund for Rural Development under the project 'Development of cloudberry propagation and cultivation technologies for recultivation of peat bogs by establishing commercial plantations' Nr. 24-00-COLA1602-000003.

USE OF BIOSTIMULANTS AS CULTURAL MEASURES FOR WEED CONTROL

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The transition toward more sustainable crop production systems has increased interest in non-chemical weed management strategies. Within both, Organic (OWM) and Integrated Weed Management (IWM), cultural measures that enhance crop competitiveness are particularly important. Biostimulants – defined as substances or microorganisms that stimulate natural plant processes independently of nutrient content – represent a promising complementary tool.

Biostimulants such as beneficial microorganisms (e.g., *Trichoderma spp.*) can enhance early crop establishment, root development, nutrient-use efficiency, and tolerance to abiotic stress. Improved crop vigor promotes faster canopy closure and greater biomass accumulation, thereby reducing light, water, and nutrient availability for weeds. Although biostimulants do not exert direct herbicidal effects, their integration with optimized sowing density, crop rotation, cover cropping, and mechanical control can strengthen crop competitive ability and reduce herbicide reliance. Their role is particularly relevant in agroecological systems aiming to increase resilience and ecosystem services. The aim of our study was to evaluate the effectiveness of preparations containing microorganisms in controlling weeds in winter rye sowing, in combination with agronomic techniques (single harrowing and “false sowing”). Trials were conducted in the organic crop rotation of the Institute of Agrosources and Economics in winter rye ‘Kaupo’. The study was conducted within the framework of the Horizon Europe project “AGROECOLOGY for Weeds” (GOOD*). *<https://www.goodhorizon.eu/>

Keywords: weed management, winter rye, agriculture

FROST DAMAGES MITIGATION WITH BIOPROTECTIVE *PSEUDOMONAS* SP. ENVIRONMENTAL ISOLATES

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Bacteria of the genus *Pseudomonas* are widely distributed in environmental and plant-associated habitats and are known to influence freezing processes through interactions with water and ice nucleation mechanisms. Certain species, particularly *Pseudomonas syringae*, produce ice nucleation proteins that promote ice formation at relatively high subzero temperatures (–2 to –5°C), contributing to frost damage in plants. These proteins, encoded by *ina* genes, promote heterogeneous ice nucleation by organizing water molecules into ice-like structures (Green & Warren, 1985; Warren, 1995). Due to this property, ice nucleation-active bacteria are recognized as important contributors to frost damage in agricultural systems. In contrast, some environmental and cold-adapted bacteria e.g. *P. fluorescens*, produce extracellular compounds that alter ice crystal formation or inhibit ice recrystallization, thereby enhancing survival under freezing conditions (Raymond & Fritsen, 2001). The identification of bacterial strains capable of reducing ice nucleation or enhancing resistance to freezing is of significant interest for the development of biological frost mitigation strategies in agriculture.

In this study locally isolated *Pseudomonas* (P1L, P3, P4L, P7 and P11) strains have been evaluated and compared their freezing related properties with reference strains of *P. fluorescens* and *P. syringae* compared. Differences in freezing behaviour were observed between strains and sample types, particularly between bacterial suspensions and cell-free supernatants. Local isolates demonstrated reduced ice nucleation activity compared to reference strains, and their supernatants exhibited greater resistance to freezing. These findings suggest that extracellular compounds produced by local isolates may suppress or delay ice nucleation, thereby contributing to enhanced cold tolerance (Raymond & Fritsen, 2001). In contrast, reference strains, particularly *P. syringae*, showed higher freezing frequencies consistent with their well-documented ice nucleation activity and role in frost injury. It has been found that several isolates produced detectable levels of indole-3-acetic acid (IAA) – a phytohormone commonly synthesized by plant-associated *Pseudomonas* spp. (Patten & Glick, 2002). Microbial IAA production is associated with modulation of plant growth and stress responses, including adaptation to environmental stress conditions. The observed metabolic activity confirms the plant protection -associated potential of the assessed strains and supports their ecological relevance under cold stress.

The results demonstrate that locally isolated *Pseudomonas* strains possess characteristics consistent with enhanced resistance to freezing, particularly through extracellular mechanisms. These findings suggest that environmental *Pseudomonas* isolates may represent promising candidates for biological frost protection applications in sustainable agriculture.

Keywords: *Pseudomonas*, frost protection, ice nucleation activity, cold tolerance

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INITIAL COMPARATIVE RESEARCH OF EURASIAN PERCH (*PERCA FLUVIATILIS*) POPULATIONS IN LATVIA AND UKRAINE USING MTDNA ATP6-D-LOOP MARKER (Poster)

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Unintentional environmental changes caused by direct anthropogenic activities such as Chernobyl disaster in 1986 or still ongoing war in Ukraine that started a few years ago greatly affect surrounding biodiversity for decades. Before any large-scale comprehensive comparative research of currently existing genetic diversity of life systems found within distinct geographic regions, it is beneficial to collect at least some important information about their previous generations. This initial study aims to investigate the intraspecific genetic diversity of one decade ago collected specimens belonging to selected Eurasian perch populations from Latvia and Ukraine by combining two mtDNA genetic markers, such as ATP6 and D-loop regions, to one dataset (ATP6-D-loop). In total, ~951 bp length sequence analysis was carried out using 68 perch individuals from Latvia (Lake Babites, Lake Kālezers, Lake Sventes and Lake Cirišu) and 8 from Ukraine (Chernobyl and Desna River). Then MP-MJ mtDNA ATP6-D-loop haplotype networks were constructed using all newly determined sequences together with previously obtained (un)published (by our laboratory and available at GenBank) data regarding different haplotypes of ATP6 and D-loop regions. Haplotypes were grouped into haplogroups and superhaplogroups based on higher number of mutational steps between nearest haplotypes, median vectors, star-like structures and mutation type (transition, transversion or 1–2 bp InDels). Haplotypes were (re)named based on their positions in 2 separate ATP6 and D-loop haplotype networks using previously established naming systems for each marker, while new H X (haplotype of ATP6 region) Y (haplotype of D-loop region) system was established to combine all available data in the final ATP6-D-loop network. This network contained 46 transitions, 26 transversions, 9 InDels and 3 hypothetical sequences. Overall, network was portrayed by 57 different haplotypes grouped to distinct 20 haplogroups that belong to 5 superhaplogroups. One studied individual from Chernobyl failed to show any important differences of Chernobyl zone from other more natural regions, as it had a haplotype HCC which was also found in Desna River (Ukraine), as well in Latvia and Lithuania. Whereas 7 individuals from Desna River displayed a variety of haplotypes (HAB, HBC, HCC, HCD) and unique haplotype HD1S, which represent distinct superhaplogroup E, found exclusively in this location. Presented study revealed a glimpse of pre-war situation of perch mtDNA ATP6-D-loop diversity in Ukraine and Latvia and contributes as a steppingstone towards more comprehensive comparative research of perch genetics involving specimens collected in the Chernobyl zone and non-affected by consequences of war Latvian populations.

Keywords: haplotype diversity; population genetics; intraspecific variation; mutation

MITOCHONDRIAL PHYLOGEOGRAPHY OF THE EUROPEAN PINE MARTEN (*MARTES MARTES*) WITH EMPHASIS ON THE BALTIC REGION (Poster)

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The European pine marten (*Martes martes*) is a common carnivore found throughout continental Eurasia, ranging from Western Europe to the western regions of Siberia (Proulx et al., 2004). Despite its broad range, the phylogeographic position of populations from the Baltic region remains insufficiently characterized. Given the limited genetic data from the Baltic region (Ruiz-González et al., 2013), it remains unclear whether populations from Lithuania and Latvia exhibit distinct geographic structuring or represent a contact zone between broader European lineages. To address this gap, a phylogeographic analysis was conducted using a 658 bp fragment of mitochondrial DNA (mtDNA), incorporating sequences from Baltic populations together with comparative data from across Europe. Phylogenetic reconstruction and haplotype network analyses demonstrated that individuals from Lithuania and Latvia are embedded within the broader *M. martes* clade and do not form a separate, geographically isolated cluster. Instead, Baltic haplotypes are distributed across several branches of the network and are closely related to haplotypes identified in other European regions, suggesting shared evolutionary history and historical or ongoing gene flow. At the same time, several haplotypes detected in the Baltic samples were unique within the analyzed dataset. Although additional sampling would be required to fully resolve regional patterns, the presence of these private haplotypes indicates the existence of region-specific genetic variation in northeastern Europe.

Keywords: *Martes martes*, phylogeography, mitochondrial DNA, haplotype diversity

GENETIC STRUCTURE ANALYSIS OF THE MOTTLED GRASSHOPPER *MYRMELEOTETTIX MACULATUS* (THUNBERG, 1815) POPULATION IN GREY DUNES (Poster)

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Biodiversity faces a range of threats, yet it is primarily human-driven pressures that are accelerating global species loss and the disappearance of natural habitats. Grey dunes are among the rarest and most endangered habitats in Europe, including Latvia and Lithuania, and their quality and area continue to decline as a result of human activity and natural succession processes. Analyzing population genetic structure is a powerful way to track the effects of habitat loss on specialized species. Because genetic diversity enables evolution and provides flexibility to survive the changing conditions, it is a primary sign of a healthy population.

Myrmeleotettix maculatus is a characteristic yet relatively common and genetically well-studied grasshopper species, making it an ideal model organism for understanding the population structure and dispersal potential of rarer, less widespread grasshoppers. Given that a declining trend has been observed in some *M. maculatus* populations in Europe and the species is considered sensitive to climate change, studying its genetic structure is essential not only for understanding ecology but also for conservation planning.

A set of 10 male and 10 female Mottled Grasshoppers were collected from each of nine coastal sites, comprising eight locations in Latvia and one in Lithuania. The selected locations are characterized by complete isolation from other similar open areas. Using mitochondrial D-loop sequences the genetic structure of *M. maculatus* is analyzed. This approach provides a high resolution view of maternal lineages, allowing to not only assess genetic structure of the species population, but also to reconstruct the historical distribution patterns. We analyze the genetic clustering in the context of landscape connectivity, and discuss the restrictions to the gene flow between the sampled populations. It is hypothesized that the continuous coastline of Latvia facilitates gene flow among local individuals, while the Lithuanian grey dunes serve as a geographic bottleneck, resulting in a genetically discrete cluster isolated from the broader regional population.

Keywords: Genetic structure; D – loop sequences; gene flow; gray dunes; grasshopper conservation.

Acknowledgements: This research was supported by the Faculty of Medicine and Life Sciences, University of Latvia, through the FMLS performance-based student grant (No. FUD2025/194).

NON-INVASIVE MITOCHONDRIAL DNA ANALYSIS REVEALS GENETIC CONNECTIVITY AND EMERGING POPULATION STRUCTURE OF WESTERN CAPERCAILLIE (*TETRAO UROGALLUS*) IN LATVIA AND LITHUANIA (Poster)

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The western capercaillie (*Tetrao urogallus*) is a forest-dependent boreal specialist widely recognized as an umbrella and indicator species of structurally complex coniferous ecosystems. In the Baltic region, populations have declined due to habitat fragmentation and intensive forest management, potentially reducing connectivity and genetic diversity (Löhmus et al., 2017). Although mitochondrial D-loop haplotype lineages have been described at the European scale, Baltic populations remain insufficiently characterized. This study optimized non-invasive DNA extraction from feather samples and assessed mitochondrial genetic diversity and population structure of *T. urogallus* in Latvia and Lithuania. A total of 159 feather samples (91 from Latvia and 68 from Lithuania) were used for DNA extraction, amplification, and sequencing of 324 bp fragment of the mitochondrial D-loop region. Overall, seven haplotypes across the study area were identified. Latvian individuals represented three haplotypes, whereas among birds reared in captivity in Lithuania five different haplotypes were found, with most frequent haplotype Tu37 shared between capercaillie from both countries. Phylogenetic reconstruction revealed low mitochondrial differentiation and a lack of clear geographic segregation among studied samples. Moderate bootstrap-supported sub-clustering and closely related haplotypes differing by a single nucleotide substitutions indicate insignificant genetic structuring. The shared haplotype Tu37 suggests historical maternal connectivity and non-restricted transboundary gene flow among capercaillie populations in Latvia and Lithuania. The emerging sub-structuring patterns that may be consistent with early-stage fragmentation effects, due to reduced dispersal has not yet resulted in deep phylogeographic divergence. Compared to strongly differentiated mountain populations in Western Europe (Duriez et al., 2006), Baltic capercaillie populations retain comparatively higher historical connectivity despite supposed discrimination to different subspecies. As mitochondrial DNA reflects only maternal inheritance, future incorporation of nuclear markers would provide a more comprehensive assessment of gene flow and population differentiation. Preservation of biotopes and improvement of environmental conditions alongside with efforts to re-establish distinct capercaillie populations by artificial rearing and releasing of capercaillier into natural habitat may be one of the possible ways to prevent capercaillie from distinction. The results of the current molecular study do not contradict to such management plan.

Keywords: mitochondrial DNA, D-loop region, population structure, genetic connectivity, non-invasive sampling.

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POLLINATOR SPECIES DIVERSITY IN THE NATURE RESERVE RANDU MEADOWS (Poster)

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Today, one of the global ecological problems is the decline in the number and diversity of pollinators. In order to assess the current state of pollinators in the Randu Meadows Nature Reserve, which is one of the research sites of the Latvian national eLTER network, their censuses were conducted in 2024-2025. This study presents the results of pollinator surveys conducted in the Randu meadows during the flowering seasons of 2024 and 2025. The aim was to assess pollinator species composition, abundance, sex structure, and plant-pollinator interactions within this semi-natural coastal grassland ecosystem. Sampling was carried out from mid-June to early August using standardized transects (30 × 5 m; 30 minutes per transect; five transects per site) combined with active insect collection from flowers using an entomological net.

In 2024, a total of 159 pollinator individuals were recorded, comprising 68 Hymenoptera (16 species) and 91 Diptera. Among Hymenoptera, bumblebees dominated, particularly *Bombus sylvarum* (26 individuals), followed by *Bombus humilis* (7) and *Bombus lapidarius* (5). Solitary bees were present in low numbers. Diptera represented 57% of all recorded individuals in 2024. Within Syrphidae (at least 9 identified species plus 3 unidentified morphospecies), the most abundant species were *Syrphus vitripennis* (13 individuals), *Helophilus pendulus* (12), *Syrphus ribesii* (9), and *Sphaerophoria scripta* (9). *Sarcophaga carnaria* (15 individuals) was the most abundant non-syrphid fly.

In 2025, 63 Apoidea individuals representing 14 species were recorded, of which 60 were females (95%) and 3 males (5%). The dominant species were *Bombus humilis* (13 individuals), *Apis mellifera* (13), *B. pascuorum* (12), and *B. lapidarius* (11). Diptera remained highly abundant in 2025, with 136 recorded individuals. Syrphidae comprised 97 individuals across 12 species, with *S. vitripennis* (20 individuals), *Sph. scripta* (17), *S. ribesii* (15), and *Helophilus hybridus* (11) being most abundant. Additional Diptera included Muscidae (15 individuals), Anthomyiidae (8), Calliphoridae (12), Polleniidae (2), Sarcophagidae (1), and Tachinidae (1). Coleoptera were represented by 10 individuals across Mordellidae, Cerambycidae, and Cantharidae.

Across both years, Diptera exceeded Hymenoptera in total abundance (227 vs. 131 individuals), while bumblebees were the dominant bee group in terms of species richness and floral visitation frequency. Interannual differences were observed in dominant species, with strong *B. sylvarum* dominance in 2024 and a more even distribution among *B. humilis*, *B. pascuorum*, and *B. lapidarius* in 2025. In 2025, pollinators were recorded visiting more than 20 flowering plant species. The most frequently visited plant was *Achillea millefolium*, with over 60 visitation records, making it the main floral resource during the study period. Other highly visited species included *Centaurea jacea* (more than 20 visits), *Pimpinella saxifraga* (more than 20 visits), *Trifolium pratense* (≈ 15 visits), and *Trifolium repens* (≈ 15 visits).

The results demonstrate that Randu meadows support a taxonomically diverse and numerically fly-dominated pollinator community, with structurally important bumblebee populations contributing substantially to pollination dynamics in Baltic coastal grasslands.

Keywords: Latvian national eLTER network, coastal grasslands, Hymenoptera, Diptera

LONG TERM EFFECT OF A LOW FREQUENCY MAGNETIC FIELD (50 HZ, 450 μ T) ON THE MODEL ORGANISM *DROSOPHILA MELANOGASTER* (Poster)

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Electromagnetic radiation is an integral part of the modern environment, with which any living organism comes into contact on a daily basis. Its effects on living organisms are widely studied, as it is increasingly observed that electromagnetic radiation not only affects physiological properties but may also potentially impact genetic material (Danho et al., 2025). The study analysed the long-term effect of a low – frequency electromagnetic field (50 Hz, 450 μ T) on the population of the genetic model organism *Drosophila melanogaster* across five generations. Attention was focused on population fluctuations, phenotypic changes, as well as genotypic changes by sequencing a Y-chromosome region. A wild-type *Drosophila melanogaster* line “Canton-Special” was used in the study. To determine phenotypic and genotypic changes in *D. melanogaster*, five generational cycles were carried out. The length of one generational cycle lasted from 14 to 16 days – from counting individuals, transferring the generation, and seeding the next generation. For seeding each generation, 10 females and 10 males from the previous generation were used. In each generation, 6 conical flasks with medium were prepared (for 6 families) and divided into two groups: three of them were isolated in a low-frequency electromagnetic field (1.8 A) (group name – EMF), while the other three were maintained without enhanced electromagnetic field exposure (group name – Control). A temperature of +24 °C was fixed for both groups. The electromagnetic field was artificially produced using a special device – Helmholtz coils. In the study, a constant 50 Hz field of 450 μ T was used. In population dynamics, an increase in the number of individuals was observed in the EMF group in F1, the most pronounced increase in F2 (F2 incubated for 16 days, the other generations for 14 days), but in F3–F4 a significant decrease in the population was recorded, followed by a slight increase in F5. In phenotypic assessment, repeated wing deformities (bent or damaged wings) were observed in the EMF group from F3 to F5, whereas no phenotypic changes were observed in the control group. In the molecular part, DNA extraction was performed according to the protocol of Aljanabi and Martinez (1997) for F4 samples, DNA concentration and quality were determined, with the lowest DNA concentration observed in an EMF – group male (1.2). PCR and sequencing results showed fragments of identical length (410 bp) in all analysed samples, and no mutations were detected in the analysed Y – chromosome region. Overall, the results indicate that long-term EMF exposure under these conditions is associated with fluctuations in population viability and repeated phenotypic changes, while no sequence changes were observed in the analysed genomic region; similar effects on fitness components in drosophila have also been described previously in other 50 Hz studies.

Keywords: low – frequency electromagnetic field (50 Hz, 450 μ T), phenotype, PCR, DNA sequencing.

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A COMBINED MICROSCOPIC AND MOLECULAR INVESTIGATION OF SARCOCYSTIS SPECIES IN CATTLE FROM LITHUANIA (Poster)

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Protozoan parasites of the genus *Sarcocystis* are widely distributed among animals, with cattle (*Bos taurus*) serving as important intermediate hosts, making these parasites relevant to veterinary and public health (Dubey et al., 2015). In recent years, the increasing number of *Sarcocystis* species, including those with zoonotic potential, has raised concerns regarding food safety and public health (Oduori et al., 2024). Accurate species identification is challenging due to strong morphological similarities among closely related *Sarcocystis* species, which limits the reliability of microscopic methods (Hu et al., 2017). Consequently, molecular approaches are essential for reliable identification and assessment of *Sarcocystis* diversity. In Lithuania, the prevalence and species composition of *Sarcocystis* parasites in cattle remain insufficiently investigated using molecular methods.

A total of 56 cattle tissue samples, comprising 28 heart and 28 diaphragm samples, were analysed. Parasite abundance was evaluated using a muscle squash compression method with methylene blue staining. Species identification was carried out following artificial pepsin digestion, genomic DNA extraction, and nested PCR amplification. Mitochondrial *cox1* gene fragments were used for species discrimination, and the resulting PCR products were analysed by electrophoresis, sequencing, and subsequent bioinformatic analysis.

Microscopical examination of 28 bovine heart muscle samples did not reveal any *Sarcocystis* sarcocysts. Therefore, further molecular investigations or an increased sample size are required to clarify the presence and prevalence of the parasite in cardiac tissue. Species diversity was determined exclusively in diaphragm samples. Molecular analysis of diaphragm tissue identified two *Sarcocystis* species, *Sarcocystis cruzi* and *Sarcocystis bovifelis*, with *S. cruzi* being the dominant species (75.0%, 21/28), while *S. bovifelis* was detected in 7.14% (2/28) of the samples.

The findings indicated a limited diversity of *Sarcocystis* species in Lithuanian cattle, emphasizing the necessity of molecular methods for accurate species identification and assessment of zoonotic potential. Future studies should focus on expanding the sample size and further optimizing molecular and parasite viability assessment methods to enable a more reliable evaluation of *Sarcocystis* prevalence in cattle and their relevance to veterinary and public health.

Keywords: bovine protozoan parasites; molecular diagnostics; parasite prevalence

FIRST MOLECULAR CHARACTERIZATION OF *SARCOCYSTIS BERTRAMI* IN LITHUANIAN HORSES (Poster)

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Protozoa of the *Sarcocystis* genus are characterized by an obligatory two-host life cycle that involves the formation of sarcocysts within the muscle or neural tissues of intermediate hosts (IH), including domestic livestock. Infection of definitive hosts (DH), typically carnivores or omnivores, occurs through the ingestion of raw or undercooked meat containing mature sarcocysts. In both animals and humans, sarcocystosis may be associated with a range of clinical manifestations affecting the muscular, neurological, or gastrointestinal systems, depending on the host species and the infecting parasite. Although these parasites are considered important from both veterinary and economic perspectives, information on their occurrence and species diversity in equids remains limited, largely due to the scarcity of molecular investigations. At present, five *Sarcocystis* species have been reported in equine hosts: *Sarcocystis asinus*, *Sarcocystis bertrami*, *Sarcocystis equicanis*, *Sarcocystis fayeri*, and *Sarcocystis neurona*. However, uncertainties in species delineation still exist, particularly concerning the relationship between *S. bertrami* and *S. fayeri*. Because of the prolonged maturation time of sarcocysts in horses, morphological assessment alone is often inadequate for accurate species-level identification, emphasizing the necessity of combining microscopy with molecular tools. Accordingly, this study aimed to evaluate the prevalence, infection intensity, and species composition of *Sarcocystis* in different muscle tissues of domesticated horses (*Equus ferus caballus*).

Between 2023 and 2024, 107 muscle samples were obtained from horses slaughtered at Lithuanian abattoirs. Samples included neck ($n = 59$), cheek ($n = 23$), and masticatory muscles ($n = 25$). Initial screening for sarcocysts was carried out using both methylene blue-stained and unstained muscle squash preparations. Subsequently, individual sarcocysts were isolated for genomic DNA extraction. Molecular identification was performed by PCR targeting fragments of the *cox1*, 18S rRNA, and 28S rRNA genes, followed by sequencing and bioinformatic analysis to confirm species identity. Microscopic examination revealed the presence of *Sarcocystis* spp. in 23.4% of analyzed samples, with infection intensities ranging from 1 to 12 sarcocysts per gram of tissue. The detected cysts were elongated and septate, measuring 400–6000 μm in length and 30–225 μm in width, and contained banana-shaped bradyzoites approximately $10\text{--}16 \times 2\text{--}4 \mu\text{m}$ in size. All isolates subjected to molecular analysis were identified as *Sarcocystis bertrami*.

This study provides the first molecular confirmation of *S. bertrami* in horses from Lithuania and demonstrates the importance of integrative diagnostic approaches for resolving taxonomic ambiguities and improving our understanding of *Sarcocystis* distribution in equids, with potential implications for animal health management and food safety risk assessment.

Keywords: equine protozoan parasites; molecular identification; *cox1* / rRNA gene sequencing; microscopic examination

ZOONOTIC PATHOGENS IDENTIFIED IN ECTOPARASITES OF RED FOXES (*VULPES VULPES*) (Poster)

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Vector-borne zoonotic pathogens represent a growing concern for public health worldwide. Among them, *Rickettsia* spp. and *Bartonella* spp. are gram-negative bacteria transmitted primarily by ectoparasites such as ticks and fleas. These pathogens cause a variety of infectious diseases that affect both animals and humans. Wild carnivores, particularly foxes (*Vulpes vulpes*), play an important role in the maintenance and circulation of these bacteria in natural ecosystems. Ectoparasites feeding on wildlife act as vectors and reservoirs, contributing to pathogen persistence and facilitating transmission between wildlife, domestic animals, and humans. Therefore, investigating the prevalence of *Rickettsia* and *Bartonella* in ectoparasites from wild animals is essential for understanding their epidemiology and evaluating potential zoonotic risk. In this study, molecular methods were used to detect *Rickettsia* and *Bartonella* DNA in ectoparasites collected from red foxes in Lithuania. A total of 109 ectoparasites (21 ticks and 88 fleas) were collected from 9 red foxes. All samples were analyzed using PCR amplification targeting the *gltA* gene for *Rickettsia* spp. and the internal transcribed spacer (ITS) region for *Bartonella* spp., followed by sequencing analysis. Overall, 19.3% of the examined ectoparasites tested positive for either *Rickettsia* or *Bartonella* DNA. Specifically, *Rickettsia* spp. were detected in 17.4%, while *Bartonella* spp. were detected in 1.8%. Detection rates varied among ectoparasites: in fleas, *Rickettsia* was detected in 21.6% and *Bartonella* in 2.3%, whereas in ticks, only *Rickettsia* was identified, with a detection rate of 28.6%. These findings indicate that the relatively high detection rate of *Rickettsia* spp. indicates active circulation of these pathogens in wild ecosystems. The lower prevalence of *Bartonella* spp. may reflect differences in host, vector, and pathogen dynamics, vector competence, or ecological factors influencing transmission. Overall, the presence of these bacteria in ectoparasites collected from foxes highlights their potential role as reservoirs and vectors of zoonotic bacteria.

Keywords: *Rickettsia* spp., *Bartonella* spp., Lithuania

OCCURRENCE OF *TOXOCARA* SPP. IN WILD CANIDS IN LITHUANIA: A PRELIMINARY INVESTIGATION (Poster)

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Toxocara species are cosmopolitan parasitic nematodes that infect a wide range of companion, domestic, and wild animals as definitive and paratenic hosts. *Toxocara canis* is recognized as a zoonotic parasite, whereas *T. leonina* is a common species of numerous felids and canids worldwide. The significance of wild carnivores as definitive hosts of *Toxocara* spp. has received much less attention compared to that given to domestic dogs and cats. To date, the populations of wild canids in Lithuania have not been subjected to comprehensive integrated parasitological investigations. The fragmented previous studies on the parasites of red foxes and raccoon dogs in Lithuania were conducted 15 years ago.

In 2025, a total of 19 intestinal samples from wild canids collected in Lithuania were examined for the presence of *Toxocara* nematodes using microscopic and molecular techniques. The samples were obtained from eight red foxes (*Vulpes vulpes*), eight common raccoon dogs (*Nyctereutes procyonoides*), and three grey wolves (*Canis lupus*). The detected parasites were genetically characterized by analysis of the internal transcribed spacer (ITS1-ITS2) region. By microscopical techniques, helminths of *Toxocara* spp. were observed in six intestinal samples (31.6%). *Toxocara canis* has been identified in a single common raccoon dog and red fox by morphological characteristics. Meanwhile, *T. leonina* has been detected in five red foxes and a single common raccoon dog using microscopical techniques. Microscopical examination revealed a mixed infection with *T. canis* and *T. leonina* in a common raccoon dog and in a red fox. Microscopical analysis showed that male *T. canis* measured approximately 7–8 cm in length and females 10–11 cm, while male *T. leonina* measured 3–6 cm and the females 3–9 cm. Molecular results are currently under investigation. This study represents the first investigation in a recent decade of *Toxocara* infections in wildlife in Lithuania. Further studies are required to evaluate the interspecific and intraspecific diversity of the selected *Toxocara* nematodes.

Keywords: parasitology, ITS1–ITS2 region, morphological identification, red foxes, raccoon dogs, grey wolves

Acknowledgements: The research was funded by the Research Council of Lithuania (grant number S-MIP-25-45)

MOLECULAR ANALYSIS OF PARASITES IN VILNIUS URBAN SOIL SAMPLES (Poster)

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Lithuania is home to more than 600,000 cats, a considerable proportion of which live outdoors. In Vilnius, the municipal authorities introduced winter shelters at designated feeding sites for stray cats. Besides feeding and resting in these areas, cats also defecate nearby, which may lead to environmental contamination with parasitic organisms.

In this study, 162 soil samples were collected from areas surrounding the winter shelters in Vilnius and examined for the presence of the protozoan parasites *Toxoplasma gondii*, *Sarcocystis* spp. as well as the cestodes *Taenia taeniaeformis*, *Dipylidium caninum* and *Mesocestoides* spp.

The analysis revealed *Sarcocystis bovifelis* in three samples, *S. morae* in six samples, and *Toxoplasma gondii* in 15 samples. Furthermore, two genetically different *Sarcocystis* species that could not be confidently assigned to known *Sarcocystis* spp. were identified; *Sarcocystis* sp. 1 in one sample and *Sarcocystis* sp. 2 in two samples. Bioinformatic evaluation of the obtained DNA sequences showed that the detected *Sarcocystis* sp. 1 was genetically most closely related to species that use rodents as intermediate hosts, and *Sarcocystis* sp. 2 was associated with *Sarcocystis* species from members of the family Cervidae. Based on the identified species, it is likely that stray cats acquired *Sarcocystis* infections by consuming the muscle tissue of rodents (*Sarcocystis* sp. 1), cattle (*S. bovifelis*) and cervids (*Sarcocystis* sp. 2 and *S. morae*). The examined cestode species were not detected in the samples analysed.

Keywords: environmental parasitology, protozoan parasites, parasite transmission, *Sarcocystis*

FAUNA OF MESOSTIGMATA MITES FROM SMALL MAMMALS IN SUBURBAN HABITATS FROM LITHUANIA (Poster)

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Small mammals play a key role in sustaining ectoparasite populations and act as reservoir hosts for numerous arthropod-transmitted pathogens. Mites associated with these animals are ecologically significant and can act as potential vectors of microorganisms responsible for diseases in humans and animals (Kaminskienė et al 2022). In Lithuania, only a few studies have investigated diversity of parasitic mites on small mammals in their natural habitats (Kaminskienė et al 2020; Kitrytė et al 2022). However, there is no data on the prevalence of small mammal-associated mites in suburban areas. The aim of this study was to evaluate the species diversity of Mesostigmata mites and to assess their mean intensity and prevalence in small mammals inhabiting suburban areas of Lithuania. A total of 899 mites were collected from 934 hosts trapped from 20 different suburban sites in Lithuania during 2017-2020. Based on morphological characteristics, 14 Mesostigmata mite species belonging to eight genera (*Androlaelaps*, *Cyrtolaelaps*, *Eulaelaps*, *Haemogamasus*, *Hirstionyssus*, *Hyperlaelaps*, *Laelaps*, and *Myonyssus*) were taxonomically identified. Prevalence and mean intensity of infestation varied among host species and study locations. Mesostigmata mites were detected on 24.7% of the examined hosts, with the highest number collected from *A. flavicollis* mice. *Laelaps agilis* and *L. hilaris* were the most frequent laelapid mite species. One more species, *Hg. nidi*, were also common. The rest of the mesostigmatid mite species comprised less than 12% of all collected mites. One mite species, *Cyrtolaelaps mucronatus*, was found for the first time in Lithuania during this study. This investigation advances insight into the diversity of Mesostigmata mites in Lithuanian suburban habitats and provides a foundation for future studies on host-parasite relationships and pathogen-associated processes.

Keywords: ectoparasites, host-parasite interactions, vectors, prevalence, suburban ecosystems

TICK-BORNE PATHOGENS IN EUROPEAN POLECATS (*MUSTELA PUTORIUS*) FROM LITHUANIA (Poster)

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Tick-borne infectious diseases represent an increasing threat to both human and animal health; however, the role of small wild carnivores in the maintenance and circulation of tick-borne pathogens in Lithuania remains insufficiently studied. The European polecat (*Mustela putorius*) is a widespread species that may interact with tick-borne pathogens and potentially contribute to their persistence in natural ecosystems (Balčiauskas et al., 2014; Król et al. 2019).

The aim of this study was to investigate the prevalence of selected tick-borne pathogens in European polecats in Lithuania. A total of 55 individuals (17 females and 38 males) were collected between 2013 and 2025 from multiple locations across Lithuania. Biological material was obtained from legally hunted animals, road-killed individuals, and animals found dead in the wild. For DNA extraction, spleen (n = 42), lung (n = 7), and kidney (n = 6) tissues were used. Genomic DNA was isolated using a commercial extraction kit (Thermo Fisher Scientific, Lithuania) following the manufacturer's protocol. Molecular screening was performed using real-time PCR (Rotor-Gene Q 5plex) in duplex and triplex assays targeting *Rickettsia* spp., *Bartonella* spp., *Borrelia* spp., *Neorhlichia mikurensis*, and *Anaplasma phagocytophilum*. Samples positive for *A. phagocytophilum* were further analysed by nested PCR targeting three genes (16S rRNA, msp4, and groEL). Obtained sequences were aligned and compared with GenBank entries using MEGA 12 and BLASTn. Phylogenetic trees were constructed using the Maximum Likelihood method with the Tamura–Nei model and bootstrap analysis (1000 replicates).

Out of 55 analysed polecats, four samples (7.3%) tested positive for *A. phagocytophilum* DNA. All positive cases were detected in spleen tissue. Three infected individuals were males, and one was a female. DNA of other investigated tick-borne pathogens was not detected. Positive sequences clustered phylogenetically with *A. phagocytophilum* isolates previously reported from ticks and vertebrate hosts in Europe, Asia, and the Americas.

These findings indicate that European polecats in Lithuania may participate in the circulation of *A. phagocytophilum* in natural ecosystems, although their role in the maintenance of other tick-borne pathogens was not supported. The study expands current knowledge on the ecology of *A. phagocytophilum* in wildlife and provides new epidemiological data from Lithuania.

Keywords: Lithuania, *Mustela putorius*, *Anaplasma phagocytophilum*

DIVERSITY OF *BARTONELLA* IN BATS AND HOST ASSOCIATIONS REVEALED BY *gltA* GENE ANALYSIS (Poster)

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Bats (*Chiroptera*) are globally widespread mammals and are increasingly recognized as reservoirs of diverse bacterial pathogens, including *Bartonella* spp., which comprise multiple zoonotic and wildlife associated lineages. As the second most species rich order of mammals with broad ecological diversity and global distribution, bats harbor numerous microorganisms, and their life history traits such as longevity, sociality, and mobility facilitate pathogen maintenance and dispersal (Szentivanyi et al, 2023). *Bartonella* are vector-borne, facultative intracellular bacteria that typically persist asymptotically in mammalian erythrocytes and are transmitted by hematophagous arthropods.

To investigate associations between bats and *Bartonella* genotypes, kidney, lung, heart, and spleen tissues were collected from bats in Lithuania during 2018–2020. Genomic DNA was extracted using a commercial purification kit. Detection of *Bartonella* spp. was performed by real-time PCR targeting the *gltA* gene, and positive amplicons were verified by agarose gel electrophoresis, purified, and sequenced.

Phylogenetic analysis of five partial *gltA* sequences identified multiple *Bartonella* genotypes circulating in Lithuanian bats, showing 89–100% similarity to GenBank references. Several genotypes clustered with previously described bat associated lineages from Europe and North America (Muñoz-Hernández et al, 2025), whereas others showed phylogenetic affinity to rodent or ectoparasite associated *Bartonella*. Cophylogenetic comparison of bat phylogeny and *Bartonella* genotypes revealed both host specific and shared lineages among closely related bat species.

The tanglegram analysis showed that some *Bartonella* genotypes were associated with a single bat species, whereas others were shared among phylogenetically related hosts, particularly within the genus *Myotis* and among *Pipistrellus* and *Nyctalus*. This pattern indicates both host restricted and shared circulation of *Bartonella* genotypes within Lithuanian bat assemblages.

Keywords: bats, *Bartonella*, *gltA*, host specificity

PRELIMINARY ANALYSIS OF THE BACTERIAL COMMUNITY OF THE FOREST PEST *IPS TYPHOGRAPHUS* (Poster)

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The European spruce bark beetle (*Ips typographus* L.) is one of the most destructive forest pests in Europe, particularly affecting spruce-dominated stands. This species causes substantial ecological and economic losses by contributing to large-scale mortality of mature Norway spruce (*Picea abies*). *I. typographus* was already recognized as the most significant spruce pest in Latvia in the previous century by Ozols (1985), but its impact has intensified in recent decades. Climate change characterized by milder winters and increasingly hot summers, has facilitated rapid population growth and expanded the beetle's distribution, making management efforts increasingly difficult. In the spring of 2023, Latvia declared (Order No. 180. 2023. On the Declaration of a State of Emergency. Riga, Cabinet of Ministers of the Republic of Latvia) a state of emergency in spruce forests due to the extensive spread of the pest [1]. This situation highlights the urgent need to explore new, sustainable strategies for controlling *I. typographus* populations.

To better understand natural factors influencing beetle mortality, we initiated a study focusing on the microbiota associated with *I. typographus*. Insects are colonized by diverse microorganisms, and insect-associated bacterial communities are known to play important roles in nutrition, development, immunity, and environmental adaptation. Previous research, such as that by Wegensteiner (2007.), has documented pathogens and disease agents affecting *I. typographus*, yet the broader composition and functional significance of its bacterial community remain insufficiently understood. A deeper knowledge of these microbial associations may provide valuable insights for developing novel biological control approaches.

The aim of this study was to characterize the bacterial community of *I. typographus* larvae and to assess differences among individual insects. In the first stage of the research, a culture-dependent approach was applied. Larvae were homogenized and plated on nutrient media, and the resulting bacterial colonies were examined based on morphological characteristics, including color, size, shape, opacity, margin structure, elevation, and viscosity. Identification of bacterial isolates to the species level was performed using a Bruker MALDI-TOF mass spectrometer.

The results of this preliminary analysis will contribute to a foundational understanding of the bacterial diversity associated with *I. typographus*. Identifying microorganisms that may influence beetle development, fitness, or mortality is an important step toward evaluating the potential of microbiota-based strategies in integrated pest management. Ultimately, such knowledge may support the development of environmentally friendly, biologically grounded methods for mitigating the impact of this major forest pest.

Keywords: The European spruce bark beetle, biological control, bacterial diversity

SCREENING OF IPBS MOLECULAR MARKERS FOR GENETIC DIVERSITY ANALYSIS OF *RHODODENDRON KOTSCHYI* SIMONK. POPULATIONS (Poster)

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The iPBS (inter-primer binding site) method represents a relatively simple and cost-effective molecular marker system. It is based on retrotransposons, which occur in large numbers in the genomes of virtually all eukaryotes. Due to the widespread occurrence of retrotransposons and the highly conserved structural elements involved in their "copy-and-paste" replication mechanism, this method functions as a universal multilocus marker system that is broadly applicable across both plant and animal taxa. Despite these advantages and the extensive body of research addressing genetic diversity in *Rhododendron*, iPBS markers have not yet been utilised in studies of this genus.

Despite its universality, the iPBS system requires prior screening to identify the most informative primers for each species. Accordingly, before population-level diversity analysis of *Rhododendron kotschyi* Simonk., a laborious screening process was conducted. Of the 83 primers within the iPBS system, 68 were tested. PCRs were performed using four *R. kotschyi* samples, each from a different population, alongside positive and negative controls. PCR products were visualised by running electrophoresis for 2 hours and photographing the gels under UV light. Primer efficiency was assessed based on the original iPBS six-tier (0–5) rating scale (Kalendar et.al. 2010), the proportion of polymorphic fragments, and the overall quality of the PCR products (fragment brightness, background smearing, etc.). Based on this initial evaluation, twenty primers were selected for extended screening. At this stage, PCR products were run on electrophoresis gels for 5.5 hours to improve fragment separation. The evaluation process remained largely the same, with overall PCR quality and the proportion of polymorphic fragments serving as the main selection criteria. Ultimately, seven iPBS primers with at least 35% polymorphic fragments were selected for final population analysis.

While the iPBS method requires initial screening for each species, primers identified as effective for one *Rhododendron* species are likely to perform well across other species within the same genus. Consequently, the primers validated as informative for *R. kotschyi* provide a useful foundation for future studies of rhododendron genetic diversity using the iPBS system, potentially reducing time and effort spent on primer selection. It should be noted, however, that when investigating distantly related species within large and phylogenetically diverse taxonomic units, such as the genus *Rhododendron*, more extensive screening may still be necessary to ensure optimal primer performance.

Keywords: iPBS, retrotransposons, molecular markers, genetic diversity, *Rhododendron*

CHANGES IN LEAF CELL GENOME PLOIDY OF CLOUDBERRY (*RUBUS CHAMAEMORUS*) POPULATIONS UNDER DIFFERENT GROWTH CONDITIONS (Poster)

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Cloudberry *Rubus chamaemorus* is an ecologically and economically valuable peatland plant species that is highly sensitive to environmental changes. While endoreduplication of chromosomes and changes in endoploidy levels are seen as a plant's adaptive reaction to environmental stress, the genetic structure and ploidy variations of cloudberry populations in Latvia remain insufficiently researched.

This study was conducted to understand how different growth conditions and potential environmental disturbances affect the genome stability of this species. The hypothesis was that the ploidy structure of cloudberry leaf cells varies according to the environmental conditions of the growth habitat, with a higher proportion of polyploid cells occurring in leaves under poorer growing conditions.

To test this, 10–15 dried leaf samples from each of the seven bogs in Latvia were analyzed using flow cytometry (BD FACSJazz cell sorter) based on changes in cell relative fluorescence (RF) after irradiation with a blue laser (480 nm). Cell nuclear DNA was stained with propidium iodide. Cells with 2n endoploidy levels dominated in all sites; however, in several bog populations, flow cytometry revealed diffuse cell clusters around the 3n and 4n positions. This scattering indicates the formation of an unbalanced genome with varying chromosome numbers and the occurrence of aneuploid cells within the populations, suggesting genomic instability. Statistically significant differences in endoploidy distribution were found among the studied locations ($p < 0,001$). In the transitional bog, Baltais purvs, 4n cells were not detected, and the proportion of 3n cells was the lowest. In contrast, in bogs with potential anthropogenic or landscape disturbances, such as Pelēčāres and Nītaures bogs, the lowest proportion of 2n cells and higher levels of 3n and 4n cells were observed. The results confirm our hypothesis that the endoploidy structure of *Rubus chamaemorus* cells is closely related to growing conditions, acting as a reaction to growth habitat changes, highlighting the need for further in-depth research on this topic.

Keywords: cloudberry, DNA endoploidy, flow cytometry, peatlands, environmental impact

VALORIZATION OF TOMATO HYDROPONIC WASTEWATER BY MIXOTROPHIC CULTIVATION OF MICROALGAE (Poster)

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Hydroponic wastewater (HW) contains high concentrations of residual nitrogen, organic acids, and phosphorus that may pose an environmental risk if not properly treated. In hydroponic systems nutrient concentrations often exceed plant growth requirements, resulting in nutrient rich effluents that can be reutilized for cultivation of microalgae (Yolanda et al., 2025). Typically, hydroponic HW contains high concentrations of nitrogen (150–600 mg/L) and phosphorus (30–100 mg/L) which, if discharged into natural water bodies, can alter microbial communities and promote eutrophication (Richa et al., 2020). Microalgae offer a sustainable alternative for HW treatment due to their ability to assimilate excess nutrients (Sriket et al., 2024). Since hydroponic HW lacks sufficient organic carbon, cultivation media could be optimized by supplementation of glucose or cheese whey. Thus mixotrophic cultivation of microalgae has been found to enhance biomass and lipid production as shown previously (Apse et al., 2025; Yousif et al., 2022). In this study the potential of microalgae to valorise tomato hydroponic HW supplemented with organic carbon sources, under mixotrophic conditions for improved growth and lipid yield for microalgae *C. vulgaris* CCAP 211/111 and *S. quadricauda* CCAP 276/16 has been evaluated. Wastewater samples used in this study were obtained from SIA “Getliņi Eko” after tomato growth in hydroponics and whey from AS “Rankas Piens” after cheese production. The selected strains were cultivated under autotrophic and mixotrophic conditions using HW supplemented with glucose (5 g/L) or cheese whey (10% v/v) in 100 mL Erlenmeyer flasks with 5 mL inoculum at concentration of 0.1–0.2 g/L for 14 days with light intensity of 100 $\mu\text{mol m}^{-2} \text{s}^{-2}$. Results indicated that a lower concentration of HW (20%) after dilution with distilled water and subsequent pH adjustment to 7.0 enhanced biomass production, particularly for *S. quadricauda* to 0.58 ± 0.01 g/L, whilst *C. vulgaris* reached the highest results at 20% dilution and control group in the HP standard medium. Mixotrophic cultivation significantly enhanced biomass and lipid productivity for both microalgae ($p < 0.05$). *C. vulgaris* achieved the highest biomass in hydroponic HW supplemented with glucose – 0.72 ± 0.01 g/L, however the highest lipid yield was found in HW supplemented with cheese whey – $22.10 \pm 0.72\%$ from the biomass dry weight. In contrast, *S. quadricauda* reached its highest biomass (1.54 ± 0.03 g/L) in HW supplemented with whey. While the highest lipid content ($32.77 \pm 1.15\%$) was recorded in HW supplemented with glucose. These findings indicate that higher dilution rates reduce growth inhibition of microalgae in HW that can be caused by excess of residual nutrient compounds or NaOH in the medium used for pH adjustment. While supplementation with organic carbon sources enhances

biomass accumulation and lipid synthesis, highlighting the potential of HW valorisation through microalgal mixotrophic cultivation.

Keywords: *Chlorella vulgaris*, *Scenedesmus quadricauda*, reutilisation, whey

Acknowledgments: This study was co-financed by European Agricultural Fund for Rural Development (EAFRD) and supported by the Ministry of Agriculture and Rural Support Service of the Republic of Latvia within the project "Green technologies in hydroponics: microalgae as a natural solution for nutrient recycling in agricultural systems", grant Nr. 25-00-C0LA1602-000004.

EFFECT OF MICROWAVE-ASSISTED MICROALGAL EXTRACTS ON GERMINATION AND SEEDLING MORPHOLOGICAL CHARACTERISTICS OF WHITE MUSTARD (*SNAPIS ALBA*) (Poster)

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Microalgae-derived biostimulants are increasingly investigated as a sustainable alternative to synthetic growth regulators in agriculture. This study evaluated the effect of microalgal extracts obtained by microwave-assisted extraction (MAE) from *Chlorella vulgaris* CCAP 211/111 and *Scenedesmus quadricauda* CCAP 276/16 biomass on the germination and seedling morphological characteristics of white mustard (*Sinapis alba*) "Borowska".

Concentrated extracts (50 g L⁻¹) of microalgal biomass were obtained by using MAE treatment and were subsequently diluted (1:9 and 1:99) in either water (H₂O) or an ethanol:water solution (1:9, ETO) for further experimental treatments. The treatments included individual microalgal extracts and their 1:1 mixture (MIX) as well, alongside the control (distilled water). Germination dynamics (up to 168 h), germination rate, sprout length, root length, and seedling dry matter were determined. Statistical differences were assessed by one-way ANOVA followed by Tukey's HSD test ($p < 0.05$).

It was found that water-based extracts significantly enhanced germination and seedling growth compared to both control and ethanol extracts. The highest germination rate was observed by treatments with *C. vulgaris* (83,33 ± 5,66%) and *S. quadricauda* (80,95 ± 1,57%) 1:99 H₂O extracts, exceeding the control (71,43 ± 5,44%). Germination dynamics showed earlier onset and faster progression for water-based extracts, whereas ethanol extracts markedly delayed and reduced germination progression.

Morphological parameters of seedlings were significantly influenced by the microalgal extracts. Root development was especially stimulated by water extracts, with the longest roots shown in *S. quadricauda* 1:9 H₂O (38,71 ± 5,76 mm) and *C. vulgaris* 1:9 H₂O (33,08 ± 7,80 mm) treatments, surpassing the control (26,60 ± 5,75 mm). For sprout length a similar trend was observed, as water extracts of *S. quadricauda*, 1:9 (18,19 ± 2,08 mm) and 1:99 (14,50 ± 2,49 mm) promoted growth, whereas ethanol extracts significantly slowed it. Water-based extracts increased seedling dry matter compared to the control (0,05 ± 0,008 g), with the highest accumulation (0,08 ± 0,005 g) observed in *S. quadricauda* 1:9 H₂O treatments, whereas ethanol-based extracts heavily reduced biomass production in all groups. Overall, microwave-assisted water extracts of *C. vulgaris* and *S. quadricauda* demonstrated strong biostimulant potential for *S. alba*, enhancing both germination performance and seedling morphological characteristics. The results highlight the importance of extraction solvent used and dilution factors for maximizing bioactivity and support the implementation of microalgae-derived water extracts as promising sustainable biostimulants in agricultural production systems.

Keywords: biostimulant, *Chlorella vulgaris*, *Scenedesmus quadricauda*, extract, microalgae

Acknowledgements: This study was co-financed by European Agricultural Fund for Rural Development (EAFRD) and supported by the Ministry of Agriculture and Rural Support Service of the Republic of Latvia, grant Nr. 25-00-COLA1602-000004.

ANTIMICROBIAL EVALUATION OF THREE ORGANIC PROCESSED JUICES FROM *CURCUMA LONGA* L. (Poster)

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Turmeric (*Curcuma longa* L.) is a herbaceous perennial plant with orange-yellow, bitter rhizomes, used worldwide as a spice in culinary, for food colouring as well as in traditional and alternative medicine. It is famous because anticancer, antidiabetic, anti-osteoarthritis, antidiarrheal, cardioprotective, anti-oxidative, antimicrobial, renoprotective and anti-inflammatory activities. Nowadays, immunity-enhancing and stimulating nutritional products, including juices, are often advertised. In the case of turmeric, the antimicrobial evaluation of organic processed juices is not explored so wide. In this research, antimicrobial activity of three organic processed juices from turmeric (*Curcuma longa* L.) rhizomes were studied. For experimental part, the Kirby-Bauer Disk Diffusion Susceptibility Test and the Minimum Inhibitory Concentration (MIC) Test were carried out for the evaluation of each juice antimicrobial activity against sixteen pathogenic microorganisms.

The results proved that *Salmonella typhimurium*, *Escherichia coli*, *Staphylococcus aureus*, *Listeria monocytogenes* and *Pseudomonas aeruginosa* bacteria were sensitive towards turmeric juice, besides, *Salmonella typhimurium* bacteria showed the greatest sensitivity. By the results, the inhibitory effect of turmeric was noticeable even at low juice concentrations (0.24–3.91 µL/mL). The results indicate that turmeric juice has antibacterial properties more as well as using the turmeric juice can be particularly effective in inhibiting the growth of foodborne bacteria. The fungi did not show sensitivity to turmeric juice. In our research, the sample with additive of lemon juice concentrate (0.9%) was more effective in comparison with two other turmeric juices. That is why experimental work should be continued with the aim to detect the antibacterial properties of fresh-pressed / pasteurized pure turmeric juice (without any additives).

Keywords: turmeric, antimicrobial properties, pathogenic microorganisms.

ULTRAFILTRATION AS A WAY TO INCREASE THE EFFICIENCY OF FUNCTIONAL FOODS (Poster)

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The increase in life expectancy in modern humans is largely due to the popularisation of a healthy lifestyle. To enhance the biological effects of one or more nutrients in liquid products, it is advisable to fractionate them by ultrafiltration based on molecular weight. This method has been used mainly in the chemical and pharmaceutical industries, while the food industry uses ultrafiltration to clarify beverages. Modifying the functional properties of liquids by ultrafiltration involves increasing the concentration of relevant substances or removing inhibitors of biochemical and physiological processes in the body. However, ultrafiltration offers significant potential for developing new technologies, enabling the creation of innovative products with desired functional properties while ensuring energy-efficient and waste-free production.

This technology requires the laboratory investigations using biochemical and physiological experiments. Our study aimed to develop technologies for producing fruit and vegetable juices that stimulate intestinal iron absorption under conditions of experimental iron-deficiency anaemia, and to create a line of fruit juices with a reduced glycaemic index. Experiments were conducted on the chicken duodenum *in situ*, and *in vivo* conditions. Zucchini, pumpkin, carrot, beetroot, and cabbage juices were studied using column chromatography (Sephadex) and ultrafiltration through semipermeable sulfone membranes. Fruit juices (apple, pomegranate, grapefruit) and their aqueous extracts were ultrafiltered using membranes with permeability in the range of 100–150 kDa. The followed determination of fractionated juices effects on the activity of enzymes regulating glucose digestion (salivary and pancreatic α -amylases, α -glucosidase) conducted *in vitro* conditions.

It was found that, compared to native juice, isolated fractions of red beetroot and zucchini juices had a 2–3-fold higher ability to stimulate active iron transport into the duodenum. The parameters of fruit juice fractions that inhibit glucose breakdown with the same activity vary significantly among different fruit types. The obtained results have been used to develop the innovative functional food products.

Keywords: ultrafiltration, vegetable and fruit juices, biological effect

INFLUENCE OF ENVIRONMENTAL FACTORS (LIGHT AND TEMPERATURE) ON BETA-CAROTENE PRODUCTION IN *RHODOTORULA* SPP. (Poster)

Regina Losinska-Sičiūnienė, Elena Servienė, Živilė Strazdaitė-Žieliene

State Scientific Research Institute Nature Research Centre, Lithuania

Carotenoids are natural lipid-soluble terpenoid pigments, which give microorganisms red, orange, and yellow colors. *Rhodotorula* yeasts are distinguished producers of carotenoids. Carotenoids are widely used in phytomedicine and across the chemical, pharmaceutical, cosmetic, food, and feed industries due to their valuable biological properties. Among them, β -carotene is considered one of the most significant compounds, distinguished by its notable biological activities, including antioxidant, anticancer, and antimicrobial effects. The effects of temperature and light in the environment where *Rhodotorula* yeast grows play an important role in the biosynthesis of carotenoids. The study aimed to investigate the accumulation of β -carotene in different species of the *Rhodotorula* genus yeasts, depending on environmental factors: light, darkness, and temperature changes (26 °C and 4 °C). *Rhodotorula* yeasts were isolated from the natural environment and analyzed using morphological and molecular methods. Species identification was carried out using restriction fragment length polymorphism (RFLP) analysis together with sequencing of the internal transcribed spacer (ITS) region of rDNA. In this study, the β -carotene content in *Rhodotorula* yeasts was evaluated after cultivation on solid YEPD medium at two different temperatures (4 °C and 26 °C) under varying light intensities (8–10 $\mu\text{mol}/\text{m}^2\text{s}$). The biomass was harvested, and carotenoids were extracted with N, N-dimethylformamide (DMF). The concentration of β -carotene was calculated based on the measured light absorption at a wavelength of 440 nm. It was demonstrated that β -carotene content increased over 14 days in all *Rhodotorula* species grown at 26 °C in the dark. After 2 days of cultivation, *R. ingeniosa*, *R. dairenensis*, *R. mucilaginosa*, and *R. diobovata* had lower β -carotene levels of 0.18 to 0.23 mg/g biomass than the other yeasts. After 14 days, the β -carotene content in the same yeasts doubled. After 2 days of cultivation, *R. babjevae*, *R. glutinis*, *R. graminis*, and *R. kratovchilovae* accumulated 0.3 to 0.36 mg/g of β -carotene. After 14 days, the pigment content in this yeast species increased by 30% and reached 0.76 mg/g of biomass. The level of β -carotene was 30 to 55% lower, depending on yeast species, when the yeast culture after 2 days of cultivation at 26 °C was transferred to 4 °C and followed by 12 days of incubation in the dark. When the yeast was grown in light at a temperature of 26 °C, the β -carotene content in all *Rhodotorula* spp. remained almost unchanged for 3 days. After 7 days, the highest β -carotene content was found in *R. kratovchilovae* – 0.54 mg/g biomass, *R. glutinis* – 0.60 mg/g biomass, *R. graminis* – 0.47 mg/g, and *R. babjevae* – 0.69 mg/g biomass. 14 days of illumination conditions likely cause inhibition of β -carotene synthesis or even degradation in *R. glutinis*, *R. kratovchilovae*, and *R. babjevae* yeast strains. When yeasts were kept in the light at 4 °C, out of 8 yeast species tested, *R. mucilaginosa* and *R. babjevae* accumulated about 20–30% more β -carotene than in dark conditions. The synthesis and accumulation of β -carotene are decreased at a low temperature. The data obtained suggest that isolated *Rhodotorula* yeast species under appropriate conditions can be promising for carotenoid production.

Keywords: yeasts, carotenoid biosynthesis, biomass

ENHANCING THE SENSITIVITY OF THE QBS-AR INDEX IN LATVIAN AGROECOSYSTEMS: PRELIMINARY RESULTS TO REFINING ECO-MORPHOLOGICAL APPROACH TO SOIL MITE (ACARI) CLASSIFICATION (Poster)

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Acari are among the most abundant and ecologically diverse soil arthropods. Being saprophages, phytophages and predators they are crucial in the soil food webs. Still, their role in bioindication is often undervalued due to coarse taxonomic resolution. The QBS-ar index is frequently used method of soil bioindication in Central Europe, however its treatment of Acari as a monolithic group limits its diagnostic precision. To address this, we propose subdivision of the Acari group within the QBS-ar framework into five ecomorphological categories. We contrast this refined “QBS-ac” approach against standard protocols to determine if increased resolution improves the index’s ability to map the “standard reliable gradient” of agricultural intensity (Control-Biological-Conventional). Preliminary analysis suggests that differentiated Acari scores offer a more precise reflection of soil bioavailability, stability and organic matter dynamics. Our findings advocate for the inclusion of trait-based Acari subdivision as a standard practice to bolster the reliability and discriminative power of soil biological quality assessments. Broader scale research including a higher number and variability of surveyed agricultural lands is planned to be carried in near future to test the significance of the “QBS-ac” usefulness in bioindication in the European Baltic region.

Keywords: QBS-ac Index, Acari, Eco-Morphological Categorization, Agroecosystems, Soil Health

Acknowledgements: This research was supported by the Latvian Council of Science within the Fundamental and Applied Research Programme (project No. LZP-2024/1-0643 Soil biological quality index (QBS) determination using machine learning).

ASSESSING SOIL BIOLOGICAL DIVERSITY ACROSS AGRICULTURAL MANAGEMENT GRADIENT (Poster)

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Agricultural intensification significantly alters soil community structures. This study evaluates soil biological quality across a management gradient-control, biological, and conventional-integrating chemical analysis with the QBS-ar index. Soil cores were sampled for arthropod extraction and chemical characterization, including soil organic carbon, total N, pH, and bulk density. Leveraging high-resolution digital imaging at 30x magnification and Label-Studio software, we performed arthropod identification to the QBS-ar group level. We hypothesize a clear bioindication gradient: control sites yielding the highest QBS values, followed by moderate scores in biological farming systems, and the lowest in conventional fields. By correlating this biological indicator with physicochemical parameters, this research explores the extent to which management-induced shifts in soil properties can predict patterns of soil biological diversity. The results contribute to a more standardized and accessible framework for monitoring soil biological health in agroecosystems.

Keywords: QBS-ar, agriculture, soil biological quality, bioindication, soil physiochemistry, biological diversity

Acknowledgements: This research was supported by the Latvian Council of Science within the Fundamental and Applied Research Programme (project No. LZP-2024/1-0643 Soil biological quality index (QBS) determination using machine learning).

8.8. sekcija. **ZOOLOĢIJA UN
DŽĪVNIEKU EKOLOĢIJA /**
**ZOOLOGY AND
ANIMAL ECOLOGY**

BUTTERFLY MONITORING SCHEMES IN EUROPE (EBMS): FROM CITIZEN SCIENCE TO NATURE CONSERVATION LAW

Cristina G. Sevilleja

Dutch Butterfly Conservation – Vlinderstichting

Butterflies are popular with the general public and sensitive to environmental change. They are relatively easy to identify, and people know a lot about them compared to other insects. This makes them valuable indicators of environmental health. These characteristics present a significant opportunity to develop citizen science initiatives aimed at monitoring and conserving butterflies at national and local levels. Butterfly Monitoring Schemes (BMS) have been developed across Europe for several decades and have since spread beyond the continent's borders. By leveraging citizen science networks, these schemes provide an efficient, cost-effective method of monitoring butterflies, facilitating the calculation of species trends and the identification of conservation areas. Robust data from these schemes has allowed the calculation of indexes such as the Grassland Butterfly Index (GBI), which is based on trends observed in 17 grassland butterfly species. The GBI is explicitly referenced in Article 11 of the EU Nature Restoration Regulation (NRR) on the restoration of agricultural ecosystems. Additionally, the eBMS has dedicated significant resources over several years to addressing the needs, challenges, and methods of enhancing its network. Through several EU-funded projects, eBMS has developed a capacity-building strategy incorporating effective communication, active collaborator involvement and a commitment to continuous improvement. One such project is EPIC-Butterfly, which focuses on producing training materials and courses to improve citizens' knowledge of butterflies in Europe, making butterfly monitoring more accessible. Citizen involvement in this significant monitoring initiative ensures the acquisition of high-quality data and fosters a deeper connection between people and nature. This inspires a sense of discovery and understanding, encouraging environmental protection.

EUROPEAN BREEDING BIRD ATLASES AND THEIR USE IN RESEARCH AND CONSERVATION

Petr Voříšek, Sergi Herrando

European Bird Census Council (EBCC) & Czech Society for Ornithology (CSO)

Data on bird distribution and abundance are needed for understanding bird populations as well as their conservation. In Europe, two continental breeding bird atlases provide information on breeding distribution while breeding bird surveys provide data on population trends. The data from 1st European atlas (EBBA1) have been used in >3.000 scientific papers with climate change, impact of agriculture and habitat loss as main topics. The data from 2nd Atlas (EBBA2, www.ebba2.info), which was published in 2020 and made available online too, were downloaded for various research projects in 168 cases so far. Comparison of EBBA1 and EBBA2 data revealed that species shifted their ranges by 2.4 km/year. However, these shifts can not be explained by climate change and land cover only, the reasons behind the changes in distribution are more complex. EBBA2 also helped us to assess patterns in national population estimates, a key information for e.g. Red lists. The atlases have proved to be extremely useful source of information for further scientific analyses, but organising the atlases at continental scale requires big effort and they can not be updated quickly. Fortunately, development of data infrastructure and modelling methods allow us to test production of distribution atlases in nearly real time. The first attempt at European scale to produce live maps (EBBA Live) covers a set of farmland species and uses the data from breeding bird surveys collated within Pan-European Common Bird Monitoring Scheme (PECBMS, www.pecbms.info). We have been able to produce updated modelled distribution maps and change in distribution between 2013–2017 and 2018–2022 as well. Using data from observation portals organised within EuroBirdPortal (EBP, www.eurobirdportal.org) project will be the next step expected to further improve quality of the outputs.

WHAT IS IN COMMON FOR THE SPECIES DRIVING THE DECLINE OF FOREST BIRD INDEX IN LATVIA

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In 2024 EU Nature Restoration Regulation entered into force. Article 12 of the regulation sets out indicators for forest ecosystem regulation, and the only index mandatory for all member states is the Forest Bird Index (“common forest bird index”), of which member states are obliged to “achieve an increasing trend at national level” with 2024 as a baseline. In Latvia, the Forest Bird Index shows a moderate decline from 2005 to 2025. Our goal was to propose measures that should be taken to reverse this trend under the national Nature Restoration Plan. To achieve this, we disaggregated the Forest Bird Index back to the indices of individual species and tried to identify what traits are in common for the species with declining population trends, i.e., the ones driving the decline of the overall Forest Bird Index.

INSIGHTS INTO THE POTENTIAL OF PASSIVE ACOUSTIC MONITORING TO IMPROVE DATA ON BIRD POPULATIONS IN LATVIA

Mārtiņš Locs

University of Latvia

Due to their high ecological specialization, sensitivity to habitat changes, and wide distribution, birds are considered one of the most reliable indicators of biodiversity and environmental quality (Gregory et al. 2003). Consequently, high-quality data on their population status is essential. Given current technological advancements, conventional monitoring methods could be integrated with Passive Acoustic Monitoring (PAM).

As part of my Bachelor's studies in Biology at the University of Latvia (supervised by Andris Avotiņš), my research aimed to assess current knowledge of bird populations in Latvia and characterize the potential for improvement through PAM. To achieve this, I:

- 1) analyzed bird observation data in relation to high-resolution landscape classification to determine species preferences across various land cover/land use classes;
- 2) evaluated the significance of acoustic signals in species observations;
- 3) assessed the quality of population status assessments in relation to species acousticity – a relative indicator of detectability via PAM.

Around 44% of bird species in Latvia are most frequently recorded acoustically. This indicates significant potential for using PAM to gather additional data on populations and their characteristic acoustic behavior. The value of PAM lies in its ability to conduct surveys 24/7 over several months, providing data on acoustic species that are otherwise difficult to detect using traditional methods. However, there is an undeniable benefit for any vocally active species. By combining this technology with habitat suitability data from State Research Programme project “HiQBioDiv” (VPP-VARAM-DABA-2024/1-0002) it will be possible to enhance our knowledge of rarer, acoustically active species.

Overall, this study identifies the species and landscape classes where PAM would be most effective. Reedbeds are particularly noteworthy; they are difficult to access and generate significant noise during movement, making active human-led surveys inefficient. Conversely, PAM can provide high-quality and far more comprehensive data on species presence in these environments.

DAILY AND SEASONAL VOCAL ACTIVITY OF CHAFFINCHES (FRINGILLA COELEBS) DURING THE NESTING PERIOD USING PASSIVE ACOUSTIC MONITORING DATA

Elizabete Anete Briede, Ainars Aunins

University of Latvia

Monitoring of birds is essential for assessing species distribution and population dynamics, as well as for determining ecological status and developing conservation plans. Passive acoustic monitoring, enabled by autonomous recorders and advancing sound analysis technologies, allows for consistent and extensive data collection, even from remote or hard-to-access areas with greater regularity than that of physical surveys. However, the large volume of data generated makes manual analysis impractical, necessitating automated approaches. Machine learning-based tools, such as convolutional neural networks (e.g. BirdNET), offer scalable solutions, but their ability to accurately detect target species must be critically evaluated for long-term operational use.

Using more than 1,000 recordings from eight recorders placed at different locations during the 2024 nesting season (March–June), this study compares manually annotated recordings with BirdNET's species recognition results. Using Chaffinch (*Fringilla coelebs*) as a model species, the algorithm's ability to detect and correctly recognise its vocalisations is analysed based on the confidence score provided by the algorithm, different types of Chaffinch calls, and other potentially influencing factors. As a result of the analysis, we offer voice type-specific thresholds of the confidence score to be used for selecting reliable vocalisations. The reliable vocalisations obtained for each of the bird's voice types are used to characterise its vocal activity throughout the day and the nesting season.

DIURNAL-NOCTURNAL ACTIVITY OF BARBITISTES CONSTRUCTUS IN ĶEMERU NATIONAL PARK

Aleksandra Koliņa, Rūta Starka

University of Latvia

Barbitistes constrictus is a bush-cricket that lives in coniferous tree canopies, only climbing down to lay eggs in the tree bark. This makes visual observations of the species very rare. Throughout its distribution range information on the species biology and ecology is scarce. Because of recent technological developments, passive bioacoustic recorders are becoming increasingly available. As the species produces ultrasonic sound while stridulating, bioacoustic monitoring represents the most effective method for detecting and studying this species. The acoustic signal of *B. constrictus* is unique among other Orthoptera species present in Latvia. We aimed to analyze the nocturnal-diurnal activity of *B. constrictus* using passive bioacoustic recorders.

Ķemeru National park was chosen as a study area to increase the probability of recording stridulating individuals, based on previous audio-visual observations of *B. constrictus*. Seven Audiomoth recorders were set up in Ķemeru National park, along ecotones between pine and spruce dominated forest stands of varying ages. Each device was set apart so to prevent one stridulation event to be recorded in multiple devices simultaneously. Each device recorded a minute of audio every 30 minutes for 14 days in August and 15 days in October covering the species seasonal activity.

In total, more than 8100 audios were recorded and analyzed. From all audios, 1098 had Orthoptera presence in them, 599 of those being *B. constrictus*. In all sites, the most commonly recorded species were *Tettigonia cantans* and *B. constrictus*, with a few rare recordings of other Orthoptera species. Most of *B. constrictus* stridulation was recorded between 17:00 and 5:00, with highest activity of the species recorded between 00:00 and 3:00, which indicates a predominantly nocturnal behavior. With only 14 audio recordings in “Xeno-Canto” database in the entire species distribution range, this research represents the first thorough analysis of *B. constrictus* stridulation activity.

USE OF FPV AND CONVENTIONAL UAV'S FOR MONITORING BREEDING SUCCESS OF DIURNAL BIRDS OF PREY AND BLACK STORKS

Dāvis Ūlands, Kārlis Millers

Unmanned aerial vehicles (UAVs) provide opportunities for efficient monitoring of breeding state in forest-nesting raptors and Black Storks. We present practical field experience from the combined use of first-person-view (FPV) drones and conventional UAVs during nest inspections.

Between 2022 and 2025, over 600 nest controls were conducted. FPV drones were used for nests located within the tree canopy, where traditional drones cannot easily access. This approach proved effective for species such as *Buteo buteo*, *Clanga pomarina* and other species. Conventional UAVs were used for nests visible from above – nests located in the upper canopy, on nesting platforms or tree tops (e.g. *Haliaeetus albicilla* and *Pandion haliaetus*). The average duration of a nest inspection was ~ 5 minutes, with 2–4 minutes of actual flight time.

No attacks on drones were observed. A single disturbance event occurred when a female *Clanga pomarina* flushed from a nest during incubation; the bird returned the following day and breeding continued normally. In several cases *Clanga pomarina* remained on the nest during FPV inspection when the drone maintained a distance of more than 5–10 m.

The method offers several advantages: rapid nest status assessment, detection of nestlings hidden from ground view, and photographic documentation with geolocation. UAV inspections also clarified nest status in cases where nests appeared abandoned during ground observations but were later confirmed to be active. Conventional drones additionally enable inspection of large nests from distances of up to 2 km (where permitted and depending on signal strength), significantly reducing survey time.

Key challenges include determining nest activity during short visits, flight limitations in wind conditions above Beaufort scale 4, and evaluating potential behavioural effects following UAV inspections.

WHAT CITIZEN SCIENCE TELLS US ABOUT CHANGES OF HIBERNATION BEHAVIOUR IN MIGRATORY SPECIES OF BATS

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In recent decades, there have been many reports of supposedly migratory bat species hibernating in their summertime habitats in northern Europe. In Latvia, no research has been conducted to identify the wintering sites of these species. However, there has been an increasing number of reports of such bats being found in different places during the winter, mostly after severe frost. This report summarizes the current data on the winter observations of three bat species (the Parti-colored bat, *Vespertilio murinus*; the Nathusius' pipistrelle, *Pipistrellus nathusii* and the Noctule bat, *Nyctalus noctula*) in Latvia registered during the last decades from late autumn to early spring. We used observations in which the species could be verified by high-quality pictures sent to bat experts, reports on the Dabasdati.lv portal and occasions in which bats were transferred to Riga Zoo for rehabilitation.

PATTERNING AND STRUCTURE OF CRANIAL DERMAL BONE ORNAMENTATION IN EXTANT AND EXTINCT AMPHIBIANS: AN EVOLUTIONARY AND HISTOMORPHOLOGICAL REVIEW

Florian Witzmann, Leyli Purrafee Dizaj, Nadia Fröbisch

Museum für Naturkunde, Berlin, Germany

The ornamentation on cranial dermal bones represents a widespread and characteristic feature among amphibians, although its evolutionary origin and functional significance remain subjects of ongoing discussion. This research examines cranial sculpture in temnospondyls and Lissamphibia, with particular emphasis on its evolutionary development and distribution across these lineages. Evidence from both fossil specimens and modern histological studies is synthesized to describe the macrostructural patterns and microstructural organization of sculptured dermal bone. In addition, this review discusses several functional hypotheses, including roles in mechanical re-inforcement, physiological processes such as thermoregulation or fluid balance, and potential functions in ecological interactions or behavioural display. The biological and developmental mechanisms responsible for the formation and patterning of dermal ornamentation are also considered, providing insight into how these structures emerge and change through growth and evolution.

RELATIONSHIP BETWEEN THE COMPOSITION OF ORIBATID MITES (ACARI: ORIBATIDA) AND COLEMBOLA (HEXAPODA: COLLEMBOLA) MORPHOGROUPS AND COPROPHAGIA BASED ON THEIR PRESENCE IN EXCREMENTS OF ARTIODACTYLS (ARTIODACTYLA) HELD IN CAPTIVITY COMPARED TO SOIL SAMPLES OBTAINED FROM THREE DIFFERENT FARMS IN LATVIA

Tabita Saukāne, Andris Avotins, Uģis Kagainis

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The important role of Oribatida and Collembola in soil ecosystems is closely linked to the de-composition of plant residues and the promotion of soil fertility. Herbivores such as Artiodactyla consume large amounts of plant biomass, which is processed through digestion and returned to the soil as excrement, thereby providing a concentrated resource for soil decomposers in Artiodactyla farms. Seasonal variation can influence the quality, structure, and composition of Artiodactyla excrement, while feeding practices – particularly under captive conditions – may also play a significant role.

In theory, the analysis of Oribatida and Collembola assemblages in excrement and soil could be used to investigate the digestive health of Artiodactyla as a non-invasive indicator and may have broader ecological relevance. The aim of this study was to identify the key factors influencing the abundance and composition of Oribatida and Collembola inhabiting excrement and soil, and to assess whether these communities reflect differences in food base quality among Artiodactyla farms.

In total, 4051 adult Oribatid individuals and 35982 adult Collembolan individuals were identified across three farms. A new Collembola species for Latvia, *Spinonychiurus* sp., was recorded at one of the farms. Our results demonstrate that farm-specific management significantly affects morphogroup diversity and individual abundance. Notably, *Hypogastrura* sp. was eudominant in excrement samples, suggesting a specialized trophic relationship within the family Hypogastruridae and highlighting the need for further investigation of coprophagous behaviour. Overall, these findings support the potential use of Oribatida and Collembola as bioindicators for livestock management assessment, although further research is required to refine their diagnostic application.

ECOLOGICAL FACTORS INFLUENCING THE ABUNDANCE OF *PODISMA PEDESTRIS* (ORTHOPTERA: ACRIDIDAE) IN CENTRAL LATVIA

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Common mountain grasshopper *Podisma pedestris* is an endangered and protected species in Latvia, as well as in several other European countries. According to the IUCN Red List of Threatened Species, the population trend of the species is declining. Information on suitable habitats and over-all ecology of *P. pedestris* in the Baltic region is scarce and limits the implementation of effective conservation measures. The aim of this study is to identify the factors influencing the abundance of *P. pedestris* in Central Latvia, where the majority of the species' known localities in the country are concentrated.

In potentially suitable habitats for *P. pedestris*, the abundance of all Orthoptera species was recorded, vegetation and landscape factors were characterized. Collected data were analyzed using binomial N-mixture models to define environmental covariates of species' detection and abundance.

P. pedestris populations were found to be concentrated around sandy roads and forest clearings. These habitats were predominantly characterized by poor sandy soil, and a mosaic of small shrubs, grass and coniferous litter cover.

The species is most abundant in landscapes dominated by coniferous forests with sparse vegetation, shrubs and local low-growing shrub cover. The probability of detecting an individual is most significantly influenced by the proportion of exposed soil, shrub and grass cover, and vegetation height.

DOES THE POLLARD STANDARD ENSURE DATA COMPARABILITY? ANALYSING SPECIES AVAILABILITY AND DETECTION PROBABILITY: A CASE STUDY OF THE LARGE WHITE (PIERIS BRASSICAE)

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Butterflies are widely recognised as sensitive indicators of environmental quality. However, their populations in Europe have declined markedly over the past century. This issue has become particularly important under the EU Nature Restoration Regulation (2024/1991), which sets legally binding targets for biodiversity restoration and halting pollinator declines. One key indicator used to assess ecosystem condition is the Grassland Butterfly Index, largely based on the Pollard walk method. This method assumes that observed abundance reflects true population size, but it does not account for variation in detection probability between surveys. Instead, detection probability is assumed to remain relatively constant through the standardisation of survey conditions.

Using the Large White (*Pieris brassicae*) as a case study, this research evaluates the limitations of the Pollard method by applying distance sampling and hierarchical models. The study quantifies how detection probability changes with distance from the observer within the Pollard zone and tests whether survey conditions influence individual availability for detection, assessing whether the standardized conditions proposed by the Pollard method ensure data comparability.

The results demonstrate that detection probability declines significantly with the distance from the observer: approximately 94% of available individuals are detected within the 0–0.5 m band, whereas only 11% are detected within the 1.5–2.5 m band. Comparison of posterior simulations of the modelled parameters reveals that under highly favourable weather conditions (temperature 33 °C, 100% sunshine), species availability is significantly higher, and the average detection probability is 26 times greater than under the minimum Pollard standard requirements (temperature 16 °C, 60% sunshine).

These findings demonstrate that environmental factors substantially influence both availability and detection probability, and that standardised survey conditions do not eliminate this variability. This could lead to biased population trend estimates. Incorporating detectability corrections into monitoring protocols would improve data reliability and strengthen the scientific basis for nature conservation policy implementation.

APIARY DENSITY AND PARASITE PRESSURE: EXPERIMENTAL EVIDENCE OF SPATIAL EFFECTS ON BOMBUS TERRESTRIS COLONY PERFORMANCE

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The rapid increase of managed honeybee (*Apis mellifera*) colonies in agricultural and semi-natural landscapes has intensified concerns about their ecological impact on other pollinators. Beyond re-source competition, apiaries may facilitate parasite spillover and alter disease dynamics within pol-linator communities. We experimentally assessed how spatial proximity to honeybee apiaries influ-ences parasite infestation, reproductive investment and immune function in commercial colonies of buff-tailed bumblebees (*Bombus terrestris*) placed under natural field conditions in southeastern Latvia.

Standardized colonies originating from the same breeding line were positioned at five distances from apiaries (0–600 m). We monitored infestation by the wax moth *Aphomia sociella*, quantified reproductive output (number of young queen and worker cells), and measured cellular immune performance using a standardized encapsulation assay. Statistical analyses included logistic re-gression and linear models evaluating the independent effects of distance and infestation status. Infestation probability declined significantly with increasing distance from apiaries, approaching zero at 600 m. Colonies located closer to apiaries produced fewer reproductive cells, indicating re-duced colony performance. Independently of spatial effects, infested colonies exhibited markedly lower reproductive output and suppressed immune responses. Encapsulation capacity increased with distance from apiaries, suggesting improved physiological condition further from managed honeybee concentrations.

Our findings indicate that apiary proximity can act as a spatial driver of parasite pressure and immunocompromise in *B. terrestris* colonies. The combined effects of increased infestation risk and reduced immune function may compromise colony fitness and potentially influence pollina-tor community dynamics. Although commercial colonies were used as an experimental model, the results highlight the importance of incorporating spatial planning of managed honeybee apiaries into pollinator conservation and landscape sustainability strategies, particularly in biodiversity-sensitive areas.

WILDLIFE DIVERSITY IN HEMIBOREAL OLD-GROWTH FOREST STANDS: PRELIMINARY INSIGHTS FROM CAMERA TRAPPING, AUDIO RECORDING, AND POLLINATOR SAMPLING (Poster)

Laura Ķēniņa

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One of the primary values of old-growth forests is their role as habitats for wildlife. However, studies examining differences in wildlife diversity, including mammals, birds, and forest pollinators, between old-growth and younger forests remain limited. This study aims to assess differences in biodiversity composition between mature (control) and old-growth Norway spruce and Scots pine-dominated stands in Latvia.

For wildlife evaluation, a total of 60 forest stands were selected, including 30 old-growth stands (15 Norway spruce and 15 Scots pine-dominated stands) and 30 control stands (managed mature stands). In 2025, 59 trail cameras were deployed in spruce stands (both old-growth and mature) for mammal detection (April–October), and 45 passive acoustic sensors Song Meter mini 2 were installed (April–July) for bird survey in old-growth stands, as well as mature spruce stands. Pollinator abundance and diversity was assessed using pan traps in 12 stands, sampling once per month from May–August. Sampling involved 18 pan traps per sample plot and 6 sample plots per stand, resulting in 256 samples in total.

In 2025, a total of 2165 images of 36 medium-to-large vertebrate species (mammals and birds) were obtained, including brown bears, capercaillie, Eurasian wolves, northern lynx, and others. Species composition did not differ significantly between mature and old-growth stands; however, trapping rates showed some differences. For the first time in European hemiboreal forests, the biodiversity-related data from old-growth and mature stands have been systematically gathered, and this work will continue.

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USING GEOMETRIC MORPHOMETRICS TO ASSESS VARIATIONS IN RODENT MANDIBLE SHAPE ACROSS DIFFERENT HABITATS (Poster)

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Rodents' mandible is one of the most plastic bones in the skeleton. Mandibular shape may reflect the state of an animal and of a whole population. Multiple environmental factors may affect the mandible shape and size. Morphological parameters of the mandible are highly affected by the animals' diet. It was shown that rodents fed soft diet have shorter and narrower mandibles, smaller jaw adductor muscles and smaller muscles attachment areas in contrast with animals fed hard diet. It has also been suggested that the epigenetic regulation of the mandible shape may exist in animals fed similar diet over multiple generations.

One of the principal approaches for evaluating shape variability is geometric morphometrics. This method uses statistical analysis of shape based on objects' anatomical landmark coordinates in a Cartesian coordinate system.

In this preliminary study, we aimed to analyse mandibular shape variation in three local small rodent species – striped field mouse, bank vole, and common vole – inhabiting different environments in Lithuania, using geometric morphometrics. We found significant shape variation among the three striped field mouse populations, which inhabit distinct environments. Both age and habitat were significant factors influencing mandible shape, although the effect of habitat was stronger. In common vole, both age and habitat significantly affected shape, with age having a stronger impact than habitat. In Bank vole, habitat had no significant effect, while age was significant; however, the two populations studied were located in close proximity to each other. Overall, our results indicate that habitat can have a significant influence on rodent mandible shape. Our next step will be to investigate shape variability among populations of diseased rodents inhabiting green zones in Riga.

WHO'S MORE AFRAID OF THE BIG BAD WOLF? – AN ATTITUDES SURVEY IN BALTIC STATES (Poster)

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Grey wolf (*Canis lupus*) conservation is shaped not only by ecological factors but also by social values, risk perceptions, and stakeholder interests. Fear can be a significant part of a person's attitude towards carnivores and can influence behavioural intentions towards them, thus creating additional challenges for balancing the conservation of a sustainable wolf population with public interests, hunting management, and damage mitigation. As wolf populations expand across national borders in the Baltic region, understanding attitudes at the biological population level is essential for socially sustainable management.

In 2022–2023, a survey on the public's attitudes towards large carnivores was conducted across three Baltic States. Electronic questionnaires were distributed through schools, stakeholder organisations (hunters, farmers, beekeepers, and nature conservation NGOs), social media, and regional newspapers. Among other questions, respondents were asked to answer whether they agree or disagree that it is dangerous to encounter these animals in the wild. A total of 4740 respondents completed the questionnaires.

Perceptions of danger varied across countries and stakeholder groups. Overall, Latvian respondents expressed the most negative opinions, and Estonian respondents were the least concerned. In the General public group, respondents from Lithuania considered wolves less dangerous than those from other countries. In the Hunter group, almost twice as many respondents in Latvia and Lithuania found wolves dangerous as in Estonia. A similar pattern was observed in the Farmer/Beekeeper group. In the Nature conservation NGO group, Lithuanians were least likely to consider wolves dangerous.

Differences among the countries and groups are largely driven by variations in wolf population status, public and stakeholder trust in wildlife management institutions' decisions and their conflict-mitigation capacity, as well as by respondents' demographic factors (sex, age), personal experience, and knowledge about wolves. The information gained can be used to develop and implement country-specific, targeted adaptations to wolf population management strategies.

AUTUMN AND WINTER ACTIVE GROUND SPIDERS IN THE UNIVERSITY OF LATVIA BOTANICAL GARDEN (Poster)

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There are approximately 5780 known spider species in Europe, around 500 of them are found in Latvia. Previous studies of spider fauna have been conducted in various locations, predominantly within natural habitats. In contrast, considerably less is known about urban environments and green zones within cities, where parks may function as habitat islands supporting higher levels of biodiversity.

It is well established that most spider species are active during the spring and summer season, while only a limited number of species can survive harsh environmental conditions such as cold autumns and snowy winters. Nevertheless, the continued activity of other invertebrates, which serve as food resources for spiders, allows some species to remain active during the non-vegetation season and take place in the food web. Little is known about spider autumn and winter activity in Latvia, as only one study on spider activity in grey dunes has been conducted.

The research so far was conducted in University of Latvia Botanical Garder from September 25th, 2025, until February 26th, 2026. Altogether, six pitfall traps were placed. The pitfall traps were placed near trees or shrubs. The samples were collected once every two weeks. Spider species were identified and later put into sample containers for further safekeeping. Temperature data was taken from Latvian Environment, Geology and Meteorology Centre.

Research data are still being processed; however, it is already known that large proportion of the identified spiders belong to the sheet-web spider family (Linyphiidae).

BARK-DWELLING SPIDERS DURING THE AUTUMN AND WINTER PERIOD IN THE UNIVERSITY OF LATVIA BOTANICAL GARDEN AND VĪKSNA PARISH (Poster)

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Spiders are one of the most important invertebrate predators in most ecosystems. Since they primarily function as secondary consumers in the food chain, they play a crucial role in maintaining ecological balance and preserving biodiversity. Many spider species use vegetation, including trees, as their habitat. This specific group of spiders is relatively little studied in Latvia, as there haven't been any recent research focusing on bark-dwelling spiders in this region since last centuries 20s. The purpose of the study was to determine bark-dwelling spider families and species in the territories of the University of Latvia Botanical Garden and Viksna parish, as well as to evaluate the impact of various abiotic factors such as tree species, tree trunk circumference, trap height from ground and mean air temperature on their composition. Cardboard traps and modified pitfall traps were used to collect the samples, which were placed on tree trunks in the study areas. In total, the traps were placed on 8 trees in the University of Latvia Botanical Garden and on 20 trees in Viksna parish during the period from September 2025 to January 2026. Research data is still being processed, but it has been established that species from the Linyphiidae family and *Anyphaena accentuata* (Anyphaenidae) were dominant among the bark dwelling spiders during the study period. In addition, limited research on spiders on bark led to the discovery of at least one spider species new to Latvia.

RECENT FINDINGS ON THE SPIDER FAUNA OF LATVIA (Poster)

Inese Cera

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The number of spider species in Latvia has exceeded 500. Intensive research conducted over the past 20 years has led to the discovery of several new species in specific habitats, including grey dunes, peat bogs, and fens. Additionally, new spider records have resulted from citizen science initiatives, particularly through observations submitted to the biodiversity database Dabasdati. These newly recorded (over the past 10-12 years) species include *Eresus sandaliatus*, *Larinioides ixibolus*, and *Harpactea rubicunda*. Furthermore, *Hyptiotes paradoxus*, previously identified (2009) from forest habitat in Nature Park Engure Lake, has since also been recorded in www.dabasdati.lv. Species *Phalangoides opilionides* are also recorded, but the specimen needs to be checked.

Additional data obtained from the home page Dabasdati.lv were used in the assessment of spider species for the Red Data Book of Latvia. Based on records from this database, the following species were assessed: *Arctosa cinerea*, *Dolomedes plantarius*, *Arctosa perita*, and *Eresus sandaliatus*. The last one is a rare species, found recently in Lithuania.

Some new findings are on the species *Arctosa cinerea*, the diurnal activity, and the population size. The study was done in a small territory and can be assumed as efforts to understand more species ecology.

Now there is a study on spider activity on the ground during the non-vegetation season and faunal composition of spiders living and foraging on tree barks, both studies are performed at the Botanical Garden. These studies are expected to provide valuable insights, as previously such studies had not been performed.

8.9. sekcija. **AUGU ZINĀTNE, EKOSISTĒMU
NOTURĪBA UN ILGTSPĒJĪGI
BIORESURSI /**

**PLANT SCIENCE, ECOSYSTEM
RESILIENCE AND SUSTAINABLE
BIORESOURCES**

SAKARĪBA STARP VĀRPAINĀS KORINTES *AMELANCHIER SPICATA* IZPLATĪBU UN AUGSNES FAKTORIEM RĪGAS PILSĒTAS MEŽOS

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Pētījums tika veikts ar mērķi noskaidrot vārpainās korintes *Amelanchier spicata* (turpmāk – korinte) izplatības ietekmējošos augsnes faktoros Rīgas pilsētas mežos. Pētījumā tika izvēlētas septiņas teritorijas – Buļļu, Kleistu, Anniņmuižas, Šampētera, Mangaļsalas un Vecāķu, Biķernieku un Šmerļa meži. Pētāmās teritorijas tika sadalītas 500 x 500 m, lielos parauglaukumos, no kuriem katrā tika izvēlēti divi 10 x 10 m lieli parauglaukumi – viens ar korinti, un otrs bez tās.

Katrā parauglaukumā uzskaitītas sastopamās augu sugas, noteikts koku vainagu segums (procentos), parauglaukumos ar korinti tika nozāģētas dažādu izmēru korintes ripas vecuma noteikšanai, kopumā ievākts 451 paraugs. Pētījumā 44 parauglaukumos ar augsnes zondi ievākti O horizonta paraugi ķīmisko analīžu veikšanai. Laboratorijā augsnes paraugiem noteikts skābums, apmaiņas katjoni (Ca^{2+} , Mg^{2+} , K^+ , Mn^{2+} , Al^{3+} , Fe^{2+}), slāpekļlis, ogleklis un fosfors.

Parauglaukumos sastopamajām sugām veikta indikatorsugu analīze, katrai sugai tika aprēķināta indikatorvērtība attiecībā uz to vai suga ir sastopama parauglaukumos ar korinti vai nav, rezultātā tika iegūtas indikatorsugas, kuras ir saistītas ar korintes izplatību. Korintes izplatību ietekmējošie augsnes faktori meklēti ar vispārējiem lineāriem modeļiem (GLM), izmantojot binārās loģistikas regresiju.

Secināts, ka korintes izplatība ir cieši saistīta ar tādām sugām kā parastais pīlādzis *Sorbus aucuparia*, parastā kļava *Acer platanoides*, meža zemene *Fragaria vesca*, parastais ozols *Quercus robur*, āra bērzs *Betula pendula* un melnalksnis *Alnus glutinosa*. Korinte turpina izplatīties, jo tika novēroti dzinumi, kas jaunāki par pieciem gadiem. Vislabāk korinte aug daļēji noēnotos apstākļos. Korintes izplatību ietekmē augstā slāpekļa un zemā oglekļa koncentrācija. Noskaidrots, ka augsnes faktori ietekmē korintes izplatību, bet nav zināms vai korinte ir ieviesusies pirms augsne kļuva barības vielām bagātāka vai pēc tam.

DZELTENĀS AKMEŅLAUZĪTES *SAXIFRAGA HIRCULUS* L. DZĪVOTŅU EKOĻOĢISKAIS RAKSTUROJUMS

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Dzeltenā akmeņlauzīte (*Saxifraga hirculus* L.) sastopama galvenokārt ziemeļu reģionos, no vēsās līdz aukstajai joslai, atsevišķas atradnes arī kalnos siltāka klimata apvidos. Latvijā šobrīd droši zināma vien 19 purvos, lai gan vēsturisko atradņu skaits ir bijis lielāks. Ņemot vērā, ka nelabvēlīgos vides apstākļos suga var neveidot virszemes dzinumus vienu vai vairākus gadus, aktuāls ir jautājums par šīs sugas dzīvotņu atpazīšanu arī tad, kad suga nav konstatējama. Sugas dzīvotņu raksturojumi Latvijā līdz šim bijuši vispārīgi, nav sniegts augāja raksturojums, kā arī ir publicēta tikai fragmentāra cita veida informācija par sugai nepieciešamajiem vides apstākļiem. Pētījuma mērķis ir raksturot dzeltenās akmeņlauzītes dzīvotnes Latvijā – augu sabiedrību floristisko sastāvu, vides apstākļus – pH, elektrovadītspēju, ūdens temperatūru un ūdens līmeni. 2025. gadā pētījumi veikti deviņos purvos, kā arī izmantoti dati vēl no trim purviem, kur sastopama šī suga. Mūsu pētījuma rezultāti liecina, ka dzeltenā akmeņlauzīte galvenokārt aug avotu purvos, kuriem cauri tek avotstraumi un aizaugušās, pārpurvotās ezeru daļās, kur pazemes ūdeņi plūst difūzi caur kūdru no blakus esošajām minerālaugsnēm. Dzeltenā akmeņlauzīte visbiežāk konstatēta savienību *Saxifraga-Tomentypnion nitentis* un *Sphagno warnstorffii* – *Tomentypnion nitentis* sabiedrībās, vietās, kur ūdens līmenis līdz sfagnu vai zaļsūnu galotnēm bija no 5 cm līdz 25 cm, izvairoties no ilgstoši zem virsūdeņiem esošām liekņām. Purvu ūdeņu elektrovadītspējas (EC, $\mu\text{S}/\text{cm}$) mērījumi sugas augšanas vietās liecina, ka tie galvenokārt ir minerālvielām vidēji bagāti, vāji skābi līdz vāji bāziski, un to temperatūra bija no 10,1°C līdz 18,4°C. Avotu purvos bieži tika novēroti dzelzs savienojumu nogulumi. Iegūtie rezultāti var tikt izmantoti sugas izplatības modelēšanā, Natura 2000 teritoriju monitoringā, dabas ekspertu apmācībās.

AUTOMATIZĒTA METADATU IEGUVE NO LATVIJAS HERBĀRIJU KOLEKCIJĀM: ČEMURZIEŽU DZIMTAS (*APIACEAE*) PIEMĒRS

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Pašreizējo situāciju Latvijas herbāriju kolekcijās raksturo nepietiekama herbārija etiķešu un pašu herbārija lapu digitalizācija, kā arī ierobežota šo datu pieejamība. Šobrīd sistēmisku datu ievadi PlutoF platformā īsteno Daugavpils Universitātē (DU), turpretī pārējo lielāko kolekciju digitizēto un digitālizēto datu pieejamība joprojām vērtējama kā nepietiekama, kas būtiski apgrūtina pētījumus botānikā.

Šī pētījuma ietvaros, iepazīstoties ar Latvijas Universitātes Bioloģijas institūta Herbārija (LATV) čemurziežu dzimtas (*Apiaceae*) herbārija kolekciju, tika aprobēta pusautomātiska metadatu ieguves metode no herbārija etiķetēm, izmantojot uz GPT-4 platformas balstīto lielo valodu modeli (ChatGPT maksas versiju), kuras mērķis bija paātrināt datu ieguvu. Pētījuma metodika balstījās uz pakāpenisku uzvednes (prompta) precizēšanu, lai sasniegtu vēlamos rezultātus. Iegūstamā informācija tika strukturēta 12 datu laukos: institūcijas nosaukums, inventāra numurs, suga, rajons, vietas apraksts, datums, ievācējs, noteicējs, apraksta numurs, ģeobotāniskais rajons, augšuplādētā faila nosaukums un etiķetes veids (drukāta vai ar roku rakstīta). Pateicoties spējai izprast kontekstu, neironu tīkls sekmīgi atpazīna informāciju pat no nekvalitatīviem attēliem vai etiķetēm. Dati tika automātiski strukturēti CSV formātā, pieļaujot lejupielādi un izmantošanu tālākai apstrādei un analīzei.

Procesā tika apstrādātas vairāk nekā 340 dažāda veida un perioda herbārija etiķetes. Rezultāti apliecināja, ka mākslīgā intelekta rīku izmantošana ļauj efektīvi identificēt dublikātus. Metode ir īpaši noderīga darbā ar dažādos periodos drukātajām etiķetēm, kur tika konstatēta ļoti augsta precizitāte un spēja strukturēt informāciju norādītajos laukos. Šāda pieeja ļauj operatīvi integrēt vietējās kolekcijas starptautiskajās datubāzēs (piemēram, GBIF), nodrošinot to plašu pieejamību un efektīvu izmantojamību.

PARASTĀS EGLES (*PICEA ABIES* (L.) H. KARST.) AUDŽU PIEAUGUMS PĒC DAŽĀDĀ VECUMĀ VEIKTAS KRĀJAS KOPŠANAS

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Plānojot mežsaimnieciskos pasākumus, ir svarīgi izvēlēties piemērotāko audzes vecumu kopšanas ciršu izpildei. Pašlaik starp meža apsaimniekotājiem un zinātniekiem dominē viedoklis, ka krājas kopšanas cirte parastās egles audzēs Latvijā tiek veikta novēloti, līdz ar to samazinot kopšanas cirtes efektu uz koku pieaugumu. Tādējādi pētījuma mērķis bija noskaidrot dažādā vecumā veiktas krājas kopšanas cirtes ietekmi uz parastās egles pieauguma rādītājiem.

Pētījums veikts 2023. un 2024. gadā divos atšķirīgos Latvijas reģionos AS “Latvijas valsts meži” apsaimniekotās mežaudzēs vērī: LVM Rietumvidzemes reģiona Valmieras, Rūjienas un Limbažu meža iecirkņos (12 audzes), kā arī LVM Zemgales reģiona Dobeles, Engures, Īles, Kandavas un Tērvetes iecirkņos (12 audzes). Pieauguma rādītāju salīdzināšanai katrā reģionā izraudzītas parastās egles tīraudzes ar valdošās sugas vecumu 40, 50 un 60 gadi, kurās pirms 10 gadiem izdarīta krājas kopšana (katram vecumam 3 audzes), kā arī, katram vecumam – viena audze, kurā krājas kopšana nav notikusi. Pētītajās mežaudzēs ierīkoti aplveida parauglaukumi (rādiuss 7.98 m), veikti koku caurmēra un augstuma mērījumi, kā arī iegūti koksnes gadskārtu urbumu serdeņi dendrometrisko rādītāju pieauguma noteikšanai.

Salīdzinot audzes krājas kumulatīvo papildus pieaugumu 30, 40 un 50 gadu vecumā koptās egles audzēs, noskaidrots, ka krājas kumulatīvais papildus pieaugums ir statistiski būtiski augstāks pēc agrākā vecumā izdarītas krājas kopšanas. Konstatēts, ka krājas kopšanas cirtei ir pozitīva ietekme uz parastās egles pieauguma rādītājiem, ja tā tiek veikta 30 un 40 gadu vecumā.

Pētījumā iegūtie rezultāti apstiprina izvirzīto hipotēzi, ka agrāka krājas kopšanas cirte būtiski paaugstina kokaudzes produktivitāti un pieauguma rādītājus.

ALGORITMS EIROPAS NOZĪMES MEŽA BIOTOPU KVALITĀTES NOVĒRTĒJUMAM LATVIJĀ

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Dabas skaitīšanas projekta ietvaros no 2017. līdz 2021. gadam Latvijā tika apzināti Eiropas nozīmes biotopi, tajā skaitā arī meža biotopi. Katram biotopam eksperts kartē iezīmēja robežas un aizpildīja anketu, kur tika norādīts biotopa veids, kvalitātes vērtējums un raksturotas dažādas struktūras, kā arī biotopu raksturojošās un citas sugas. Biotopa kvalitātes vērtējums ir nozīmīgs biotopu aizsardzības un apsaimniekošanas pasākumu plānošanai.

Meža biotopu apzināšanā tika iesaistīti vairāk nekā 350 eksperti. Lai mazinātu vērtējumu atšķirības starp novērotājiem, kvalitātes vērtēšanai tika izstrādāti katram biotopam specifiski algoritmi, kas balstīti uz mežaudzes struktūru raksturojumu. Meža biotopiem to izstrādāja Latvijas Universitāte ES LIFE programmas projekta “Natura 2000 aizsargājamo teritoriju pārvaldības un apsaimniekošanas optimizācija” ietvaros.

Lai nodalītu nozīmīgākās biotopu kvalitāti ietekmējošās pazīmes, katram biotopam atsevišķi veica galveno komponentu analīzi (PCA). Realizēja arī loģistisko regresiju (GLM), kā atkarīgo mainīgo izmantojot PCA pirmās ass, vērtības (*scores*). Šī ass tika asociēta ar kvalitātes gradientu.

Balstoties uz analīžu rezultātiem, algoritmu veidošanai izvēlējās piecas līdz vienpadsmit pazīmes. Katrai pazīmei deva novērtējumu punktus, kas var būt specifisks katram no biotopiem. Pēc atbilstošā punktu skaita piešķiršanas katram poligonam, poligona ietvaros tos summēja. Balstoties uz katram biotopam specifiskām robežvērtībām, izdalīja četras kvalitātes klases – zema, vidēja, laba un izcila.

Salīdzinājumā ar ekspertu vērtējumu jaunajā algoritmā vērtējumi pārsvarā ir nedaudz augstāki. Vairumā gadījumu algoritmā ir vairāk izcilu vērtējumu, bet bieži arī zemu vērtējumu ir vairāk. Lielākās atšķirības ir biotopiem 9010* – vairāk izcilu vērtējumu (20,3% pret 7,8%), mazāk labu; 9050 – vairāk izcilu vērtējumu (25,9% pret 6,8%), mazāk labu un vidēju.

ZEILERA PLAKANSTAIPEKŅA *DIPHASIASTRUM* × *ZEILLERI* APSAIMNIEKOŠANAS PASĀKUMU IETEKME UZ TĀ SASTOPAMĪBU

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Diphasiastrum × *zeilleri* ir *Diphasiastrum complanatum* un *Diphasiastrum tristachyum* hibrīds, kura izplatība Latvijā ir maz pētīta. *D. complanatum* un *D. tristachyum* ir reti sastopami un ir iekļauti īpaši aizsargājamo sugu sarakstā. Visas *Diphasiastrum* spp. sugas ir iekļautas Latvijas Sarkanās grāmatas jaunākajā izdevumā. Lai iekļautu *D. × zeilleri* īpaši aizsargājamo sugu sarakstā un plānotu tā aizsardzību, nepieciešami pētījumi par tā ekoloģiju un izplatību Latvijā.

D. × zeilleri sastopams sausos priežu mežos ar izklīdētu apgaismojumu, atsegtu vai mineralizētu augsni un nelielu konkurenci ar citām zemsedzes sugām. Lai gan attīstība no sporām ir lēna, pieaugušie augi var izplatīties veģetatīvi, īpaši gar meža ceļiem un stigām.

Pētījuma teritorija atrodas Viduslatvijas zemienes Taurkalnes līdzenumā, Viduslatvijas ģeobotāniskajā rajonā. 2016. gadā atklāta jauna *D. × zeilleri* atradne 10,2 ha platībā, un 2017. gadā daļā no tās – 3,8 ha platībā – veikta kopšanas cirte ar mērķi uzlabot *D. × zeilleri* augšanas apstākļus. Pirms kopšanas cirtes uzsākts monitorings 55 parauglaukumos gan koptajā atradnes daļā, gan pārējā daļā, kur apsaimniekošanas pasākumi netika veikti.

Lai novērtētu izmaiņas zemsedzē un noskaidrotu, vai veiktās mežsaimnieciskās darbības ir pozitīvi ietekmējušas *D. × zeilleri* izplatību, pētījumā tika salīdzināti 2016. un 2024. gados veiktie parauglaukumu apraksti.

Pēc apsaimniekošanas ir notikušas izmaiņas zemsedzes struktūrā, tostarp ķērpju, sūnu un sīkrūmu projektīvajos segumos, kā arī nobiru daudzumā, kas potenciāli var ietekmēt *D. × zeilleri* sastopamību. Sākotnēji – 2016. gadā *D. × zeilleri* vidējais projektīvais segums parauglaukumos bija 4,62 %, savukārt 2024. gadā tas palielinājās līdz 8,23 %.

BIOTOPA 2180 MEŽAINAS PIEJŪRAS KĀPAS KVALITĀTI IETEKMĒJOŠIE FAKTORI

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Viens no “Dabas skaitīšanas” projekta ietvaros kartētajiem Eiropas nozīmes meža biotopiem ir 2180 *Mežainas piejūras kāpas*. Balstoties uz ekspertu sniegto informāciju, kas apkopota dabas datu pārvaldības sistēmā “Ozols”, LIFE integrētā projekta “Natura 2000 aizsargājamo teritoriju pārvaldības un apsaimniekošanas optimizācija” ietvaros Latvijas Universitātē tika izstrādāts algoritms šā biotopa kvalitātes vērtējumam. Tas nepieciešams, lai labāk varētu definēt biotopa aizsardzības prioritātes un efektīvāk plānot tā apsaimniekošanas pasākumus. Kopā tika aplūkoti anketu dati par 1197 šī biotopa poligoniem, kurus izmantoja algoritma izstrādē, lai noteiktu nozīmīgākos ar biotopa kvalitāti saistītos faktorus.

Salīdzinājumā ar citiem Eiropas nozīmes meža biotopiem konstatēts, ka analizējamā biotopā 2180 *Mežainas piejūras kāpas* ir lielākas kvalitātes atšķirības. Ir izcilas un labas kvalitātes mežaudzes (attiecīgi 13 % un 32 % no aplūkotajām), bet daļai ir raksturīga zema kvalitāte (18 %), kas skaidrojama ar to, ka pie šā biotopa pieder arī jaunas mežaudzes bez nozīmīgām uz dabiskumu norādošām struktūrām vai bijusi pārmērīga antropogēnā ietekme.

Tika veikta Galveno komponentu analīze (PCA), izmantojot datus par mežaudzes struktūrām. Kā nozīmīgākos faktorus, kas saistīti ar biotopu kvalitātes gradientu, tā izcēla dažādvecuma audzes struktūru, vecu koku, kritalu, sausokņu, dzeņu sakaltu koku un atvērumu daudzumu.

Pozitīva saistība ar kvalitāti ir arī reto un aizsargājamo sugu klātbūtnei un negatīva ekspansīvo un invazīvo sugu klātbūtnei. Tā gan nav būtiska, aplūkojot visu datu kopumu, tomēr, definējot aizsardzības prioritātes, šis aspekts ir jāņem vērā. Īpaši tas attiecas uz apdraudētu sugu dzīvotnēm oligotrofos, klajos priežu mežos (silos, nabadzīgos mētrājos). Pozitīva un būtiska saistība ar kvalitātes gradientu vērojama vairākām zemsedzes sugām – *Vaccinium myrtillus*, *Empetrum nigrum*, *Ledum palustre*, *Dicranum polysetum* un *Polytrichum juniperinum*. No kokaudzes sugām pozitīva un būtiska saistība ir *Picea abies* un *Alnus glutinosa*, jo šo koku sugu klātbūtnē bieži ir lielāks kritalu un sausokņu īpatsvars.

METODES EPIFĪTU REKOLONIZĀCIJAS NOVĒRTĒŠANAI 25-28 GADUS VECĀS JAUNAUDZĒS LATVIJĀ

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Viens no plašāk izplatītajiem mežu apsaimniekošanas veidiem Ziemeļeiropā ir vienlaidus atjaunošanas cirtes. Šāda apsaimniekošana var negatīvi ietekmēt bioloģisko daudzveidību. Lai veicinātu bioloģiskās daudzveidības saglabāšanos pēc vienlaidus atjaunošanas cirtes, pieņemts atstāt ekoloģiskos kokus. Ekoloģisko koku spēja nodrošināt bioloģisko daudzveidību plaši pētīta tropiskajos reģionos, kā arī Eiropas centrālajā un dienvidu daļā. Viens no aspektiem, kas tiek pētīts saistība ar ekoloģisko koku ietekmi uz bioloģisko daudzveidību, ir epifīti un to daudzveidība. Ekoloģisko koku epifītu daudzveidība var tikt negatīvi ietekmēta sugām, kuras ir uzņēmīgas pret krasām vides apstākļu izmaiņām.

Epifītu daudzveidība uz ekoloģiskajiem kokiem ir atkarīga no ekoloģiskā koka sugas, augšanas apstākļiem, koka mizas īpašībām, kā arī mizas pH. Lielāka epifītu daudzveidība novērojama uz veciem lapkokiem. Zināms, ka epifītu izplatīšanās notiek salīdzinoši lēni, kas var ietekmēt to rekolonizācijas spējas. Epifītu rekolonizācija no ekoloģiskajiem kokiem ir maz pētīta, jo lielākā daļa pētījumi koncentrēti uz epifītu daudzveidību un segumu uz ekoloģiskajiem kokiem. Savukārt daļa no pētījumiem veikti audzēs, kas nav apsaimniekotas ilgā laika periodā. Literatūrā variē metodes, kā tiek uzskaitīta epifītu daudzveidība un segums uz kokiem. Apvienojot dažādu metožu aspektus, izveidota metode ar kuras pielietojumu plānots noteikt ekoloģisko koku ietekmi uz epifītu rekolonizācijas spējām jaunaudzēs. Metodes ietveros tiek apsekoti 5–10 ekoloģiskie koki, kuriem no 0,1–2,0 metru augstumam nosaka epifītu sastopamību un segumu. No ekoloģiskā koka, virzienā uz nogabala centru, novilkta 30 metrus gara transekte, kur 1 m platumā uzskaitīti koki, to attālums no ekoloģiskā koka un epifītu sugu sastopamība un segums.

Pētījums tapis projekta Nr. 1.1.1.3/1/24/A/095 ietvaros.

BETULA NANA L. GADSKĀRTU VEIDOŠANĀS MELDŪKAS UN TEĻEZERA PURVOS UN PURVAINAJĀ MEŽĀ

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Pasiltinoties klimatam, barības vielas augsnē kļūst pieejamākas, kā rezultātā novērojama *Betula nana* L. virszemes daļu un gadskārtu platumu palielināšanās. *Betula nana* L. ir viena no izplatītākajām modeļsugām dendrohronoloģijas pētījumiem Ziemeļu reģionos. *Betula nana* L. Latvijā aug uz sava izplatības areāla dienvidrietumu robežas un Latvijā ir īpaši aizsargājamo sugu sarakstā. *Betula nana* L. atradņu skaits Latvijā laika gaitā ir samazinājies. Pētījuma mērķis bija noteikt *Betula nana* L. gadskārtu veidošanos Meldūkas un Teļezera purvos un purvainajā mežā, kā arī veikt to zīmīgo gadu analīzi.

Pētījumā izmantoti *Betula nana* L. indivīdi no Meldūkas un Teļezera atradnēm. Pārstāvēti biotopi – augstais purvs, purvainais mežs un pārejas purvs, kur katrā no biotopa veidiem ievākti 5 indivīdi. Katram indivīdam izvēlēta galvenā rameta, kurai ik pēc 10 cm veikts šķērsgriezums. Gadskārtu platumu hronoloģijas vizuāli šķērsdatētas. Izveidotas biotopu kopējās gadskārtu platumu hronoloģijas, kas vizuāli salīdzinātas ar tuvumā esošajām hronoloģijām, lai noskaidrotu pastāvošās saistības starp tām. *Betula nana* L. biotopu hronoloģijām veikta arī zīmīgo gadu analīze.

Morfometrisko parametru analīze uzrādīja atšķirības starp indivīdu kopējo garumu, kā arī vidējo zaru skaitu starp atradnēm. Garākie *Betula nana* L. indivīdi sastopami Meldūkas purvainajā mežā. Arī to zaru skaits šajā biotopā bija vislielākais, kas varētu būt skaidrojams ar gaismas konkurenci ar citām biotopa sugām. Biotopu kopējās gadskārtu hronoloģijās novērojamas kopīgas tendences augšanā, bet tās nav izteiktas. Teļezera purvainā meža un pārejas purva hronoloģijas ir īsākas kā Meldūkas biotopu hronoloģijas. Zīmīgo gadu analīzē redzami atsevišķi zīmīgie gadi, kas lielākoties nav savstarpēji saistīti starp biotopiem. Atšķirīgie zīmīgie gadi liecina par individuāliem biotopu apstākļiem, kas ietekmē *Betula nana* L. augšanu tajos.

HERB-CHRONOLOGY IN PRACTICE: RETHINKING SECTIONING METHODS FOR *VISCARIA VULGARIS*

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The analysis of tree growth rings provides information on tree age, development, forest structure, and past environmental changes, significantly enhancing our understanding of forest ecosystems. Herb-chronology offers a parallel method for obtaining similar ecological and temporal data from open ecosystems, particularly grasslands. This is possible because certain perennial forbs have persistent underground structures that undergo secondary growth, forming visible annual rings. However, to obtain reliable information from growth ring analysis, the methods for sample collection and preparation must be carefully selected, as taproots and rhizomes exhibit fundamentally different growth principles from those of tree stems.

In herb-chronology, for growth ring analysis, cross-sections are typically made at the root collar. *Viscaria vulgaris*, however, presents a challenge: a persistent taproot is inconsistently present, often absent due to decay. When present, its growth rate relative to the rhizome is also unknown. This variability directly complicates standard dendrochronological practices and raises critical questions about optimal sampling strategies: Where should cross-sections be taken when the taproot and, therefore, the root collar are absent? Does secondary growth vary spatially along the rhizome, and how can these variations inform the selection of sites for growth ring analysis? Understanding these spatial growth patterns is essential for accurate temporal reconstruction.

This study addresses these critical methodological gaps by examining the growth ring characteristics of *V. vulgaris*. Serial cross-sections from multiple individuals were analysed, extending along the length of the rhizome and, where present, the taproot. Growth ring counts and widths were compared across these sections. Anatomical differences within the xylem of the taproot and rhizome were also described. Based on these comparative analyses, evidence-based recommendations for optimal cross-section locations for reliable growth ring analysis in *V. vulgaris* were proposed, thereby providing essential guidance for the application of herb-chronology and for ecological studies in grassland ecosystems.

ANATOMICAL FEATURES IN THE ROOT COLLAR OF *CENTAUREA SCABIOSA* L.: METHODOLOGICAL CHALLENGES IN HERB-CHRONOLOGY

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Herb-chronology offers increasing potential for age determination and growth analysis of perennial grassland forbs, yet methodological challenges remain considerable in species with complex belowground architecture. *Centaurea scabiosa* L. is commonly described as a taprooted species. However, observations in the root collar zone suggest the presence of both a taproot and rhizome-like pleiocorm structures, indicating a more complex structural organisation than often assumed.

The present study aims to clarify anatomical transitions between these belowground structures and to evaluate their implications for growth ring identification. Samples were collected after the vegetation season, and initial cross-sections have been prepared from different vertical positions within the root collar region. Further anatomical analysis aims to assess whether growth ring number and ring-width patterns differ between taproot and pleiocorm tissues, and whether annual boundaries are equally distinct in both structures.

A central objective is to define anatomical criteria for delimiting the transition between taproot and pleiocorm tissues and to determine the most reliable sampling position for age estimation. The study further considers whether comparable chronological information may be obtained from different belowground structures. If growth patterns are consistent, partial sampling may reduce the need for complete excavation of entire root systems, thereby minimising destructive sampling in species-rich grassland habitats.

By addressing both structural complexity and methodological uncertainty, this research contributes to improving sampling precision and strengthening the application of herb-chronology in studies of grassland dynamics and ecosystem resilience.

KRUSTZIEŽU DZIMTAS *CRUCIFERAE* SVEŠZEMJU SUGU IZPLATĪBAS IZMAIŅAS LATVIJĀ UN TO IESPĒJAMIE CĒLOŅI

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Krustziežu dzimta *Cruciferae* ir viena no plašākajām dzimtām Latvijas florā, kurā ietilpst 102 sugas, no kurām 62 ir svešzemju sugas. Analizējot *Cruciferae* svešzemju sugu izplatību, secināts, ka vairākām sugām ir ievērojamas izplatības izmaiņas.

Sugas, kurām izplatība Latvijā ievērojami palielinājusies, ir *Bunias orientalis* L., *Sisymbrium volgense* M. Bieb. ex E. Fourn., *Barbarea arcuata* (Opiz ex J. et C. Presl) Rchb. un *Brassica napus* L. Šīs sugas konstatētas galvenokārt uz dzelzceļa uzbūrumiem, nezālienēs un ceļmalās. *Camelina alyssum* (Mill.) Thell. ir viena no sugām, kuras izplatība ir samazinājusies, un var spriest, ka to ir ietekmējušas lauksaimniecības zemju apstrādes izmaiņas.

B. orientalis galvenokārt izplatīta Latvijas centrālajā daļā un austrumu daļā. *S. volgense* sastopamība galvenokārt saistīta ar pilsētām un to apkārtni, kur konstatēta uz dzelzceļa uzbūrumiem, ceļmalās un nezālienēs. *B. arcuata* izplatības analīze rāda, ka tā galvenokārt sastopama ceļmalās, nezālienēs, tīrumos un atmatās, reti sastopama dabiskos zālajos. Lielākās *B. arcuata* populācijas konstatētas jaunās atmatās. *B. arcuata* ir konstatēta rapšu un graudaugu tīrumos, kuros ir dominējoša nezāle. *B. napus* konstatēta ceļmalās, ielu malās, uz sliežu ceļiem un dzelzceļa uzbūrumiem, kā arī nezālienēs, un secināts, ka transporta ceļi veicina *B. napus* izplatību. *C. alyssum* ir viena no sugām, kuras izplatība ir samazinājusies, un var spriest, ka to ir ietekmējušas lauksaimniecības zemju apstrādes izmaiņas. Herbārija dati ļauj secināt, ka Latvijā *C. alyssum* izzūd un viens no ietekmējošiem faktoriem ir linu kultūras audzēšanas samazināšanās vai tās pārtraukšana.

DAŽAS ATZIŅAS PAR DEKORATĪVO ZIEMCIEŠU IEVIEŠANOS SAVVAĻĀ

Inese Nāburga

LU Botāniskais dārzs

Ārpus stādījumiem izplatījušās sugas, kam būtu jāaug dārzos, parkos, stādu audzētavās un citās kultivētās vietās, potenciāli var radīt draudus vietējai florai. Pētījuma mērķis ir apzināt dekoratīvi ziemcietīgo lakstaugu dārzebēglus, kā arī to sastopamības dinamiku laika periodā no 1991. gada līdz 2025. gadam. Darbā izmantots AB, LATV, LDM, DAU un RIG II herbāriji, informācija no 1999. gadā publicētās Gavrilovas Ģ. un Šulca V. grāmatas “Latvijas vaskulāro augu flora: taksonu saraksts”, atradņu apsekojumi un dati no novērojumu portāla Dabas Dati (<https://dabasdati.lv>).

Datu apkopojums un analīze liecina, ka sugas, kas pagājušajā gadsimta pēdējā desmitgadē bija ieviesušās rudērālās teritorijās un pilsētvidē, arvien biežāk ir sastopamas mežmalās, ezeru un upju krastos, zālajos un citur savvaļā. Tas novērots vairāk nekā 20 sugām, piemēram, *Asparagus officinale*, *Colchicum autumnale*, *Hemerocallis sp.*, *Hesperis matronalis*, *Ornithogalum umbellatum*, *Scopolia carniolica*, *Sisyrinchium montanum*. Savukārt pēdējos 10 gados rudērālās un pilsētvides atradnēs ir konstatētas 10 jaunas dārzebēglu sugas – *Allium hollandicum*, *Clematis recta*, *Crocus vernus*, *Crocus tommasianus*, *Iris germanica*, *Lavandula angustifolia*, *Papaver orientale*, *Papaver orientale* cv. Olympia, *Phlox divaricata*, *Phlox subulata*, *Scilla lucidiae*. Rezultātā secināms, ka pēdējos 30 gados palielinās gan konstatēto dārzebēglu sugu, gan atradņu skaits.

OTTO ŠTĀNKES IEGULDĪJUMS ACĀLIJU SELEKCIJĀ: SIMTGADES PERSPEKTĪVA

Inga Apine

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Siltumnīcu acāliju (*Rhododendron simsii* hibrīdu) audzēšanai un selekcijai Eiropā ir apmēram 200 gadus sena vēsture. Sākot no 19. gadsimta vidus acāliju kultūras attīstībā būtiskākie procesi notiek Beļģijā un Vācijā. Beļģija ir pārliecinoša līdere acāliju komerciālajā audzēšanā, savukārt Vācijas selekcionāri ir guvuši izcilākos panākumus jaunu šķirņu izveidē. Selekcionāru Otto Štānke (Otto Stahnke, 1926–2021), uzskata par vienu no nozīmīgākajiem acāliju selekcionāriem Eiropā. Viņa radītās 30 šķirnes ievērojami paplašināja siltumnīcu acāliju ģenētisko un dekoratīvo daudzveidību, vienlaikus uzlabojot komerciālās audzēšanas efektivitāti. Īpaši nozīmīga ir O. Štānkes pirmā reģistrētā šķirne ‘Hellmut Vogel’ (1967. gads), jo atšķirībā no citām šķirnēm, tai ir raksturīga agrīna ziedēšana, kam nav nepieciešams miera periods. Bez tam, šķirnes krūmi salīdzinoši spēcīgi aug un tos ir iespējams sekmīgi pavairot ar spraudeņiem, tādēļ nav nepieciešama potēšana. No ‘Hellmut Vogel’ ir izdalītas ap 30 spontāno pumpura mutāciju jeb sportu un izveidotas jaunas šķirnes. Mūsdienās tā saucamā ‘Hellmut Vogel’ sērija Eiropas acāliju tirgū aizņem vairāk nekā 50% no visām acālijām. Pie izcilākajiem O. Štānkes sasniegumiem jāmin arī viņa pirmais licenzētais sarkanziņu hibrīds ‘Friedhelm Scherrer’ (1972. gads), kas tiek komerciāli pavairots arī mūsdienās.

LU Botāniskā dārza kolekcijā pašlaik ir pārstāvētas septiņas O. Štānkes šķirnes – ‘Adonia’, ‘Bertina’, ‘Feuerzauber’, ‘Hellmut Vogel’, ‘Osta’, ‘Ostalett’ un ‘Ostali’. Tās uzskatāmi demonstrē O. Štānkes šķirņu tipiskākās īpašības, kur augu izturība un salīdzinošs mazprasīgums pret audzēšanas apstākļiem ir apvienots ar izcilu ziedu krāsu un formu daudzveidību. Kolekcijā ir arī astoņi citu selekcionāru atlasīti kultivāri no ‘Hellmut Vogel’ sērijas: ‘Ilona’, ‘Inka’, ‘Hülsten’, ‘Luntera’, ‘Marina’, ‘Nordlicht’, ‘Paloma’ un ‘Terra Nova’. Selekcionāra O. Štānkes izveidotās šķirnes ir Eiropas acāliju selekcijas klasika, kas joprojām ir aktuāla gan komerciālajā dārzkopībā, gan jebkurā siltumnīcu acāliju kolekcijā.

ZĀLĀJA ATJAUNOŠANAS IESPĒJAS PILSĒTVIDĒ

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Pilsētu zālieni ir viens no izplatītākajiem zaļās infrastruktūras elementiem ar noteiktu lomu pilsētas ainavā, taču tajos parasti ir zema bioloģiskā daudzveidība, neliels augu sugu skaits un minimāla ekoloģiskā vērtība. Lai veicinātu vietējo sugu atgriešanos urbānā vidē, homogēnos zālienus, piemēram, piemājas mauriņos, jāpilnveido zinātniski pamatotas un praktiski īstenojamas metodes.

Latvijas Universitātes Botāniskajā dārzā 2021. gadā uzsākts ilgtermiņa lauka eksperiments. Mūsu mērķis ir novērtēt dažādu zālāju sugu ieviešanās un apsaimniekošanas paņēmieni efektivitāti pilsētvidē. Izveidoti 30 izmēģinājuma parauglaukumi (2×2 m), kuros ar sešām dažādām metodēm piecos atkārtojumos tiek testēti augsnes traucējumi, sēklu vai donora zālāju augsnes pievienošana, atšķirīgi pļaušanas režīmi. Papildus tradicionālajiem pasākumiem – pļaušanai vienu vai divas reizes sezonā – eksperimentā iekļauta arī sēklu piesēja, velēnas noņemšana un donora augsnes pārnesšana no pusdabiska zālāja.

Pētījumā analizētas sugu skaita izmaiņas, iesēto sugu nostiprināšanās, kūlas slāņa biezuma un sūnu dinamika. Monitoringa rezultāti parāda, ka apsaimniekošanas darbības pozitīvi ietekmē sugu daudzveidību – pļaušana un nopļautās biomasas aizvākšana kombinācijā ar graudzāļu velēnas noņemšanu un tipisko augu sēklu piesēju uzlabo zālāja kvalitāti jau divus gadus pēc apsaimniekošanas uzsākšanas. Pirmo piecu gadu laikā izmēģinājuma lauciņos konstatētas 119 lakstaugu sugas. No tām aptuveni līdzīgā proporcijā ir zālāju augu sabiedrībām raksturīgās sugas, plašas ekoloģiskās amplitūdas sugas, kas bieži sastopamas ruderalizētos zālienos, un adventīvās vai ekspansīvās nezāļu sugas.

Daudzgadīgais eksperiments kalpo kā praktisks paraugs, kā atjaunot zālājus pilsētās, degradētās teritorijās, parkos, dārzos un arī lauksaimniecības ainavās. LU Botāniskajā dārzā pētījuma teritorija vienlaikus funkcionē kā izglītojoša platforma sabiedrības iesaistei un dabas atjaunošanas prakses popularizēšanai.

PIECAS JAUNAS LATVIJAS UNIVERSITĀTĒ SELEKCIONĒTAS RODODENDRU ŠĶIRNES

Gunita Riekstiņa

LU Botāniskā dārza nodaļa RSeIA "Babīte", "Rododendri"

Latvijas Universitātes Botāniskā dārza nodaļa Rododendru selekcijas un izmēģinājumu audzētava "Babīte", turpinot mērķtiecīgu Latvijas agroklimatiskajiem apstākļiem piemērotu rododendru šķirņu izveidi, 2025. gadā Lielbritānijas Karaliskās dārzkopības biedrības Starptautiskajā rododendru šķirņu reģistrā reģistrēja piecas jaunas šķirnes. Četras no tām – 'Gundega', 'Zanda', 'Mana Madona' un 'Kalsnavas arborētums' – radītas, izmantojot profesora Riharda Kondratoviča selekcijas materiālu, savukārt šķirnes 'Ingmārs' autore ir selekcionāre Gunita Riekstiņa. Līdz ar to kopējais Latvijas Universitātē izveidoto un starptautiski reģistrēto brīvdabas rododendru šķirņu skaits sasniedz 158, apliecinot institūcijas nozīmīgo ieguldījumu dekoratīvo kokaugu selekcijā.

Jaunajām šķirnēm raksturīga augsta dekoratīvitate un laba ziemcietība. Vasarzaļajam rododendram 'Gundega' ir koši oranždzeltenī, smaržīgi ziedi. Divpadsmit gadu laikā krūms sasniedz 1,7 m augstumu un ir piemērots audzēšanai visā Latvijas teritorijā. Šķirne 'Zanda' izceļas ar lieliem, koši sarkaniem ziediem, kam ir dekoratīvas putekšņlapas un savērtas vainaglapas. Divdesmit piecu gadu laikā tā izaug līdz 2,5 m augstumam, un tai ir ļoti laba ziemcietība. 'Mana Madona' nosaukta par godu Madonas novadam. Tā ir spēcīgi augoša, līdz 3 m augsta vasarzaļa šķirne ar izteiksmīgiem trīskrāsainiem ziediem – purpurrožainām apmalēm, gaišu vidusdaļu un dzeltenī oranžu triepumu.

Mūžzaļo rododendru šķirne 'Kalsnavas arborētums' nosaukta par godu Latvijas valsts mežu arborētumam Kalsnavā. Tā veido līdz 2,5 m augstu krūmu ar tumši zaļām, spīdīgām lapām un baltiem, zvanveida ziediem ar purpursarkanu lāsojumu. Savukārt šķirne 'Ingmārs' desmit gadu laikā sasniedz 1,6 m augstumu. Lapas tai ir mūžzaļas; ziedi pumpuros ir purpura krāsā, bet plaukstot kļūst gandrīz balti ar koši dzeltenzaļu lāsojumu. Šķirne ieteicama audzēšanai Latvijas centrālajā un rietumu daļā.

THE INFLUENCE OF NANOPARTICLES (Fe₃O₄) ON PLANT STRESS AND VITALITY UNDER FLOODING IN WHEAT

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Flooding is one of the major abiotic stresses affecting crop productivity worldwide. Nanoparticles can accumulate in plant roots and tissues, potentially disrupting nutrient uptake, reducing growth, and inducing oxidative stress, and, in some cases, enhancing or inhibiting plant recovery. The research object was wheat (*Triticum aestivum* L. cv. Skagen). The nanoparticles were synthesized using the Massart method. Four groups were formed: control, nanoparticle treatment, control with flooding, and nanoparticle treatment with flooding. Protein accumulation was determined by fluorometry. Superoxide dismutase (SOD) and carotenoids (Car) were used as stress markers and analyzed by spectrophotometry. Chlorophyll fluorescence was measured using fluorometry. Under flooding, SOD activity in the control increased by 22% compared to the control without flooding. Treatment with nanoparticles reduced the stress caused by flooding by a factor of two. The carotenoid content under flooding in the control increased by 23% compared to the control without flooding, while in the nanoparticle treatment, under flooding increased by 15%. Protein accumulation compared to the control and under flooding was decreased by 7%. The lowest chlorophyll a/b ratio was observed in the nanoparticle treatment group under flooding conditions, which indicates that nanoparticle treatment under these conditions did not contribute to effective protection or stabilization of photosynthetic pigments. A similar trend was also observed in the changes in the total chlorophyll and carotenoid content ratio under flooding conditions. The lowest F_v/F_m value was observed in the nanoparticle treatment group, which indicates a decrease in PSII efficiency. Thus, it can be assumed that Fe₃O₄ nanoparticles negatively affect the photosynthetic apparatus. The highest F_v/F_m value was found in the control group with flooding. Treatment with Fe₃O₄ nanoparticles under flooding conditions did not contribute to the protection of the photosynthetic apparatus, as evidenced by lower chlorophyll a/b ratios and reduced values of the maximum quantum yield of PSII. During stress pre-adaptation, nanoparticles promote antioxidant accumulation, while during additional stress, the antioxidant system effectively reduces oxidative damage. The results of this study confirm the potential of nanoparticles for practical applications.

KULTŪRAUGU SAVVAĻAS RADINIEKU SAGLABĀŠANA LATVIJĀ

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Kultūraugu savvaļas radinieki ir savvaļas augu taksoni, kuriem ir netiešs pielietojums, kas izriet no to relatīvi ciešās saiknes ar kultūraugiem. Tie pieder vai nu tai pašai sugai, kurai kultūraugs, vai arī radniecīgai sugai, ar kuru iespējama krustošanās. Kultūraugu savvaļas radiniekus iespējams izmantot selekcijā, lai veidotu jaunas lauksaimniecībā izmantojamās šķirnes. Latvijā sastopamie šīs grupas augi ir lopbarības zālaugi, aromātiskie un ārstniecības augi, kā arī savvaļas ogas un augļi. Lai izveidotu sistēmu kultūraugu savvaļas radinieku saglabāšanai, izveidots nacionālais šo sugu saraksts un sadarbībā ar nozares ekspertiem prioritāro sugu saraksts, kā arī apkopota literatūrā pieejamā informācija par dažādu sugu atradnēm. Lai izvērtētu, kā optimālāk risināt turpmākos jautājumus apsektas trīs no tām – Dabas parks "Ogres Zilie kalni", vairākas vietas Ķemeru Nacionālajā parkā un ar likumu neaizsargāta teritorija pie ciema Dzelmē. Secināts, ka platības apsekojot jāizvērtē, vai ilgtermiņā vieta saglabāsies neskarta, kā arī jāvienojas ar apsaimniekotāju / īpašnieku par iespējamu ilgtermiņa monitoringu un uzturēšanu. Tā kā optimālākais veids ģenētisko resursu saglabāšanai un izmantošanai ir *in situ* un *ex situ* nodrošināšana, tad ekspedīcijās ievākti dažu sugu sēklu paraugi ar mērķi, ievietot tos gēnu bankā gan kā drošības kolekciju, gan sēklu izsniegšanai zinātnes un selekcijas vajadzībām.

GĒNU PLŪSMAS UN HIBRIDIZĀCIJAS POTENCIĀLS STARP ĢM/NGT KULTŪRAUGIEM UN KONVENCIONĀLAJĀM ŠĶIRNĒM VAI SAVVAĻAS RADINIEKIEM: LITERATŪRAS PĀRSKATS AR UZSVARU UZ RAPSI UN KARTUPELI

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Ģenētiski modificēti (ĢM) augi tiek audzēti vairāk nekā 30 gadus. To akceptēšana vidē ir atkarīga no pamatota vides riska novērtējuma (VRN), kurā gēnu plūsma uz konvencionālajiem kultūraugiem un savvaļas radiniekiem ir viens no būtiskākajiem aspektiem. Gēnu plūsma var veicināt vides risku, ja pārnestās īpašības nodrošina selektīvas priekšrocības, kas ietekmē noturību, invazitāti vai ekoloģiskās mijiedarbības. Vienlaikus jaunās genoma tehnoloģijas (NGT) ļauj izstrādāt augus ar plašāku īpašību spektru, tostarp toleranci pret biotiskajiem un abiotiskajiem stresa faktoriem, kas VRN var padarīt sarežģītāku. Literatūras apskatā apkopota informācija par gēnu plūsmu un hibridizāciju starp ĢM un NGT kultūraugiem, konvencionālajām šķirnēm un savvaļas radiniekiem, izceļot rapsi (*Brassica napus* L.) un kartupeli (*Solanum tuberosum* L.). Lauka pētījumu dati apliecina gan rapša putekšņu, gan sēklu mediētu gēnu plūsmu, hibridizāciju ar seksuāli saderīgiem savvaļas radiniekiem, ruderalu populāciju veidošanos un ilgtermiņa saglabāšanos augsnes sēklu bankās. Pētījumi liecina, ka transgēnu introgresija *Brassica* sugās var palielināt rezistenci pret herbicīdiem, mainīt piemērotību selektīva spiediena apstākļos un mainīt ģenētisko daudzveidību ferālajās un nezāļveida populācijās. Gēnu plūsma saistībā ar ĢM kartupeļiem ir pētīta mazāk. Kartupelis galvenokārt tiek pavairots veģetatīvi, bieži raksturojas ar vāju ziedēšanu un daļēju vīrišķo sterilitāti, un putekšņu mediētā gēnu plūsma strauji samazinās līdz ar attālumu, kā rezultātā hibridizācijas potenciāls ārpus izcelsmes centriem parasti ir zems. Eiropā saderīgu savvaļas radinieku trūkums ierobežo vides ekspozīciju, savukārt Dienvidamerikā, īpaši Andu reģionā, hibridizācija ar savvaļas *Solanum* sugām ir svarīgs jautājums. Augsnē palikušie un nākamajā gadā sadīgušie bumbuļi un īsto sēklu saglabāšanās augsnē ir galvenie vides ekspozīcijas ceļi, tomēr to ilgtermiņa ekoloģiskā nozīme nav pietiekami izpētīta. Pierādījumi, kas tieši attiecas uz NGT augiem, ir ierobežoti. Pieejamie dati liecina, ka daudzi NGT izcelsmes augi, īpaši tie, kas līdzinās konvencionāli selekcionētām šķirnēm, visticamāk rada līdzīgus vides riskus, savukārt sarežģītākām NGT pielietojuma formām ar lielākām genoma izmaiņām var būt nepieciešams specifisks VRN vērtējums. Kopumā šis apskats uzsver būtisku pierādījumu bāzes nelīdzsvarotību starp dažādiem kultūraugiem un skaidru empīrisku datu trūkumu attiecībā uz NGT augiem. Lai nodrošinātu zinātniski pamatotu un samērīgu regulatīvo lēmumu pieņemšanu, nepieciešami lauka pētījumi un VRN metodoloģijas pielāgošana NGT specifiskajām īpašībām.

CENTAURIUM SP. NO MITRAS JŪRAS PIEKRASTES PĻAVAS: MINERĀLVIELU PIEEJAMĪBAS UN SĀĻUMA IETEKME

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Jūras piekrastes augu sugu adaptīvo īpašību izpratne ir svarīga gan bioloģiskās daudzveidības saglabāšanas gan ekosistēmu pakalpojumu kontekstā. Šī pētījuma mērķis bija skaidrot *Centaurium* sp. spēju pielāgoties dažāda minerālvielu pieejamībai uz atšķirīga saknēm pieejamā substrāta tilpuma fona, kā arī dažādu nātrija sāļu radītajam sāļumam kontrolētos apstākļos. Augu sēklu materiālu ievāca mitrā piekrastes pļavā Hijumā salā Igaunijā, kur tie auga kopā ar tipiskām halofītiskām sugām (*Lysimachia maritima*, *Plantago maritima*, *Trifolium fragiferum*). Pirmajā eksperimentā augus audzēja 200, 400 un 1200 mL konteineros substrātā, kas sastāvēja no kvarca smiltīm un dažādām tilpuma daļām komerciālas dārza melnzemes (10, 40, 70, 100%). Lai nodrošinātu pāreju uz ģeneratīvo stadiju, 14 nedēļas pēc pārstādīšanas augus uz astoņām nedēļām ievietoja aukstajā kamerā. Otrajā eksperimentā augus audzēja pieaugoša sāļuma apstākļos (50, 100, 200, 400 mmol L⁻¹), ko izraisīja ar dažādiem nātrija sāļiem (hlorīdu, nitrātu, hidrogēnkarbonātu, hidrogēnfosfātu un sulfātu). Minerālvielu pieejamībai bija būtiska ietekme uz *Centaurium* augu augšanu un attīstību pirmā eksperimenta apstākļos. Otrajā eksperimentā augu izturība pret sāļumu bija atkarīga no izmantotā anjona veida. Vistoksiskākā ietekme, kas izpaudās kā agrāka augu bojāeja augstā koncentrācijā, bija NaHCO₃, kam sekoja Na₂HPO₄ un NaNO₃. NaCl izraisīja lapu dzeltēšanu un augšanas samazinājumu, bet Na₂SO₄ nebija vizuāli pamanāmas negatīvās ietekmes. Dažādu sāļu apstrāde būtiski ietekmēja elektrolītu, Na⁺ un K⁺ uzkrāšanos augu audos.

ŪDENS KVALITĀTES NOZĪME AUGU AUDZĒŠANĀ – LIETIŠĶIE ASPEKTI, GALVENĀS PROBLĒMAS UN IESPĒJAMIE RISINĀJUMI

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Ūdens kvalitāte ir viens no būtiskākajiem faktoriem, kas nosaka augu augšanas sekmes, ražas apjomu un kvalitāti. Tā ietekmē ne tikai augu fizioloģiskos procesus, bet arī augšanas vides ķīmiskās īpašības un mēslošanas efektivitāti. Praktiskajā augu audzēšanā svarīgākie ūdens kvalitātes parametri ir pH, elektrovadītspēja (EC), bikarbonātu jonu koncentrācija, cietība, kā arī organiskais un mikrobioloģiskais piesārņojums. Šo rādītāju novirzes no optimālajām robežām var būt izšķirošas augus audzējot gan hidroponikā, gan siltumnīcās, gan atklātā laukā.

Viena no tipiskākajām problēmām ir nepiemērots pH līmenis, kas ietekmē barības elementu šķīdību un pieejamību. Pārāk sārmainā vidē samazinās Fe, Mn, Zn un Cu pieejamība, kas izpaužas kā hloroze un augšanas aizture. Augsta ūdens cietība un bikarbonātu koncentrācija var izraisīt pilienvēda laistīšanas sistēmu aizkalķošanos un palielinātu skābju devu nepieciešamību, lai stabilizētu pH līmeni. Augsts EC izraisa sāļu uzkrāšanos, kas rada osmotisku stresu – samazinās ūdens potenciāla gradients starp substrātu un sakņu audiem, kavējot ūdens uzsūkšanos. Savukārt mikrobioloģiski piesārņots ūdens var izplatīt sakņu slimības, kas īpaši bīstamas recirkulējošās sistēmās.

Lai mazinātu šos riskus, praksē izmanto gan tehnoloģiskus, gan agrotehniskus risinājumus: reverso osmozi, filtrāciju piemaisījumu kontrolei, ūdens skābināšanu pH stabilizēšanai, UV vai ozona dezinfekciju mikroorganismu apkarošanai, mēslojuma plāna/barības šķīduma receptūru pielāgošana elementu saturam ūdenī u. c. metodes.

Ūdens kvalitātes ietekme uz augu fizioloģiju, substrātu ķīmisko sastāvu un agroekosistēmu ilgtspēju kļūst arvien svarīgāka klimata pārmaiņu, intensīvās lauksaimniecības un resursu trūkuma dēļ. Tāpēc nākotnes pētījumu virzieni galvenokārt saistīti ar klimata pārmaiņu radītajām izmaiņām ūdens kvalitātē un pieejamībā, alternatīvu ūdens avotu izmantošanu, jaunām ūdens attīrīšanas un dezinfekcijas tehnoloģijām un reāllaika monitoringa risinājumiem.

ANTIOKSIDANTU IETEKME UZ UPEŅU (*RIBES NIGRUM*) IZDŽĪVOŠANU UN REĢENRĀCIJU PĒC KRISAGLABĀŠANAS

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Augu ģenētiskos resursus (ĢR) uzglabā sēkļu bankās, lauka kolekcijās vai *in vitro* kultūrās. Upeņu (*Ribes nigrum*) ĢR nav iespējams uzglabāt sēkļu bankās, taču lauka kolekcijās tos apdraud mainīgi klimata apstākļi, kaitēkļi un slimības, toties *in vitro* kultūru kolekcijas apdraud kontaminācija un somaklonālā mainība. Ņemot vērā šos faktorus, upeņu ĢR saglabāšanai piemērotāka varētu būt kriosaglabāšana – augu materiāla uzglabāšana ekstrēmi zemās temperatūrās (-196 °C) šķidrā slāpekļī (LN). Panākot šūnu vitrifikāciju LN, teorētiski tiek apturēti šūnas bioloģiskie procesi. Ir novērots, ka antioksidantu pievienošana kriosaglabāšanas priekšapstrādē uzlabo, piemēram, vīnogu un aveņu izdzīvošanu pēc kriosaglabāšanas, taču ietekme uz upenēm nav pārbaudīta. Lai to pārbaudītu, balstoties uz literatūru par upeņu kriosaglabāšanu, izstrādāja pilienu vitrifikācijas protokolu izmantojot Dārzkopības institūtā (DI) radītu upeņu hibrīdu '1.r.11'. Šo protokolu izmantoja turpmākajiem eksperimentiem. Priekšapstrādes barotnēm pievienoja glutationu (GSH) un askorbīnskābi (AsA) dažādās koncentrācijās (25 vai 50 mg L⁻¹) un kombinācijās. Kopā pārbaudīja deviņus šo antioksidantu kombināciju variantus un to ietekmi pārbaudīja uz trīs upeņu genotipiem: '1.r.11', 'Ben Garn' un 'Mara'. No katra genotipa eksperimentam izmantoja 576 dzinumu galotnes, no kurām pusi ievietoja LN. Izdzīvošanas un reģenerācijas rādītājos nenovēroja statistiski būtiskas atšķirības starp antioksidantu priekšapstrādes variantiem. Genotipiem '1.r.11' un 'Ben Garn' antioksidantu priekšapstrāde uzlaboja izdzīvošanas īpatsvaru salīdzinot ar kontroles variantu, bet genotipam 'Mara' – samazināja. Šķirnēm 'Ben Garn' un 'Mara' novērojami zemāki izdzīvošanas rādītāji visos variantos salīdzinot ar hibrīdu '1.r.11', kas skaidrojams ar kriosaglabāšanas protokola specifiskumu katram genotipam. Genotipa '1.r.11' augu lapām veica peroksidāzes aktivitātes pārbaudi, kur nenovēroja antioksidantu priekšapstrādes ietekmi, toties varēja novērot zemāku peroksidāzes aktivitāti augos pēc kriosaglabāšanas, šis efekts bija saglabājies trīs mēnešus pēc kriosaglabāšanas.

Līdz šim iegūtie rezultāti norāda uz GSH un AsA priekšapstrādes potenciālu uzlabot upeņu izdzīvošanu pēc kriosaglabāšanas. Pētījumi tiks turpināti.

9.

- **Valsts pārvaldes
efektivitāte /**
Efficiency of public
administration

9.1. sekcija. **TIESĪBU PIEMĒROŠANAS PROCESU
EFEKTIVITĀTE: IZAICINĀJUMI UN
RISINĀJUMI /**

**EFFICIENCY OF LEGAL PROCEEDINGS:
CHALANGES AND SOLUTIONS**

VALSTU POZITĪVIE PIENĀKUMI DIGITĀLAJĀ LAIKMETĀ: VAI CILVĒKTIESĪBU ATTĪSTĪBAS CETURTAIS VILNIS?

Daina Mita

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Digitālo tehnoloģiju straujā attīstība pasauli maina mums vēl nepazīstamā virzienā. Kļūst aizvien grūtāk prognozēt, kā mākslīgais intelekts nākamo desmit vai pat piecu gadu griezumā ietekmēs pastāvošos ekonomiskos, socioloģiskos, tiesiskos un citus procesus. Valstīm šajā skrējienā ir neapskaužams uzdevums līdzsvarot sabiedrības labklājības un ekonomiskās attīstības intereses, vienlaikus pieturoties pie demokrātiskuma un tiesiskuma vērtībām.

Viens no virzieniem, kuros valstis darbojas, ir digitālo risinājumu un mākslīgā intelekta rīku integrēšana valsts funkciju veikšanā, paralēli noritot centieniem nodrošināt šo tehnoloģiju saderību ar cilvēktiesību prasībām. Līdz šim ir plaši analizēta digitālo risinājumu ietekme uz datu aizsardzību un privātumu, kā arī diskriminācijas riski, kas izriet no mākslīgā intelekta algoritmu darbības. Pakāpeniski arvien lielāka uzmanība tiek pievērsta tehnoloģiju ietekmei uz materiālajām cilvēktiesībām, kā tiesībām uz izglītību, taisnīgu tiesu un veselības aizsardzību, kur digitālo rīku izmantošana var gan veicināt, gan ierobežot pilnvērtīgu tiesību realizāciju, atkarībā no izstrādes un ieviešanas procesa niansēm.

Starptautiskā līmenī vairākas organizācijas – Eiropas Savienība, Eiropas Padome, Ekonomiskās sadarbības un attīstības organizācija, Apvienoto Nāciju Izglītības, zinātnes un kultūras organizācija u. c. – ir attīstījušas un turpina izstrādāt izvērstus normatīvos un politikas dokumentus, definējot valstu pozitīvos un negatīvos pienākumus un rīcības ietvarus. Nozīmīgi, ka šie dokumenti koncentrējas ne tikai uz materiāltiesiskajiem aspektiem, bet arī uz tehnoloģiju ieviešanas procesu, prasot, piemēram, ietekmes uz cilvēktiesībām novērtējumu, sabiedrības līdzdalības nodrošināšanu, sistēmu testēšanu, apmācību veikšanu, institucionālās kapacitātes celšanu u. c.

Izanalizējot aktuālo starptautisko regulējumu un starptautisko organizāciju vadlīnijas, rekomendācijas, pētījumus un citus dokumentus, tiek argumentēts, ka pašlaik ir vērojams process, kurā procesuālie mehānismi, kas balstīti demokrātiskās sabiedrības principos – tostarp piesardzībā, caurskatāmībā un līdzdalībā – pakāpeniski iegūst juridiski saistošu cilvēktiesību pienākumu statusu. Minēto spilgti ilustrē šo principu iekļaušana Eiropas Padomes ietvara konvencijā par mākslīgo intelektu, cilvēktiesībām, demokrātiju un tiesiskumu.

Tiek argumentēts, ka šī attīstība iezīmē jaunu posmu cilvēktiesību evolūcijā, radot valstīm jaunu pienākumu kopumu ar mērķi nodrošināt neprognozējamo tehnoloģiju attīstības līdzsvarošanu ar demokrātiskas sabiedrības vērtībām.

SAEIMĀ IZSKATĀMĀS LIKUMDOŠANAS INICIATĪVAS: VAI TO ANOTĒŠANU VĒRTS UZTICĒT MĀKSLĪGAJAM INTELEKTAM?

Iveta Kažoka

Latvijas Universitātes Juridiskās fakultātes doktorante

Likumdošanas procesā sabiedrībai, nevalstiskajām organizācijām un lēmumu pieņēmējiem pastāvīgi jāizvērtē liels skaits Saeimā iesniegtu likumprojektu priekšlikumu. Lai atvieglotu šo uzdevumu un operatīvi iegūtu kopsavilkumus par priekšlikumu saturu un iespējamo ietekmi, praksē tiek aizvien biežāk izmantoti publiski pieejami ģeneratīvā mākslīgā intelekta (MI) rīki. Tomēr joprojām ir atklāts jautājums par šīs prakses lietderību un uzticamību – vai MI ģenerētajām anotācijām var uzticēties likumdošanas procesa uzraudzībā, un vai tās spēj sniegt pietiekami drošu pamatu turpmākai izvērtēšanai un pilsoniskajai līdzdalībai?

Referāta mērķis ir izvērtēt, vai un kādā apjomā ģeneratīvā MI modeļiem var uzticēt Saeimā iesniegto likumprojektu priekšlikumu anotēšanu. Pētījumā tiek salīdzināti četri MI modeļi (ChatGPT 5.4 Pro, ChatGPT 5.3 Instant, Gemini 3 Fast un Gemini 3.1 Pro), analizējot to kapacitāti trīs pamatvirzienos:

- 1) saturiski precīzu, skaidru un koncentrētu kopsavilkumu (anotāciju) ģenerēšana par priekšlikumiem, kas iesniegti otrajam un trešajam lasījumam;
- 2) spēja nošķirt galvenokārt tehniskus grozījumus no priekšlikumiem, kas paredz būtiskas pārmaiņas tiesību normās;
- 3) spēja identificēt priekšlikumus, kuri varētu būt īpaši nozīmīgi sabiedrības interešu aizstāvības organizācijām.

Pētījuma metodoloģija balstās uz vienotu analītisko uzdevumu izpildi attiecībā uz dažādiem likumprojektu priekšlikumiem un iegūto MI anotāciju salīdzinošo analīzi. Pētnieces vērtējums tiek papildināts ar ārējo validāciju – sabiedrības interešu aizstāvības organizāciju ekspertu atzinumiem, lai noskaidrotu, vai šādi ģenerēti kopsavilkumi praksē var palīdzēt savlaicīgi pamanīt sabiedriski nozīmīgus riskus un atvieglot kvalitatīvu iesaisti likumdošanas procesā.

Pētījums atklāj, ka mākslīgais intelekts šiem uzdevumiem var būt noderīgs, vienlaikus parādot, ka ne visi modeļi ir vienlīdz uzticami.

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MĀKSLĪGĀ INTELEKTA AĢENTI: MEKLĒJOT LĒMUMU IZSKAIDROJAMĪBAS ROBEŽAS

Jūlija Terjuhana

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Pēdējo trīs gadu laikā, kopš plašākai sabiedrībai kļuva pieejami ģeneratīvā mākslīgā intelekta (MI) modeļi, ir pieaugusi MI aģentu izmantošana dažādās uzņēmējdarbības jomās.

MI aģenti ir MI sistēmas, kas spēj autonomi plānot, pieņemt lēmumus un mijiedarboties ar ārējo vidi. Tie iezīmē jaunu posmu MI attīstībā.

Atšķirībā no tradicionālām algoritmiskām sistēmām, MI aģentu arhitektūra balstās uz daudzpakāpju lēmumu pieņemšanu, rīku izmantošanu, atmiņas mehānismiem un nereti – vairāku aģentu savstarpēju sadarbību. To dinamiskā un adaptīvā darbība izaicina līdzšinējo izpratni par automatizētu lēmumu izskaidrojamību, ko pieprasa Vispārīgā datu aizsardzības regula (VDAR), kas veidota, balstoties uz līdzšinējo izpratni par automatizētiem lēmumiem.

Autore analizē, kā MI aģentu uzbūve ietekmē iespēju nodrošināt gala lietotājiem jēgpilnu informāciju par automatizētu lēmumu loģiku, datu apstrādi un lēmumu pieņemšanu iesaistītajām pusēm.

Pētījums balstīts uz doktrinālo tiesību analīzi, ko papildina teleoloģiskā interpretācija, kā arī starpdisciplināra pieeja, integrējot tiesību normu analīzē MI aģentu tehnoloģisko aspektu analīzi. Pētījuma ietvaros analizēti piemērojamie Eiropas Savienības (ES) tiesību akti – Vispārīgā datu aizsardzības regula (VDAR) un Mākslīgā intelekta akts (MI akts), to interpretācija judikatūrā un tiesību doktrīnā.

Secinājumi

1. MI aģentu arhitektūra, kas balstīta uz daudzpakāpju, adaptīvu un bieži vien sadalītu lēmumu pieņemšanu, izaicina tradicionālo izpratni par automatizētu lēmumu izskaidrojamību, jo lēmumi aģentiskajās sistēmās nereti nav identificējami kā atsevišķi notikumi, bet gan daudzu kumulatīvu darbību rezultāts.
2. Esošais VDAR regulējums, lai arī formāli piemērojams MI aģentiem, praksē atklāj savas robežas: 1) skaidra pārziņa un apstrādātāja lomas noteikšana ir problemātiska; 2) pastāv izaicinājums sniegt jēgpilnu VDAR 13. panta otrās daļas f) punktā noteikto informāciju par automatizēta lēmuma loģiku MI aģentu sistēmās. Šo principu normu kļūst vēl sarežģītāka gadījumos, kad personas dati tiek apstrādāti multi-aģentu sistēmās.
3. VDAR normas ir attiecināmas uz MI aģentiem, taču to darbības specifika izgaismo nepieciešamību pēc to tālākas esošo normu interpretācijas un iespējamās jaunu tiesību normu, kas būtu adresētas MI aģentiem to specifiskās uzbūves dēļ, iekļaušanas MI aktā un ES Digitālajā Omnibusā.

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ŠENGENAS INFORMĀCIJAS SISTĒMAS NORMATĪVA REGULĒJUMA EVOLŪCIJA: PIEMĒROŠANAS PRAKSES JURIDISKAIS NOVĒRTĒJUMS LATVIJĀ

Ērika, Krutova

LU JF pasniedzēja

Sākot ar 2007. gadu Latvijas pilsoņi ir tiesīgi brīvi pārvietoties Šengenas zonā. Problēma ir tāda, ka ar pieaugošo migrācijas krīzi arī šī pārvietošanas brīvība kļūst apdraudēta. Eiropas Savienība nodrošina juridiskus instrumentus, lai stiprinātu sabiedrisko kārtību un drošību dalībvalstu teritorijās un viens no praktiskajiem līdzekļiem, kas palīdz uzturēt augstu drošības līmeni Eiropas Savienības brīvības, drošības un tiesiskuma telpā, atbalstot valsts kompetentās iestādes, kas atbildīgas par noziedzīgu nodarījumu novēršanu, atklāšanu, izmeklēšanu, saukšanu pie atbildības par tiem, vai kriminālsodu izpildi un operatīvo sadarbību ir Šengenas informācijas sistēma.

Autore izvirza mērķi, analizējot normatīvā regulējuma, kas nodrošina Šengenas informācijas sistēmas darbību, attīstību Eiropas Savienībā un piemērošanas praksi Latvijā, sniegt juridisku novērtējumu. Pētījuma jautājums: Kādi ir galvenie juridiskie un praktiskie šķēršļi Šengenas informācijas sistēmas efektīvai piemērošanai un kā tie ietekmē sistēmas mērķu sasniegšanu?

Juridiskais novērtējums tiek balstīts uz ES tiesību aktu un Latvijas normatīvo aktu salīdzinošo analīzi, autores gūto empīrisko novērojumu analīzi. Praktisko šķēršļu identificēšanai tiek analizēti Eiropas Komisijas novērtēšanas ziņojumi, kompetento iestāžu publiskie pārskati.

Analizējot Šengenas informācijas sistēmas tiesiskā regulējuma evolūciju un piemērošanas praksi, autore secina, ka sākotnēji likumdevējs nodrošināja tiesisko pamatu sistēmas darbībai. Tomēr jaunu brīdinājumu kategoriju ieviešanai juridiskā pēctecība tika nodrošināta formāli, sadrumstaloti un galalietotājiem grūti izsecināt nacionālo kārtību konkrēto brīdinājumu ievietošanai un izpildei.

Starp praktiskajiem šķēršļiem identificēta nevienmērīga galalietotāju izpratne par sistēmas jaunajām funkcionalitātēm. Tiesiskā regulējuma esamība nenodrošina piemērošanas efektivitāti, jo pastāv teorētisko normu un galalietotāju zināšanu disonanse, kas liedz pilnvērtīgi izmantot sistēmas potenciālu.

No minētā izriet, ka nacionālā līmenī Šengenas informācijas sistēma ir leģitīma, tomēr pilnais potenciāls netiek izmantots cilvēkfaktora un nepietiekamu apmācību dēļ. Balstoties uz secinājumiem tiek izvirzīts priekšlikums papildināt kompetento iestāžu iekšējos noteikumus ar obligātu prasību apgūt mācības par Šengenas informācijas sistēmas nozīmi iekšējās drošības garantēšanā.

ILGAIS CEĻŠ PALĪGAVOTU IZPRATNĒ UN ATZĪŠANĀ

D. Apse

Tiesību teorijas un vēstures zinātņu katedra, Juridiskā fakultāte, Latvijas Universitāte

Viens no drošas valsts pastāvēšanas priekšnoteikumiem ir tiesību piemērošanas procesu efektivitāte, tiesību avotu daudzveidība un tiesības zināt savas tiesības. Referāta mērķis ir no tiesību teorijas un juridiskās metodes mācības pamatjautājumu skatpunkta analizēt atsevišķu palīgavotu tapšanas, izpratnes attīstības un atzīšanas aspektus laikā, doktrīnā, tiesību īstenošanā. Šādā aspektu salikumā tiesību palīgavotu attīstība nav pētīta. Pētījuma izstrādē tiek izmantotas vēsturiskā un salīdzinošā metode. Tiesību palīgavoti kā instruments taisnīguma īstenošanai atkal un atkal apliecina, ka to izmantošana tiesību aktos attīsta juridisko metodoloģiju, nacionālo tiesību avotu doktrīnu, īstenojot vispārējos tiesību principus, kas izriet no demokrātiskas tiesiskas valsts pamatnormas, veicina tiesiskās sistēmas attīstību. Joprojām tiesību avotu daudzveidība, to normativitāte un savstarpējā mijiedarbība ir viens no galvenajiem katru tiesību sistēmu raksturojošiem elementiem. Savukārt tiesību sistēmu atšķirību noteicošais faktors lielā mērā atkarīgs no konkrētajā tiesību sistēmā dominējošiem un pakārtotajiem tiesību avotiem. Problēma: vēl aizvien jāatgādina, ka likumprojekta anotācija ir daļa no tiesību normas izstrādes sagatavošanas materiāliem. Tā atspoguļo likumprojekta iesniedzēja, ne likumdevēja gribu. Ja likumdevējs negroza likumprojektu un tam piekrīt, tad to var izmantot. Ja anotācija nesakrīt ar likumprojekta tekstu, normas piemērotājs, izmantojot juridiskās metodes, sniedz atbildi uz tiesību jautājumu un taisnīgu noregulējumu. Ja tas rod risinājumu un likumdevējs neiebilst pienācīga veidā, tad risinājums ir akceptēts. Saeimas Juridiskās komisijas iebildumu vēstule ir tiesību palīgavots, kontrastdialogs ar tiesību piemērotājiem par normas tulkošanu un tiesību normas efektivitātes novērtēšanas *ex post* izpausme, kad parlamentārā kontroles reakcija pievērš uzmanību kādai tiesību problēmai. Savukārt, Saeimas lēmums par normas iztulkošanas aspektiem ir politisks lēmums. Tas nav likums, kas būtu pieņemts noteiktā likumdošanas procesa ceļā, bet tiesību palīgavots, kas nav vispāršaistošs. Iespējamie risinājumi pareizi noteikt piemērojamās tiesību normas saturu (domstarpību starp normas radītāju un piemērotāju gadījumā): grozīt judikatūru, labojot interpretāciju, likumdevējam grozot normu, izprotot, ka ir saprasts nepareizi.

Kopējais vēstījums. Nacionālā tiesību palīgavotu doktrīna ir pilnveidojusies, tās pielietojums tiesību piemērošanas praksē pieaudzis. Jāveicina ātrāka nolēmumu nominēšana judikatūras statusā. Savu oficiālo autentisko iztulkojumu likumdevējs var sniegt tikai grozot normu un normas pieņemšanas procesā, uzmanīgi lasot anotācijas, kā arī citus normas radīšanas dokumentus kopsakarā ar normas galīgo redakciju, nepārkāpjot varas dalīšanu.

SATVERSMES TIESAS SPRIEDUMA SPĒKS LAIKĀ

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Aktualitāte. Satversmes tiesas (turpmāk – ST) sprieduma spēks laikā ietekmē ST sprieduma piemērošanu un skar kā individuālas personas, tā arī sabiedrību kopumā. Tiesu prakses sistematizācija var uzlabot izpratni par ST sprieduma spēku laikā un piemērošanu.

Pētījuma jautājums. Referātā izvērtētas ST praksē attīstītās pieejas ST sprieduma laikā noteikšanā, kā arī šā faktora ietekme uz tiesību piemērotāju, tam piemērojot ST spriedumu kā tiesību avotu.

Metodoloģija. Pētījums balstīts tiesu prakses analizē un vispārināšanā. Referātā atspoguļoti secinājumi, kas gūti, analizējot ST un citu tiesu praksi.

Svarīgākie secinājumi. Vispārējo principu, kas nosaka ST sprieduma spēku laikā, paredz ST likuma 32.panta trešā daļa – par neatbilstošu atzītā norma uzskatāma par spēkā neesošu no ST sprieduma publicēšanas dienas. Vienlaikus ST likuma 32. panta trešā daļa dod iespēju ST izlemt citādi. ST praksē attīstījusi izņēmumus no vispārējā principa attiecībā uz ST sprieduma spēku laikā. Tas var būt kā noteikts brīdis pagātnē, tā arī noteikts brīdis (datums vai nosacījums) nākotnē.

ST pašai ir pienākums izvērtēt nepieciešamību paredzēt izņēmumu attiecībā uz ST spriedumu laikā. Lietas dalībnieki par to var izteikt apsvērumus, taču to esība vai neesība nav saistoša ST. ST spriedumā jāsniedz pamatojums tam, kādu apsvērumu dēļ paredzēts izņēmums no vispārējā principa.

Lietas izskatīšanu no jauna prasa tikai tāds ST spriedums, kuram noteikts atpakaļvērsts spēks, un tas attiecināts uz konkrētu personu, identificējamu personu loku vai visām personām.

ST sprieduma spēku nākotnē nosaka tas, kādas sekas radītu tūlītēja normas atzīšana par spēkā neesošu, un jaunā regulējuma izstrādei nepieciešamais laiks.

ST secinājumam par normas neatbilstību vienmēr ir tūlītējs spēks, un tas tieši ietekmē par neatbilstošu atzītās normas turpmāko piemērošanu. Laikā ST var virzīt tikai brīdi, no kura norma zaudē savu spēku.

EFEKTIVITĀTE VALSTS PĀRVALDĒ KĀ TIESISKAIS UN ĒTISKAIS PRINCIPS: VALSTS POLICIJAS PIEMĒRS

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Efektivitātes princips ir ietverts vairākos normatīvajos aktos, kas reglamentē valsts pārvaldes darbību. Šis princips ir jāievēro arī Valsts policijai kā vienai no valsts pārvaldes iestādēm un jāīsteno tās darbībā. Līdz ar to jautājums par efektīvas valsts pārvaldes darbības nodrošināšanu ir aktuāls. Referāta mērķis ir, balstoties uz Valsts policijas kā vienas no valsts pārvaldes iestādēm piemēru, analizēt efektivitāti valsts pārvaldē kā tiesisku un ētisku principu, kā arī izteikt priekšlikumus šī principa piemērošanas pilnveidei. Darbā izmantotas vispārīgas pētniecības metodes, piemēram, analīze, salīdzināšana un apkopojums, kā arī tiesību normu interpretācijas metodes.

Attīstoties normatīvajam regulējumam, radās nepieciešamība precizēt vairāku ētikas pamatprincipu un vērtību saturu. Autoru ieskatā šobrīd Latvijas augstskolām un koledžām ir nepieciešams veikt grozījumus iekšējā normatīvajā regulējumā, lai tas būtu saskaņots ar ārējo normatīvo aktu prasībām. Piemēram, Valsts policijas koledžai (turpmāk – VPK) būtu jāveic grozījumi 18.05.2021. iekšējos noteikumos Nr. 11 “Valsts policijas koledžas Ētikas kodekss”, detalizēti nosakot akadēmiskās ētikas un akadēmiskā godīguma principus, tostarp uzticamības, pārskatāmības, objektivitātes un cieņas pret intelektuālo īpašumu aspekti, kā arī profesionālās ētikas pamatprincipus, tai skaitā profesionalitātes un efektivitātes principu ievērošanas nosacījumus no VPK nodarbināto puses. VPK nepieciešams arī izstrādāt atsevišķus akadēmiskā godīguma noteikumus, kuros skaidri definēti pārkāpumu veidi, to novēršanas mehānismi un atbildības kārtība, par pamatu ņemot VPK Akadēmiskā godīguma un plaģiāta novērtēšanas un kontroles vadlīnijas. Jāveic arī VPK 18.05.2021. nolikuma Nr. 12 “Ētikas komisijas nolikums” izvērtējums, nepieciešamības gadījumā precizējot Ētikas komisijas darbības aspektus.

Referāta autori piedalījās kolektīvās monogrāfijas “Polijas darbinieka profesionālā ētika” izstrādē, kas sagatavota publicēšanai Valsts policijas koledžā. Šī pētījuma ietvaros tika analizēti Valsts policijas darbinieka profesionālās ētikas pamatprincipi un vērtības, tai skaitā arī efektivitātes princips.

EFEKTĪVS UN/VAI EFEKTĪGS: VAI NEPIECIEŠAMA IZŠĶIRŠANĀS VEIDOJOT UN PIEMĒROJOT KRIMINĀLTIESĪBU NORMAS?

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Krimināltiesību sistēmas attīstībā dažkārt var novērot zināmu spriedzi starp krimināltiesību normu **efektīgumu** un to iespējamo **efektivitāti**.

Efektivitāte krimināltiesībās tradicionāli tiek saistīta ar normu spēju sasniegt krimināltiesību politikas mērķus – nodrošināt sabiedrības drošību, novērst vai mazināt noziedzību, nodrošināt taisnīgu un samērīgu valsts reakciju uz noziedzīgām darbībām. Efektivitāte ietver ne tikai normu formālu pastāvēšanu tiesību sistēmā, tā arī pieprasa šo normu praktisku piemērojamību, skaidrību un spēju radīt paredzamu un konsekventu tiesību piemērošanas praksi.

Eiropas krimināltiesību doktrīnā efektivitātes princips tiek atzīts par nozīmīgu krimināltiesību politikas orientieri. Tomēr tas jāvērtē kopsakarā ar citiem krimināltiesību pamatprincipiem, tostarp tiesiskuma, humānisma un *ultima ratio* principiem, kas nosaka krimināltiesību izmantošanu kā galējo līdzekli sabiedrības interešu aizsardzībā. Ja šāds līdzsvars netiek ievērots, pastāv risks, ka krimināltiesības tiek pārmērīgi paplašinātas, radot krimināltiesību “inflāciju” un sistēmiski neiederīgu regulējumu.

Un šeit dažkārt savu lomu sāk spēlēt krimināltiesību efektīgums, kas var izpausties kā simboliska vai politiski demonstratīva krimināltiesību normu radīšana vai piemērošana. Šāda efektīguma galvenais uzdevums ir raidīt sabiedrībai signālu par valsts aktīvu rīcību konkrētu sociālo problēmu risināšanā, reakcijas demonstrēšana uz kādiem aktuāliem notikumiem. Šādā gadījumā krimināltiesības nereti kļūst par politiskās komunikācijas instrumentu, nevis pārdomātu kriminālpolitikas līdzekli.

Latvijas krimināltiesību attīstības kontekstā minētā problemātika dažkārt var iegūt zināmu aktualitāti, ņemot vērā dinamiskās izmaiņas krimināltiesiskajā regulējumā un pieaugošo sabiedrības un politikas ietekmi uz kriminalizācijas procesu. Tas aktualizē nepieciešamību kritiski izvērtēt, vai krimināltiesību normu veidošanā un piemērošanā prioritāte piešķirama to reālajai efektivitātei kriminālpolitikas mērķu sasniegšanā vai arī to simboliskajai iedarbībai un attiecīgajā laikā esoša vai iedomāta sabiedrības pieprasījuma apmierināšanai. Referātā tiek argumentēts, ka ilgtspējīga, konsekventa un tiesiskuma principiem atbilstoša krimināltiesību sistēma iespējama vienīgi tad, ja krimināltiesību normu izstrādē dominē pētījumos un datos balstīti efektivitātes, nevis efektīguma apsvērumi, vienlaikus saglabājot līdzsvaru ar citiem krimināltiesību pamatprincipiem.

SODA NEIZBĒGAMĪBAS PRINCIPS KĀ KRIMINĀLTIESISKO ATTIECĪBU TAISNĪGA NOREGULĒJUMA PAMATS

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Referāts veltīts soda neizbēgamības principa teorētiskajiem pamatiem un tā nozīmei krimināltiesisko attiecību noregulēšanā. Tēmas aktualitāte saistīta ar nepieciešamību nodrošināt efektīvu noziedzības novēršanu un taisnīgu krimināltiesību normu piemērošanu. Pētījumā analizētā problēma ir soda neizbēgamības principa teorētiskās izpratnes un praktiskās īstenošanas savstarpējā saskaņošana, īpaši akcentējot izmeklēšanas efektivitātes nozīmi.

Pētījuma mērķis ir analizēt soda neizbēgamības principa nozīmi krimināltiesisko attiecību noregulēšanā, izvērtējot tā sasaisti ar kriminoloģiju, krimināltiesībām un kriminālprocesu.

Darbā izmantota doktrinālā un normatīvo aktu analīze, kā arī sistēmiskā un analītiskā pieeja, lai izvērtētu kriminoloģijas, krimināltiesību un kriminālprocesa savstarpējo mijiedarbību soda neizbēgamības principa kontekstā.

Pētījumā konstatēts, ka kriminoloģijā soda neizbēgamības princips tiek pamatots ar atturēšanas teoriju, savukārt krimināltiesībās tas kalpo kā būtisks priekšnoteikums kriminālatbildības realizācijai. Principa efektīva īstenošana ir cieši saistīta ar kriminālprocesa kvalitāti, īpaši ar savlaicīgu un efektīvu noziedzīgu nodarījumu izmeklēšanu. Nepietiekama izmeklēšanas efektivitāte var mazināt principa praktisko iedarbību un negatīvi ietekmēt taisnīgu krimināltiesisko attiecību noregulējumu.

Secināms, ka soda neizbēgamības princips ir būtisks priekšnoteikums taisnīga, preventīva un proporcionāla krimināltiesisko attiecību noregulējuma nodrošināšanai, vienlaikus stiprinot sabiedrības uzticēšanos tiesību sistēmai.

KRIMINĀLSODA BARGUMA IETEKME UZ NOZIEDZĪBAS MAZINĀŠANU.

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Kriminālsoda efektivitāte un ietekme uz noziedzības mazināšanu tiek vērtētas pēc tā spējas sasniegt tām noteikto mērķi – aizsargāt sabiedrības drošību; atjaunot taisnīgumu; sodīt vainīgo personu par izdarīto noziedzīgo nodarījumu; resocializēt sodīto personu; panākt, lai notiesātais un citas personas pildītu likumus un atturētos no noziedzīgu nodarījumu izdarīšanas. Visas soda mērķa sastāvdaļas ir vienlīdz svarīgas un nevienai no tām nav prioritārā nozīme.

Vairāku gadu garumā Latvijas kriminālsodu politika bija tendēta uz sodu liberalizāciju, lai pēc iespējas mazāk personai piemērot kriminālsodu, kas ir saistīts ar brīvības atņemšanu, liekot uzsvāru uz personas resocializāciju un soda neatvairamības principu. Pretēja un satraucošā tendence ir novērojama pēdējo gadu laikā – piemērot bargākus sodus. Šim nolūkam veicot vairākus grozījumus Krimināllikumā, ka arī mainot nostāju sodu piemērošanā praksē. It īpaši šāda tendence vērojama dažu kategoriju lietās, piemēram, transportlīdzekļu vadīšana apreibinošo vielu ietekmē, noziedzīgajos nodarījumos, kas saistīti ar narkotisko un psihotropo vielu apriti, ekonomiskajos noziedzīgajos nodarījumos, ar tendenci piemērot tikai smagāko no soda veidiem – brīvības atņemšanu.

Šāda nostāja attiecībā uz kriminālsoda politiku būtiski ietekmē vienkāršoto kriminālprocesa veidu izvēli, kas būtiski ietekmē lietas izskatīšanas ilgumu un vāji ietekmē noziedzības mazināšanos. 2026. gada 27. februārī Tieslietu padome apstiprināja lietu izskatīšanas termiņu standartus 2026. gadam¹, nosakot prognozi par vidējiem krimināllietu izskatīšanas termiņiem tiesās, prognozējot, ka vidējais lietas izskatīšanas termiņš mutvārdu procesā pirmās instances tiesā būs 11,7 mēneši. Savukārt, prognozē, ka lietas izskatīšana vienošanās procesā vidēji aizņems 1,8 mēnešus, kas ir visnotaļ pozitīvs rādītājs.

Referātā tiks argumentēts, ka soda bargums būtiski neietekmē soda mērķa sasniegšanu un noziedzības mazināšanos. Tendence paredzēt un piemērot bargākus kriminālsodus ir pretrunā ar soda individualizācijas, resocializācijas un taisnīguma principiem.

¹ Tieslietu padomes 2026. gada 27.februāra lēmums Nr.9 Par lietu izskatīšanas standartu 2026. gadam // <https://www.tieslietupadome.lv/lv/jaunums/tieslietu-padome-apstiprina-lietu-izskatisanas-termi-nu-standartus-2026-gadam>

TIESĪBU UZ KRIMINĀLPROCESA PABEIGŠANU SAPRĀTĪGĀ TERMIŅĀ NIEVĒROŠANAS TIESISKĀS SEKAS UN NOZĪME SODA NOTEIKŠANĀ

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- [1] Kriminālprocesa likuma 14. pantā nostiprinātās tiesības uz kriminālprocesa pabeigšanu saprātīgā termiņā ir Latvijas Republikas Satversmes 92. pantā un Cilvēka tiesību un pamatbrīvību aizsardzības konvencijas 6. pantā noteikto “tiesību uz taisnīgu tiesu elements”.¹
- [2] Referāts veltīts tiesību uz kriminālprocesa pabeigšanu saprātīgā termiņā nievērošanas tiesisko seku apskatam un nozīmei soda noteikšanā analīzei, prakses pētījuma rezultātā secinot, ka ne vienmēr minēto tiesību nievērošanas tiesisko seku izvēle tikusi pamatota.
- [3] Kriminālprocesa likuma 14. pantā noteiktais kriminālprocesa pamatprincips paredz, ka kriminālprocess ir jāpabeidz bez neattaisnotas novilcināšanas. Tā ievērošana tiek vērtēta, ņemot vērā tādas kritērijas kā lietas apjoms, juridisko sarežģītību, procesuālo darbību daudzumu, procesā iesaistīto personu attieksmi pret pienākumu pildīšanu un citus objektīvus apstākļus. Personas tiesību uz kriminālprocesa pabeigšanu saprātīgā termiņā nievērošanas gadījumā paredzētas vairākas iespējamās tiesiskās sekas: 1) šo apstākli iespējams ņemt vērā pie soda noteikšanas un sodu mikstināt; 2) noteikt sodu, kas ir zemāks par minimālo robežu, kāda par attiecīgo noziedzīgo nodarījumu paredzēta likumā; 3) noteikt citu, vieglāku soda veidu, nekā par attiecīgo noziedzīgo nodarījumu paredzēts likumā; 4) atbrīvot no kriminālatbildības; 5) atbrīvot no soda.
- [4] Konstatējot tiesību pārkāpumu uz kriminālprocesa pabeigšanu saprātīgā termiņā, nolēmumos ietverams “motivēts atzinums par pārkāpuma esamību, kā arī motivēti atzinumi par konkrētu labvēlīgu seku veida piemērošanu vai nepiemērošanu”.² Secināms, ka ne vienmēr iepriekš minētais ievērots arī pēdējo gadu praksē. Tā, piemēram, Senāta Krimināllietu departaments konstatējis, ka, piemērojot Krimināllikuma 49.¹ panta pirmās daļas 1. punktu (apstākli, ka nav ievērotas personas tiesības uz kriminālprocesa pabeigšanu saprātīgā termiņā, var ņemt vērā pie soda noteikšanas un sodu mikstināt), nolēmumā nav sniegts likuma normu prasībām atbilstošs pamatojums personai noteiktajam sodam.³

¹ Līce K., Strada-Rozenberga K. Komentārs Krimināllikuma 14.pantam. Tiesības uz kriminālprocesa pabeigšanu saprātīgā termiņā/ Grām.: Kriminālprocesa likuma komentārs. A daļa. Rīga: Latvijas Vēstnesis, 2019, 70.lpp.; Krastiņš U., Liholaja V. Krimināltiesības.Vispārīgā daļa. Mācību grāmata. Ceturtais papildinātais izdevums. Rīga: Tiesu namu aģentūra, 2024, 378.lpp.; Rozenbergs J. Tiesības uz kriminālprocesa pabeigšanu saprātīgā termiņā. Jurista Vārds, 2011, Nr. 27.

² Meikališa Ā., Strada-Rozenberga K. Tiesu prakse par tiesībām uz kriminālprocesa pabeigšanu saprātīgā termiņā un soda noteikšanā, ja nav ievērotas tiesības uz kriminālprocesa pabeigšanu saprātīgā termiņā. Rīga, 2013, 98.lpp. Pieejams: <https://www.at.gov.lv/lv/tiesu-prakse/tiesu-prakses-apkopojumi/kriminal-tiesibas>, Kriminālprocess. Raksti. 2010-2015. Rīga: Latvijas Vēstnesis, 192.–285.lpp.

³ Augstākās tiesas 25.01.2024. lēmums lietā SKK-44/2024.

ATBILDĪBA PAR APZINĀTI NEPATIESAS LIECĪBAS SNIEGŠANU KĀ PROCESA EFEKTIVIZĀCIJAS LĪDZEKLIS

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Liecības ir viens no izplatītākajiem un tajā pašā laikā neuzticamākajiem pierādīšanas līdzekļiem. No vienas puses tās jau izsenis ir izmantotas kā efektīvs līdzeklis faktu rekonstrukcijai. No otras puses, tās ir pakļautas vairākiem subjektīviem un objektīviem faktoriem un apzināti vai neapzināti var rezultēties nepatiesu liecību sniegšanā, apdraudot lietas patieso apstākļu noskaidrošanu un neizbēgami arī ikviena tiesiskā procesa centrālā mērķa – taisnīga tiesisko attiecību noregulējuma – sasniegšanu jeb procesa efektivitāti.

Ievērojot, ka patiesības noskaidrošanā būtiska nozīme ir procesa dalībnieku sniegtajām ziņām, aktualizējas jautājums par to, kā nepatiesas liecības novērst. Viens no valsts izraudzītajiem līdzekļiem tā sekmēšanai ir kriminālatbildības noteikšana par apzināti nepatiesas liecības sniegšanu. Attiecīgi referāta mērķis ir raksturot šī institūta ietekmi uz procesa efektivitāti, noskaidrojot tā *rationalē* jeb pamatojumu un jēgu.

Pētījuma rezultātā secināts, ka, kriminālatbildība par apzināti nepatiesas liecības sniegšanu, ievērojot soda preventīvo funkciju – bailes no kriminālatbildības un soda neizbēgamības, – attur personas no apzināti nepatiesas liecības sniegšanas. Tas savukārt sekmē procesuālo ekonomiju – pēc iespējas ātrāku procesa atrisinājumu un lietderīgu resursu izmantošanu, novēršot laika, finanšu līdzekļu, cilvēkresursu veltīšanu nepatiesu liecību pārbaudei.

Līdz ar to procesa efektivitāte ir atkarīga ne vien no valsts, tai pieejamajiem tiesiskajiem mehānismiem un prasmīgas to izmantošanas, bet arī no ikviena procesa dalībnieka godprātīgas rīcības, tostarp pienākuma sniegt patiesas ziņas izpildes. Ņemot vērā, ka kriminālatbildība par apzināti nepatiesas liecības sniegšanu pastiprina šī pienākuma izpildi, tā ir atzīstama par procesa efektivizācijas līdzekli.

Lai arī kriminālatbildība par apzināti nepatiesas liecības sniegšanu un brīdinājums par atbildību kalpo kā preventīvs, apzināti nepatiesu liecību sniegšanu novērsošs līdzeklis, tas vien norāda liecinošajām personām rīcības pareizo virzienu, bet pats par sevi negarantē liecību patiesumu. Lai atbildība par apzināti nepatiesas liecības sniegšanu kā procesa efektivizācijas līdzeklis būtu iedarbīgs, ir nepieciešami skaidri definēti kriminālatbildības piemērošanas kritēriji un konsekventa tā piemērošanas prakse.

20 GADU KRIMINĀLPROCESA EFEKTIVITĀTES MEKLĒJUMOS: DARĪTAIS, SASNIEGTAIS UN IGNORĒTAIS KRIMINĀLPROCESA NORMATĪVAJĀ REGULĒJUMĀ, PIEMĒROŠANAS PRAKSĒ UN DOKTRĪNĀ

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Viens no drošas valsts pastāvēšanas priekšnoteikumiem ir efektīva krimināltiesiskās atbildības regulējuma sistēma, kas aptver gan materiālās krimināltiesības, gan to piemērošanu – procesuālās tiesības.

Referāts veltīts Latvijas kriminālprocesuālo tiesību divdesmitgades analīzei, ko pamudināja veikt Kriminālprocesa likuma pieņemšanas un spēkā stāšanās 20 gadu jubileja. Kriminālprocesa likuma normu un to piemērošana atklāj, cik lielā mērā juridiskā racionalitāte (efektivitāte, racionalizācija, digitalizācija) ir saglabājusi saikni ar taisnīguma jēgu un cilvēktiesību saturu.

Atzīmējot divu dekāžu garuma Kriminālprocesa likuma spēkā esamību, autoru kolektīvs izstrādāja monogrāfiju¹, kurā aicināts skatīt kriminālprocesu nevis kā tehnisku procedūru kopumu, bet kā instrumentu taisnīguma īstenošanai.

Divdesmit gados Kriminālprocesa likums piedzīvojis intensīvu, pārsvarā gan fragmentāru reformēšanu – pieņemti vairāk nekā piecdesmit likumi par grozījumu veikšanu. No vienas puses, novērsta sākotnējā un pašu grozījumu radītā nesaskaņotība, ieviesti jauni risinājumi ES un starptautisko prasību ietekmē, attīstīta cietušā un citu procesuālo dalībnieku aizsardzība, paplašināti ārpustiesas noregulējumi, vienkāršotie procesi, ieviesta e-lieta un elektroniskā uzraudzība. No otras puses, saglabājas tendence reaģēt uz atsevišķām problēmsituācijām, nevis veidot sistēmisku un iekšēji saskaņotu regulējumu; daļa grozījumu rada jaunas neskaidribs, palielinot normu raibumu un piemērošanas sarežģītību.

Kopējais vēstījums: Latvijas kriminālprocess 20 gados ir piedzīvojis evolūciju, ne revolūciju. Tas spējis pielāgoties starptautiskajiem standartiem un tehnoloģiskajām pārmaiņām, bet vēl pilnībā nav atradis līdzsvaru starp reformu dinamiku un normas stabilitāti, starp efektivitāti un taisnīgumu. Pieaug iespējamība, ka nākotnē būs vajadzīga jauna, sistemātiski pārstrādāta Kriminālprocesa likuma redakcija, kas apvienotu uzkrāto pieredzi un nodrošinātu iekšēji saskaņotu, cilvēktiesībās balstītu regulējumu. Kriminālprocesa nākotnes kvalitāti noteiks ne tikai normu teksts, bet arī to piemērotāju atbildīgums, profesionālā gudrība un pārliecība, ka efektivitāte nekad netiek atrauta no taisnīguma.

¹ Latvijas kriminālprocess 20 gados: tiesību attīstība starp stabilitāti un reformām. Likuma, prakses un doktrīnas krustpunkti. Zin.red. Ā.Meikališa, K.Strada-Rozenberga. Rīga, LU Akadēmiskais apgāds, 2026.

POST-BIROKRĀTISKAS VALSTS PAMATI: FILOSOFIJA, ARHITEKTŪRA, PRINCIPI UN TEHNOLOĢIJAS (Stenda prezentācija)

Oskars Galanders

Pētījums piedāvā teorētisku un tehnoloģisku ietvaru valsts pārvaldes fundamentālai transformācijai – pārejai no **monolītās birokrātijas** uz **post-birokrātisku arhitektūru**. Pāreja balstās uz vairākiem vaļiem:

1. **Psiholoģiskā atbrīvošana.** Izmantojot Maslova vajadzību hierarhiju un Csikszentmihalyi “Plūsmas” (*Flow*) koncepciju, tiek pierādīts, ka birokrātiskais slogs ne tikai rada materiālus zaudējums, bet ir arī **kognitīvās autonomijas** kavēklis. Automatizācija atbrīvo individu intelektuālos resursus, ļaujot tiem sasniegt pašrealizāciju (kā augstāko labklājības līmeni), nevis tērēt šo enerģiju procedūru pildīšanai.
2. **Tehnoloģiskā arhitektūra.** Izmantojot **Linux kodola** analogiju, tiek piedāvāta modulāra, atklātā koda sistēma, kurā valsts ir *kodols*, bet publiskās funkcijas ir neatkarīgi, konkurējoši *moduļi*. Tas ļauj ieviest “dabisko atlasī” pārvaldes pakalpojumos: sliktākie moduļi izzūd, labākie evolucionē. Atšķirīgas pašvaldības vai reģioni darbojas kā dažādi **Linux distributivi**. Tās izmanto vienu kodolu, bet izvēlas atšķirīgu moduļu kopu, kas atbilst vietējām vajadzībām (subsidiaritāte). Ja modulis kļūst novecojis vai kļūdainis, to var “noņemt” un aizstāt ar labāku, nevis gaidīt visu sistēmas atjauninājumu. Tas ļauj valsts pārvaldei *evolucionēt* nepārtraukti, nevis periodiski.
3. **Politiskā filosofija.** Integrējot Ričarda **Stallmana brīvības principus** un ideju “likumi bez likumdevēja” (*Rules without Rulers*), valsts no “pārvaldnieka” pārtop par sadarbības ietvara **arhitektu**. Viedlīgumi un MI aģenti nodrošina, ka noteikumi ir pārskatāmi, nemainīgi un neitrāli, izskaužot birokrātu patvaļu un korupciju.
4. **Principi. Pārrēķināmība (transparency), Subsidiaritāte, Saistošā pārrēķināmība, Mobilitāte, Pull (pieprasījuma) modelis.**
5. **Darbības modelis.** Pāreja no **Push** (valsts uzspiež) uz **Pull** (individuāls pieprasījums) modeli pārvērš individuālos no pasīviem objektiem uz aktīviem sistēmas arhitektiem, kuriem ir tiesības uz **saistošu pārrēķināmību** (tiem garantēts iepriekš prognozēts iznākums).

Kā praktisks instruments tiek ieviests indivīda-vadītāja funkciju leģitimitātes audits, lai salīdzinātu katru valsts īstenoto funkciju ar efektīvāko pieejamo MI risinājumu, novērtējot tos pēc izmaksām, ātruma, pārrēķināmības. Audita rezultātā veidojas publisks risinājumu “katalogs”, kuru uzņēmēji, nevalstiskās organizācijas un pašvaldības var izmantot, lai iegādātos vai kopīgi izstrādātu vajadzībām vispiemērotākos MI aģentus.

Pētījums integrē **TRIZ** (Izgudrošanas uzdevumu risināšanas teorija) principus, lai pierādītu, ka post-birokrātiskā valsts ir loģisks evolūcijas posms, kurš izklīdinās pašreizējās sistēmas fundamentālās pretrunas (drošība vs. brīvība, efektivitāte vs. pārrēķināmība). Ideālais gala rezultāts (IFR) definē ideālu sistēmu kā tādu, kas veic funkciju bez “starpnieka-cilvēka” sloga, birokrātijas “izzūd”, bet rezultāts tiek pilnībā sasniegts.

Apvienojot uz rezultātu orientētu IFR arhitektūru un uzticēšanās-brīvu (*trust-less*) viedlīgumu izpildi, šī pieeja piedāvā ceļu birokrātijas mazināšanai, digitalizācijas paātrināšanai un publisko pakalpojumu vispārējās kvalitātes paaugstināšanai, saglabājot atklātību un atbildību.

Kopējais vēstījums. Post-birokrātiskā valsts nav utopija, bet gan tehnoloģiski iespējama realitāte. Tā ir valsts **nonākšana pie sabiedriskajam līgumam atbilstošām fundamentālām funkcijām, kļūstot par konstitucionālo garantu (definējot neapstrīdamās pamatvērtības), standartu regulatoru, pēdējās instances tiesu, sistēmisku drošinātāju.** Tā kā tehnoloģija pārņem operatīvo un izpildu līmeni, valsts kļūst *mazāk* redzama ikdienā, bet *stiprāka* kā garantija taisnīgumam un stabilitātei.

ĀRĒJO FAKTORU IETEKME UZ LIETISKO PIERĀDĪJUMU SAGLABĀŠANOS KĀ VIENS NO KRIMINĀLPROCESA EFEKTIVITĀTI IETEKMĒJOŠIEM FAKTORIEM (Stenda prezentācija)

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Ievads. Kā viens no kriminālprocesa efektivitāti ietekmējošajiem faktoriem ir lietisko pierādījumu un uz tiem esošo pēdu saglabāšanās dažādu ārējo faktoru ietekmē. Ārējo faktoru pēctecīga vai vienlaicīga iedarbība uz objektu un uz tā esošajām pēdām var izraisīt gan objekta, gan uz tā esošo pēdu daļēju vai pilnīgu degradāciju, kā rezultātā var tikt nelabvēlīgi ietekmēta kriminālprocesa efektivitāte. Savukārt objekta un uz tā esošo sviedru un tauku pēdu degradācijas iespējamība norāda uz nepieciešamību izpētīt un izanalizēt dažādu apstākļu ietekmi uz šo pēdu saglabāšanās iespējām.

Pētījuma mērķis. Eksperimenta mērķis bija izpētīt un izanalizēt latentu papillārlīniju rakstu pēdu saglabāšanās iespējas uz plastmasas un stikla objektiem mainīgas un konstanti pazeminātas temperatūras ietekmē, kā arī uz ūdenī iegremdētiem objektiem laika posmā no 24h līdz 240h.

Metodoloģija. Eksperiments tika veikts trijos posmos. Katrā eksperimenta posmā latentas papillārlīniju rakstu pēdas tika atstātas uz desmit stikla un desmit plastmasas objektiem.

Pirmajā posmā desmit stikla un desmit plastmasas objekti ar uz tiem atstātajām pēdām tika novietoti āra apstākļos, kur objekti un uz tiem atstātās pēdas tika pakļautas meteoroloģiskajiem apstākļiem un temperatūras svārstību ietekmei no -5 °C līdz +3 °C.

Otrajā posmā desmit stikla un desmit plastmasas objekti ar uz tiem atstātajām pēdām tika ievietoti saldējamajā kamerā ar konstantu temperatūru -18°C.

Trešajā posmā desmit stikla un desmit plastmasas objekti ar uz tiem atstātajām pēdām tika ievietoti atklātā vietā novietotās ūdens tvertnēs ar ūdeni no ūdens apgādes sistēmas.

Pēdu vizualizēšanai tika pielietota fizikālā metode pielietojot BVDA firmas (Nīderlande) adhēzijas aģentus: melno magnētisko pulveri un divtoņu melno/sudraba magnētisko pulveri. Pēdu pārkopēšanai tika pielietota silikona pastas uzklāšanas pistole. Iegūto rezultātu apkopošanai un analīzei pēdas tika iedalītas četrās grupās.

Secinājumi. Eksperimenta rezultātā tika iegūts apstiprinājums pēdu saglabāšanās iespējām minēto ārējo faktoru ietekmē, bet gan ārējo faktoru kompleksa un vienlaicīga iedarbība uz pēdu.

INOVATĪVS TEHNOLOĢISKS RISINĀJUMS PRAKTISKAM PIELIETOJUMAM LIETISKO PIERĀDĪJUMU ATKLĀŠANĀ (Stenda prezentācija)

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Ievads. Viens no attīstības virzieniem kriminālistikā ir zaļā kursa ieviešana, kurā viens no mērķiem ir rast risinājumu sviedru un tauku pēdu vizualizēšanai ar bioloģiskajiem pulveriem, kā arī citās jomās pielietoto materiālu pulveriem.

Patreizējā izpētes posmā galvenokārt tiek pētītas alternatīvo vizualizēšanas pulveru adhēzijas īpašības, tomēr turpinot to pielietošanas izpēti nepieciešams izanalizēt šo pulveru adhēzijas īpašības sviedru un tauku vielu pēdu vizualizēšanai, kas tikušas pakļautas dažādu ārējo faktoru iedarbībai, kā arī izpētīt šo pulveru ietekmi uz pēdu kompleksas izpētes iespējām.

Pētījuma ietvarā veiktais eksperiments sniedz ieskatu uz bioloģisko pulveru kā alternatīvu rūpnieciski izgatavotiem daktiloskopiskajiem pulveriem.

Pētījuma mērķis. Izpētīt un izanalizēt vienpadsmit dažādu bioloģisko pulveru adhēzijas īpašības vizualizējot latentas papillārlīniju rakstu pēdas.

Metodoloģija. Eksperimenta laikā uz dažādu krāsu plastmasas, stikla un metāla virsmām tika atstātas latentas papillārlīniju rakstu pēdas.

Pēdu vizualizēšanai tika izmantota fizikālā metode pielietojot guāra un ksantāna sveķu, kanēļa, kurkumas, paprikas, sīpolu, banānu, upeņu, agara, spirulīnas un hlorellas pulverus, kuru uzklāšanai tika izmantotas stikla šķiedras un Marabu putna spalvu otas.

Eksperimenta rezultātā bioloģisko pulveru adhēzijas īpašības tika iedalītas četrās grupās: A – labas adhēzijas īpašības (labs pēdas atspoguļojums); B – vidējas adhēzijas īpašības (pēdas atspoguļojums neizteikts); C – vājas adhēzijas īpašības (pulveris praktiski neiekrāso pēdu); N – pulveris netika pielietots tā krāsas dēļ, jo nekontrastē ar objekta krāsu. Eksperimenta rezultāti tika fiksēti fotografējot.

Secinājumi. Eksperimenta gaitā tika konstatēts, ka atsevišķu bioloģisko pulveru adhēzijas īpašības bija izteiktākas, bet to varētu izskaidrot ar atšķirīgu graudainības pakāpi. Tika konstatēta pulvera uzklāšanas metode, kura palīdzēja iegūt labāku rezultātu, proti, vispirms pulveri plānā kārtiņā ar rotējošām kustībām uzklāt ar stikla šķiedras otu, bet pēc tam ar Marabu putna spalvas otu noņemt lieko pulveri, tādā veidā neradot lieku iedarbību uz pēdu.

PAŠVALDĪBAS DOMES PRIEKŠSĒDĒTĀJA ATSTĀDINĀŠANA OBLIGĀTA ADMINISTRATĪVĀ AKTA IZDOŠANAS KONTEKSTĀ (Stenda prezentācija)

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Valsts pārvaldes darbībā būtiskas izmaiņas radīja administratīvā procesa ieviešana. Pētījuma mērķis ir analizēt Valsts pārvaldes iekārtas likumā ietvertās Ministru kabineta pārraudzības pār pašvaldību darbību situācijā, ja piemērojamā tiesību norma paredz konkrētas sekas, tiesisko saturu. Pētījuma aktualitāti nosaka 2024. gadā izdarītie Pašvaldības likuma un likuma “Par valsts noslēpumu” grozījumi, kas noteica pienākumu pašvaldības domes priekšsēdētājam un priekšsēdētāja vietniekam saņemt pielaidi valsts noslēpumam pēc to ievēlēšanas amatā, un to piemērošanu pēc 2025. gada pašvaldību vēlēšanām, kas ietver Viedās administrācijas un reģionālās attīstības ministra rīkojumu 2026. gadā par pašvaldības domes priekšsēdētāja atstādināšanu. Pētījuma nozīmīgumu nosaka apstākļi, ka publiski nav pieejami padziļināti pētījumi šajā jomā. Pētījumā veikta tiesību normu analīze, tostarp, piemērojot vēsturisko metodi, un priekšlikumu sintēze, balstoties uz judikatūras un tiesību doktrīnas atziņām. Pētījumā izmantota deskriptīvā metode un tiesību normu interpretācija metodes.

Izmantojot Pašvaldības likuma 69. pantā iekļautās tiesības ar pilnvarotā ministra motivētu rīkojumu var atstādināt domes priekšsēdētāju no amata pienākumu pildīšanas, ja domes priekšsēdētājs nepilda vai pārkāpj ārējos normatīvos aktus vai nepilda tiesas spriedumus. Atstādināšana ir pagaidu aizliegums pildīt amata pienākumus. Paredzētot obligātu prasību pēc ievēlēšanas amatā saņemt speciālās atļaujas pieejai valsts noslēpumam, svarīgi ir noteikt tiesiskās sekas minēto prasību neizpildes gadījumā. Saskaņā ar likuma “Par valsts noslēpumu”¹³. panta ceturto daļu pēc lēmuma pieņemšanas par atteikumu vai pielaides anulēšanu persona nekavējoties pārceļama darbā, kas nav saistīts ar valsts noslēpumu. Ja tas nav iespējams, ar to nekavējoties izbeidzamas darba (dienesta) attiecības.

Secinājums. Ministram, īstenojot pašvaldību darbības pārraudzību, ir jādod tiesības atbrīvot domes priekšsēdētāju un priekšsēdētāja vietnieku, izdodot obligāto administratīvo aktu, jo piemērojamā tiesību norma liedz atrasties amatā un iestādei nav rīcības brīvības. No minētā izriet nepieciešamība grozīt Pašvaldību likuma 69. pantu, paredzot attiecīgu regulējumu, salāgojot to ar Administratīvā process likuma normām un paplašinot norma tvērumu.

AUDZINOŠĀ RAKSTURA PIESPIEDU LĪDZEKĻU PIEMĒROŠANA BĒRNIEM TIESĀ: TAISNĪGUMA UN TIESISKUMA ASPEKTI (Stenda prezentācija)

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Audzinoša rakstura piespiedu līdzekļu piemērošana bērniem (turpmāk – audzinoša rakstura piespiedu līdzekļi) tiesiski atrodas ārpus kriminālprocesuāla regulējuma, jautājums noregulēts speciālā likuma¹ ietvaros. Institucionāli lēmums piemērot šādus līdzekļus pārkāpuma gadījumā var tikt pieņemts pašvaldības administratīvajā komisijā (bērnā no 11 līdz 18 gadu vecumam) vai arī noziedzīga nodarījuma gadījumā – vispārējās jurisdikcijas pirmās instances tiesā (nepilngadīgā bērnā no 14 līdz 18 gadu vecumam), ar nosacījumu, ka pastāv priekšnosacījumi šādu līdzekļu piemērošanai (atbilstoši Kriminālprocesa likuma 522. pantam). Kaut gan priekšnosacījums iespējai uzsākt procesu par audzinoša rakstura piespiedu līdzekļu piemērošanu nepilngadīgā bērnā ir kriminālprocesa izbeigšana un atbrīvošana no kriminālatbildības (Kriminālprocesa likuma 379. panta otrā daļa), procesuālajā regulējumā pastāv būtiskās problēmas audzinoša rakstura piespiedu līdzekļu regulējumā gan teorētiskajā (materiālo un procesuālo tiesību ietvarā), gan praktiskajā līmenī. Kriminālprocesa likumā netiek regulēta audzinoša rakstura piespiedu līdzekļu piemērošanas procesuālā kārtība tiesā.

Referātā tiek analizētas materiālo tiesību *“atbrīvošanas no soda, piemērojot audzinoša rakstura piespiedu līdzekļus”* institūta regulējums krimināltiesībās, *“atbrīvošana no soda”* un *“atbrīvošana no kriminālatbildības”* izpratne, Kriminālprocesa likuma 522. panta un kopumā kriminālprocesuālās kārtības piemērošanas problēmjautājumi bērna labāko interešu, likumiskā pārstāvja tiesību nodrošināšanas aspektā, kontekstā ar nepieciešamību nodrošināt krimināltiesisko attiecību taisnīgu noregulējumu. Konstatētas vairākas problēmas, *t.sk.* bērna, likumiskā pārstāvja tiesību garantiju reglamentācija; kritēriju trūkums audzinoša rakstura piespiedu līdzekļu procesa ierosināšanai pirmstiesas vai tiesas procesā un līdz ar to vienveidīgas prakses veidošanas problēma; audzinoša rakstura piespiedu līdzekļu noteikšanas objektivitātes problēma, vienveidīgās prakses problēma. Referātā arī tiek piedāvāti priekšlikumi tiesiskā regulējuma, *t.sk.* juridiskās prakses pilnveidei. Autore sprāts, Krimināllikuma, Kriminālprocesa likuma un speciālā likuma normu harmonizēšana, kā arī profesionālais apmācības kurss izmeklētājiem, prokuroriem un tiesnešiem audzinoša rakstura piespiedu līdzekļu piemērošanā varētu veicināt tiesību piemērotāju kopējo izpratni gan par normatīvo regulējumu, gan tā piemērošanu.

¹ Ar terminu “speciālais likums” referātā tiek apzīmēts likums “Par audzinoša rakstura piespiedu līdzekļu piemērošanu bērniem” (pieņemts 31.10.2002., spēkā no 01.01.2005., ar grozījumiem, kas izsludināti līdz 15.12.2022.). Publicēts: Latvijas Vēstnesis, 168, 19.11.2002.