

# **Tartu kolledž, 2017. aasta teadus- ja arendustegevuse aruanne**

## **1. Struktuuriüksuse struktuur 2017. a**

Tartu kolledž

Tartu College

Lembit Nei, [lembit.nei@ttu.ee](mailto:lembit.nei@ttu.ee), +372 620 4802

Kolledžis tegutsevad uurimisrühmad:

- Keskkonnatehnoloogia uurimisrühm
- Ehitatud keskkonna uurimisrühm
  
- Research group of environmental technologies
- Built Environment research group

## **2. Teadus- ja arendustegevuse ülevaade uurimisrühmade lõikes**

### **KESKKONNATEHNOLOOGIA UURIMISRÜHM**

**Uurimisrühma juht:** Mari Ivask, professor

**Uurimisrühma liikmed:**

Lembit Nei, professor

Annely Kuu, dotsent

Jane Raamets, lektor, doktorant (osaleb ka Ehitatud keskkonna uurimisrühma teemades)

Sander Kutti, lektor, doktorant

Egge Haiba, lektor, doktorant

Tiit Iepasaar, lektor

Kai Kalda, lektor

Tiina Niine, lektor

**Teemarühm: nanoosakeste rakendused**

Liikmed:

Erwan Rauwel, professor

Protima Rauwel, vanemteadur

Siim Küünal, doktorant

Arnaud Behr, magistrant École Centrale de Lille (France)

Kamillia Gabaidullina magistrant Grenoble INP Phelma (France)

Anastasiia Mikheenkova magistrant University Rennes 1

Anni Kurisman, magistrant, TTÜ Tartu kolledž

Uurimisrühmal on kompetents keskkonnakeemias, keskkonnamikrobioloogias, keskkonnatehnoloogiate väljaarendamises, mullabioloogias. Meie rühma tegevuse põhisuunad on:

1. Erinevate materjalide taaskasutustehnoloogiate väljaarendamine. Lähtuvalt meie uurimisrühma kompetentsist arendame tehnoloogiaid, mis on seotud muldkeskkonna elustikunäitajate kasutamisega erinevate tehnoloogiate arendamisel, sh rakendame mulla mikroobikoosluse ja mullaselgrootute parameetreid. Meil on kompetents jäätmete taaskasutustehnoloogiate arendamisel ja rakendamisel, sh tahked jäätmed, reoveesete, mitmesugused tootmisjäätmed. Oleme uurinud jäätmete taaskasutusel aeroobsete (kompostimine) ja anaeroobsete (Bokashi) meetodite võimalikke rakendusi ja arendanud meetodeid. Üks uurimissuund

on ravimijääkide liikumine olmejäätmetest reoveesetesse ja nende lagundamise efektiivsus kompostimisprotsessis, samuti ravimijääkide liikumine toidutaimedesse kompostide kasutamisel.

2. Keskkonnaseisundi hindamise meetodikate väljatöötamine. Keskkonnaseisundi hindamisel kasutame mulla mikrobioloogilisi parameetreid (biomass, ensümaatiline ja respiratoorne aktiivsus, mitmekesisus) ning elustikuparameetreid bioindikaatoritena. Oleme hinnanud keskkonnaseisundit antropogeensete häiringute (karjäärid, töö lõpetanud prügilad, ammendatud turbaalad, haritavad maad jne) ning looduslike üleujutuste tingimustes. Oleme uurinud põhu- ja pilliroomajade siseõhu kvaliteeti mikrobioloogiliste näitajate alusel.

3. Tootmisprotsessiga seotud energia- ja materjalivoogude uurimine, olelusringi hindamine, ressursside efektiivne kasutamine. Töös kasutame lisaks õppejõududele ka meie üliõpilaste (Keskkonnajuhtimise bakalaureuseõpe, Tööstusökoloogia magistriõpe) potentsiaali.

4. Teemarühma teadustöö eesmärk on metalli nanoosakeste biomeditsiinilised rakendused (Co, Ag, Ag-Co, ...) nagu biotsiidsed ja antimikroobsed katted, vähiravi, veepuhastustehnoloogiad eemaldamaks raskemetalle ja radioaktiivseid elemente. Lisaks on eesmärgiks ka hübriid nanomaterjalide arendus fotogalvaaniliste rakenduste väljatöötamiseks.

Teemarühm teeb tihedat koostööd TTÜ Tartu kolledži keskkonnatehnoloogia uurimisgrupiga (antimikroobsed uuringud), TTÜ Materjali- ja keskkonnatehnoloogia instituudiga (veepuhastus), Tartu Ülikooli meditsiiniteaduste valdkonnaga (toksikoloogia testid nanoosakestele) ja Keemilise ja Bioloogilise Füüsika Instituudiga (antimikroobsed ja toksikoloogia-alased testid).

#### **Projektid:**

- Nanomeditsiinile suunatud ülistabiilsete metalsete nanoosakeste sünteesi taotlus (PUT431 2014-2017)
- TAR16019 "Kontrollitud korrastatus kvant- ja nanomaterjalides" (TAR16019/TK134, 2015-2023)
- Süsinikul põhinevate nanohübriidmaterjalide arendus Minateciga (IMEP (microelectronics, electromagnetism and photonics ja LMGP (materials and physical engineering laboratory) Prantusmaal Grenoble)
- Metall nanoosakeste arendus veepuhastustehnoloogiates (Hispaania ALBA sünkrotron)
- Co nanoosakeste elektrokeemiliste omaduste uurimine (Oxfordi ülikool, UK)
- Co nanoosakeste vähi- ja tervete rakkude interaktsiooni uuringud Montpellieri ülikoolis Prantsusmaal)
- Nanoosakeste fotoluminestsentsi uuringud (Oslo ülikool, Norra)
- Magnetiliste hübriidsete nanokomposiitide arendus (Aveiro ülikool, Portugal)

#### **Olulisemad teadustulemused:**

1. Reoveesettes on kindlaks tehtud ravimijääkide olemasolu, mis võivad migreeruda taimedesse. Läbiviidud uurimuse tulemused näitasid, et optimaalsete kompostimis-tehnoloogiate teel on võimalik paljude saasteainete sisaldust reoveesette kompostis olulisel määral vähendada, et minimeerida ravimijääkide sattumist keskkonda ja nende mõju seal mikroobikoosluse aktiivsusele, taimede kasvule ja arengule ning mitmete muude organismide talitlusele
2. Põhu- ja pilliroomajade siseõhus ja ehitusmaterjalides leiduvad seente perekonnad olid *Alternaria*, *Aspergillus*, *Penicillium* ja *Cladosporium*, enamusest neist kujutavad teatavat riski inimese tervisele.
3. Põhu- ja pilliroomajade sisekliima ( $t^{\circ}$ , õhuniiskus,  $CO_2$ ) vastab normidele, uuritud majades ei tuvastatud potentsiaalselt tervisele ohtlikke mikroorganisme tervist ohustatavates kogustes.
4. Otsekülvitehnoloogia avaldab mullaselgrootute (Collembola, Lumbricidae) kooslustele väiksemat mõju kui tavapärane künnitehnoloogia.

5. Reoveesete suurendab oluliselt puude kõrguskasvu. Soovitav on turba-alade taimestamisel kasutada reoveesetet kaseistikute istutamisel selle kõrguskasvu stimuleeriva efekti tõttu.
6. Uudne filtersüsteem raskemetalli ioonide ja radioaktiivsete elementide likvideerimiseks heitveest (patendeeritud). Sobib ringmajanduse põhimõtetega kokku.
7. Co nanoosakeste efektiivne tsütotoksiline mõju vähirakkudele väga väikestel kontsentratsioonidel.

**Patendid:**

E. Rauwel, P. Rauwel, Ü. Sõukand, Cobalt Metal Nanoparticles for heavy metal extraction from water, UK application GB1717391.5

**Järeldoktorid:**

Ei ole.

**Tunnustused:**

Ei ole.

**Välisorganisatsioonide liikmed:**

Ei ole.

**Osalemise võrgustikes:**

- Mari Ivask - ESSEM COST Action ES1406 - Soil fauna - Key to Soil Organic Matter Dynamics and Modelling (KEYSOM)
- Mari Ivask - Maailma looduskaitseorganisatsiooni IUCN juures asuva Euroopa Säästva Kasutamise Grupi (European Sustainable Use Group by IUNC) juhtkomitee liige

**Koostöö:**

Uurimisrühmal on aktiivne koostöö:

1. COST tegevuse ES1406 partneritega,
2. European Sustainable Use töögrupiga,
3. Valgevene TA Vermitehnoloogia laboriga.

**PhD kaitsmine:**

Egge Haiba. Optimization of Sewage Sludge Composting: Problems and Solutions. Reoveesette kompostimistehnoloogiate optimeerimine ravimijääkide kahjutustamise eesmärgil.

Juhendajad: Prof. L.Nei, M.Lillenberg

Kaitsmine: 8.12.2017

**Konverentsid:**

Haiba E., Nei L. (2017). Sewage Sludge Composting and Pharmaceuticals. 7th International Scientific Forum, ISF 2017, 7- 9 February 2017, Oxford, UK , Proceeding. European Scientific Institute, 114–121.(Oral presentation L. Nei)

Ivask M. Project meeting of COST Action ES1406, Bucharest 27.-29.09.2017.

Raamets Jane. "Assessment of indoor air in Estonian straw bale and reed houses". Air Pollution 2017. 25-27. aprill, Cadiz, Hispaania.

Invited oral presentation at EMN Europe meeting, Int. Conf. on Small Science, **San Sebastian**, Spain, May 2017

“Hybrid nanocomposites and ultrastable metal nanoparticles studied for the development of applications in nanomedicine, water purification and energy harvesting” E. Rauwel, P. Rauwel, S. Küünal, O. Volobujeva, A. Ivask, A. Galeckas, F. Ducroquet and D. Wragg

Invited oral presentation and conference at Int. Conf. & Exhibition on Nanomedicine and Drug Delivery, Osaka, Japan, May 2017

“Nanomaterial synthesis and study for biomedicine and cancer treatment” E. Rauwel

Poster presentation at Int. IX Oil Shale Conference 2017, Ida-Viru, Estonia, Nov. 2017

“Sand based nanocomposite applied to heavy metal ions extraction from polluted water.” P. Rauwel, A. Behr, S. Küünal, O. Volobujeva, Ü. Soukand and E. Rauwel

#### **Valitud publikatsioonid:**

Jüri Järvis, Mari Ivask, Lembit Nei, Annely Kuu, Egge Haiba 2017. Preliminary assessment of afforestation of cutover peatland with spot application of sewage sludge compost. *Baltic Forestry*, 23 (3), 644-657.

Raamets, J.; Kutti, S.; Ruus, A.; Ivask, M. 2017. Assessment of indoor air in Estonian straw bale and reed houses. *WIT Transactions on Ecology and the Environment*, 211, 193–196.

Haiba, E.; Nei, L.; Kutti, S.; Lillenberg, M.; Herodes, K.; Ivask, M.; Kipper, K.; Aro, R.; Laaniste, A. 2017. Degradation of diclofenac and triclosan residues in sewage sludge compost. *Agronomy Research*, 15 (2), 395–405.

E. Rauwel, A. Galeckas, M. Rosário Soares, P. Rauwel, Influence of the interface on the photoluminescence properties in ZnO carbon based nanohybrids, *J. Phys. Chem. C* 121, 14879 (2017)

#### **RESEARCH GROUP OF ENVIRONMENTAL TECHNOLOGIES**

**Head of the research group:** Mari Ivask, professor

#### **Members of the research group:**

Lembit Nei, professor

Annely Kuu, PhD

Jane Raamets, doctoral student

Sander Kutti, doctoral student

Egge Haiba, doctoral student

Tiit Iepasaar, MSc

Kai Kalda, MSc

Tiina Niine, MSc

#### **Subgroup: Nanoparticles applications**

Erwan Rauwel, professor

Protima Rauwel, senior researcher

Siim Küünal, doktorant

Arnaud Behr, magistrant from École Centrale de Lille (France)

Kamillia Gabaidullina magistrant from Grenoble INP Phelma (France)

Anastasiia Mikheenkova magistrant from University Rennes 1

Anni Kurisman, magistrant from Tartu College, TTÜ

The team has competence in the field of environmental chemistry, environmental microbiology, in development of environmental technologies, soil biology. the main activities of our research group are:

1. Development of recycling technologies for different materials. Depending on the competence of our research team, we develop technologies related to the use of soil bioindicators for the application of technologies, including the parameters of soil microbial and invertebrates

communities. We are competent in the development and implementation of waste recycling technologies, including solid industrial waste and sewage sludge. We developed methods and investigated applications for aerobic (composting) and anaerobic (Bokashi) methods for the recycling of waste. One of the research areas is the translocation of residues from municipal wastewater to the sewage sludge and the efficiency of their decomposition in the composting process, as well as the uptake of residues by food plants by using the compost.

2. Development of methodologies for assessing the status of the environment. In assessing the status of the environment, we use soil microbiological parameters (biomass, diversity, enzymatic and respiratory activities) and soil invertebrates parameters as bioindicators. We have assessed the status of environment by anthropogenic disturbances (quarries, completed landfills, exhausted peatlands, arable land, etc.) and in natural flooding conditions. We have studied the quality of indoor air in the bale straw houses on the basis of microbiological parameters.

The studies of energy and material flow, LCA, efficiency in using resources. In addition to lecturers, we use the potential of our students (curricula Environmental Management and Industrial Ecology).

3. The main topics of the research of the group are the study of ultrastable metal nanoparticles (Co, Ag, Ag<sub>2</sub>Co...) for biomedical applications like biocidal coating/painting and cancer treatment, the development of new methods for heavy metal ions extraction and radioactive elements from polluted water and the development of new hybrid nanocomposites for photovoltaic applications like photocurrent production.

The group has collaborations with the group Environmental technologies from Tartu College in areas of antibacterial/antifungal testing, with the Dept. of Environmental Technology of TTÜ for the development of water purification pilot test at the lab-scale, with the Faculty of Medicine of the Univ. of Tartu for toxicity tests on nanoparticles and Lab. of Environmental Toxicology (KBFI) for antibacterial and toxicity tests.

#### **Projects:**

- Application for the synthesis of ultrastable metal nanoparticles for nanomedicine (PUT431, 2014-2017)
- Emerging orders in quantum and nanomaterial (TAR16019/TK134, 2015-2023)
- Development of carbon based hybrid nanocomposites (HfO<sub>2</sub>\_CNTs, ZnO\_CNTs) with Minatec (IMEP & LMGP), France (PARROT, UGA, IRS)
- Study of metal nanoparticles for applications in water purification using ALBA synchrotron facility, Spain
- Study of electrochemical properties of Co nanoparticles with University of Oxford, UK
- Investigation on how Co nanoparticles interact with cancer cells and human cells using Raman spectroscopy with Bioengineering Nanoscience Laboratory from Univ. of Montpellier, France
- Study of photoluminescent properties of nanoparticles with the University of Oslo, Norway
- Development of magnetic hybrid nanocomposites with the University of Aveiro, CICECO, Portugal (Erasmus)

#### **The most important results 2017:**

1. Sewage sludge has identified residues that can migrate to plants. The results of the study showed that using optimal composting technologies, it is possible to reduce the concentration of many

contaminants in sewage sludge compost significantly to minimize the release of pharmaceutical residues into the environment and their effects on the activity of microbial communities there, plant growth and development, and the functioning of several other organisms

2. The families of fungi found in indoor and outdoor air and in construction materials were *Alternaria*, *Aspergillus*, *Penicillium* and *Cladosporium*, with a certain risk to human health.

3. The indoor climate (t °, humidity, CO<sub>2</sub>) conditions corresponds to the norms, in the investigated houses there were no detected potentially harmful micro-organisms in health-threatening quantities.

4. Direct sowing technology exerts a lesser effect on the communities of soil invertebrates (Collembola, Lumbricidae) and soil microbial community than conventional cultivating technology.

5. Sewage sludge compost acts as a firm height growth accelerator. It can be suggested for spot application in planting silver birch seedlings on cutover peatland because of the height growth-promoting effect .

Development of a new filtering method for extraction of heavy metal ions and radioactive elements from polluted water (patented and presentation at 255<sup>th</sup> ACS conference). This method can be integrated in a circular economy.

Cytotoxicity tests showed that pure Co MNPs have biocidal properties against multiple cancer cells even at low concentration (invited oral at Nanomedicine conference, Osaka, May 2017).

**Patent:**

E. Rauwel, P. Rauwel, Ü. Sõukand, Cobalt Metal Nanoparticles for heavy metal extraction from water, UK application GB1717391.5

**List of post-doctorates:**

Not.

**Most important acknowledgments:**

Not

**Members of International organisations:**

Not.

**Members of the networks:**

- Mari Ivask - ESSEM COST Action ES1406 - Soil fauna - Key to Soil Organic Matter Dynamics and Modelling (KEYSOM)
- Mari Ivask - European Sustainable Use Group by IUCN, Committee member

**Collaboration:**

The research team is active in collaborating with

1. COST activity ES1406 partners,
2. European Sustainable Use Group,
3. Laboratory of Vermitechnology, National Academy of Sciences Belarus

**Defense of PhD thesis:**

Egge Haiba. Optimization of Sewage Sludge Composting: Problems and Solutions. Reoveesette kompostimistehnoloogiate optimeerimine ravimijääkide kahjutustamise eesmärgil.

Supervisors: Prof. L.Nei, M.Lillenberg. Defence: 8.12.2017

### **Conferences:**

Haiba E., Nei L. (2017). Sewage Sludge Composting and Pharmaceuticals. 7th International Scientific Forum, ISF 2017, 7- 9 February 2017, Oxford, UK , Proceeding. European Scientific Institute, 114–121.(Oral presentation L. Nei)

Ivask M. Project meeting of COST Action ES1406, Bucharest 27.-29.09.2017.

Raamets Jane. "Assessment of indoor air in Estonian straw bale and reed houses". Air Pollution 2017. 25-27. aprill, Cadiz, Hispaania.

Invited oral presentation at EMN Europe meeting, Int. Conf. on Small Science, San Sebastian, Spain, May 2017

“Hybrid nanocomposites and ultrastable metal nanoparticles studied for the development of applications in nanomedicine, water purification and energy harvesting” E. Rauwel, P. Rauwel, S. Küünal, O. Volobujeva, A. Ivask, A. Galeckas, F. Ducroquet and D. Wragg

Invited oral presentation and conference at Int. Conf. & Exhibition on Nanomedicine and Drug Delivery, Osaka, Japan, May 2017

“Nanomaterial synthesis and study for biomedicine and cancer treatment” E. Rauwel

Poster presentation at Int. IX Oil Shale Conference 2017, Ida-Viru, Estonia, Nov. 2017

### **Selected publications:**

Jüri Järvis, Mari Ivask, Lembit Nei, Annely Kuu, Egge Haiba 2017. Preliminary assessment of afforestation of cutover peatland with spot application of sewage sludge compost. Baltic Forestry, 23 (3), 644-657.

Raamets, J.; Kutti, S.; Ruus, A.; Ivask, M. 2017. Assessment of indoor air in Estonian straw bale and reed houses. WIT Transactions on Ecology and the Environment, 211, 193–196.

Haiba, E.; Nei, L.; Kutti, S.; Lillenberg, M.; Herodes, K.; Ivask, M.; Kipper, K.; Aro, R.; Laaniste, A. 2017. Degradation of diclofenac and triclosan residues in sewage sludge compost. Agronomy Research, 15 (2), 395–405.

E. Rauwel, A. Galeckas, M. Rosário Soares, P. Rauwel, Influence of the interface on the photoluminescence properties in ZnO carbon based nanohybrids, J. Phys. Chem. C 121, 14879 (2017)

### **EHITATUD KESKKONNA UURIMISRÜHM**

**Uurimisrühma juht:** Aime Ruus dotsent

#### **Uurimisrühma liikmed:**

Epi Tohvri, PhD, dotsent,

Zenia Kotval, PhD, professor,

Toivo Kabanen, PhD, dotsent,

Merik Meriste, PhD, dotsent,

Ernst Tungel, PhD, dotsent,

Ago Rootsi, MSc, lektor,

Jiri Tintera, MSc, lektor, doktorant

Jane Raamets MSc, lektor, doktorant,

Lehar Leetsaar, MSc, lektor, doktorant,

Nele Nutt, PhD, lektor, doktorant,

Sirle Salmistu, MSc, lektor, doktorant

### **Uurimisalused teemad ja uurimisrühma kompetentsid:**

(1) ehitatud keskkond, linna- ja regionaalplaneering; (2) kogukondlik areng, linna- ja maa-asustuse majanduslikult ökonoomne taaskasutamine ja ümberkujundamine; (3) kultuuripärandi konserveerimine linnaplaneerimisel, ning ajaloolistel maastikel ning parkides. (4) pruunalade taaskasutus; (5) puitarhitektuuri ajalugu, (6) ajalooliste hoonete uurimine; (7) õppekeskkondade ja nende arhitektuursete lahenduste uurimine; (8) ehitusmaterjalid, sisekliima, ehitusfüüsikalised ja energiatõhususe aspektid; (9) küber-füüsikalised süsteemid hoonete ja linna- ning regionaalplaneerimise teenistuses.

Teemad on aktuaalsed linnaplaneerimise valdkonnas ning aitavad lahendada probleeme küberfüüsikaliste süsteemide rakendamise ehituses, tööstuses ja muudes eluvaldkondades.

### **Aruandeaastal saadud kõige olulisemad märkimist vääriavad tulemused:**

Epi Tohvri uurimistöökäsitleb Tartu arhitektuurikultuuri ning ökonomia ja arhitektuuriõppe algust Eestis 19. sajandil. Tulemusena on välja toodud valgustusajastu uue ülikooli idee – “Akadeemiline küla” – Thomas Jeffersoni poolt kavandatud Virginia ülikooli kontseptuaalne seos Tartu ülikooliga 19. sajandi alguses.

Georges Frédéric Parrot’l kui Tartu ülikooli esimesel rektoril oli määrav roll ülikooli kujundamisel.

Jiri Tintera jätkas linnaplaneeringute alaseid uuringuid – kahanevate linnade probleem Valga näitel.

Doktorant Lehar Leetsaare töö teema Optimaalne geoloogiliste uuringute maksumuse suhe hoone maksumusse Eesti hoonete näitel raames koguti andmeid mitmekümne hoone kohta.

Koostöös Keskkonnatehnoloogiate uurimisrühmaga, mille liige on Jane Raamets, viidi läbi sisekliima ja mikrobioloogia alased uuringud põhu- ja roomajades. Põhu- ja pilliroomajade siseõhus ja ehitusmaterjalides leiduvad seente perekonnad olid *Alternaria*, *Aspergillus*, *Penicillium* ja *Cladosporium*, enamus neist kujutavad teatavat riski inimese tervisele. Põhu- ja pilliroomajade sisekliima (t°, õhuniiskus, CO<sub>2</sub>) vastab normidele, uuritud majades ei tuvastatud potentsiaalselt tervisele ohtlikke mikroorganisme tervist ohustatavates kogustes.

Savikrohvide sorptsiooni- ja veeauruläbilaskvuse võime sõltub kattematerjalidest, kuid teades materjalide omadusi saab valida ka need, mille mõju on minimaalne.

Sorptsiooni omadusi uuriti suhtelise õhuniiskuse väärtuste 30%, 50% ja 80%. Niiskuse astmelisel reguleerimisel on sorptsiooni kiirus suurim esimesel tunnil. Edaspidi kiirus langeb ja stabiliseerumine toimub mõne päevaga.

### **Uurimisrühma koostöö teiste ülikoolidega:**

Michigan State University

Tartu Ülikool

### **Doktoritööde kaitsmised:**

Nele Nutt, doktorikraad. The Restoration of Nationally Protected Estonian Manor Parks in the Light of the Florence Charter (Riiklikult kaitstavate Eesti mõisaparkide restaureerimisest Firenze harta valguses), Tallinna Tehnikaülikool. Juhendaja prof. Zenia Kotval

[Nele Nutt, doktorikraad, The Perceivable Landscape a Theoretical-Methodological Approach to Landscape \(Tajutav maastik. Teoreetilis-metodoloogiline käsitus\), Eesti Maaülikool.](#)

[Juhendajad: prof. Juhan Maiste, prof. Zenia Kotval,](#)



**Järeldoktorid:**

Ei ole

**Tunnustused:**

Epi Tohvri – Muuseumiroti aasta teadusauhind 2017 auhinna laureaat ürituste kategoorias: teaduskonverentsi „Vene impeeriumi piiril: Tartu saksa ülikool ja tema esimene rektor Georg Friedrich Parrot“ korraldamise eest.

**Välisorganisatsioonide liikmed:**

Epi Tohvri - European Early American Studies Association liige

Zenia Kotval - Fellow of the American Institute of Certified Planners

Zenia Kotval - Board Member, Planning Accreditation Board 2015-18

**Osalemine võrgustikes:**

Ei ole.

**Members of International organisations:**

Epi Tohvri - European Early American Studies Association liige

Zenia Kotval - Fellow of the American Institute of Certified Planners

Zenia Kotval - Board Member, Planning Accreditation Board 2015-18

**Konverentsid:**

Epi Tohvri. Georges Frédéric Parrot and his idea of a university. 28. Balti teadusajaloo konverents teemal: On the Border of the Russian Empire: German University of Tartu and its first Rector Georg Friedrich Parrot

Aime Ruus Determination of hygrothermal performance of clay-sand plaster: influence of covering on sorption and water vapour permeability. 11th Nordic Symposium on Building Physics 11.-14. juuni Trondheim, Norra

**Olulisemad publikatsioonid:**

(1.1)

Vares, O.; Ruus, A.; Raamets, J.; Tungel, E. (2017). Determination of hygrothermal performance of clay-sand plaster: influence of covering on sorption and water vapour permeability. Energy Procedia, 132, 267–272..

Raamets, J.; Kutti, S.; Ruus, A.; Ivask, M. (2017). Assessment of indoor air in Estonian straw bale and reed houses. WIT Transactions on Ecology and the Environment, 211, 193–196.

**Monograafiad (2.1)**

[Maiste, Juhani; Polli, Kadi; Kodres, Krista; Keevallik, Jüri; Lainvoo, Linda; Levin, Mai; Hansar, Lilian; Tohvri, Epi \(2017\). Eesti kunsti ajalugu 1770-1840. Eesti Kunstiakadeemia.](#)

## **BILT ENVIRONMENTAL RESEARCH GROUP:**

**Head of the research group:** Aime Ruus, PhD

### **Members of the research group:**

Epi Tohvri, PhD,  
Zenia Kotval, PhD, professor,  
Toivo Kabanen, PhD, ,  
Merik Meriste, PhD,  
Ernst Tungel, PhD, ,  
Ago Roots, MSc, lektor,  
Jiri Tintera, MSc, doctoral student,  
Jane Raamets MSc, doctoral student,  
Lehar Leetsaar, MSc, doctoral student,  
Nele Nutt, PhD, ,  
Sirle Salmistu, MSc, lektor, doctoral student

(1) built environment, urban and regional planning; (2) community development, economic revitalization, reuse and restoration, urban and rural settlement assessment; (3) heritage conservation in urban planning and historical landscapes and parks; (4) revitalization of brownfield's; (5) history of wooden architecture; (6) examination of historical buildings; (7) exploring learning environments and its architectural design; (8) construction materials, indoor climate, aspects of building physics and energy efficiency; (9) cyber-physical systems for buildings and urban and regional planning.

### **Results:**

The topic of Epi Tohvri studies is related to architecture, economy and engineering studies at the beginning of the 19<sup>th</sup> Century in Estonia. The new university idea of Enlightenment Era – “Academic Village” – Thomas Jefferson`s Virginia University and its conceptual roots with the University of Tartu was introduced. The first of Georges Frédéric Parrot realised his idea of a university and therefore had significant influence on University of Tartu.

Studies of urban planning were continued, the problems of decreasing towns were studied by by Jiri Tintera on example of Valga.

Within the doctoral studies of Lehar Leetsaar (Optimal volume of geotechnical studies based on buildings in Estonia), the main task was collecting information on different buildings, foundations, and geotechnical investigations. Exhaustive information for buildings have been collected.

In cooperation with Research Group of Environmental Studies it was find out that the families of fungi found in indoor and outdoor air and in construction materials were *Alternaria*, *Aspergillus*, *Penicillium* and *Cladosporium*, with a certain risk to human health. The indoor climate (t °, humidity, CO<sub>2</sub>) conditions corresponds to the norms, in the investigated houses there were no detected potentially harmful micro-organisms in health-threatening quantities.

Hygrothermal performance of clay-sand plaster was studied: influence of covering on sorption and water vapour permeability. The speed of moisture uptake was highest within the first hour after a sudden change in moisture level (RH=30, 50, 80%) and stabilized within few days. The covers have influence on sorption properties and water-vapour permeability on plaster but gathering information about properties of materials there can be chosen materials having not significant influence.

### **Cooperation:**

Michigan State University,  
Tartu Ülikool

**Defence of PhD thesis:**

Nele Nutt, PhD. The Restoration of Nationally Protected Estonian Manor Parks in the Light of the Florence Charter (Riiklikult kaitstavate Eesti mõisaparkide restaureerimisest Firenze harta valguses). TTU. Supervisor prof. Zenia Kotval

Nele Nutt, PhD. The Perceivable Landscape a Theoretical-Methodological Approach to Landscape (Tajutav maastik. Teoreetilis-metodoloogiline käsitus). Estonian University of Life Sciences

Supervisors: prof. Juhan Maiste, prof. Zenia Kotval,

**List of post-doctorates:**

Not.

**Most important acknowledgments:**

Epi Tohvri - co-organizer of the event: The 28<sup>th</sup> Baltic Conference on the History of Science "On the Border of Russian Empire: German University of Tartu and its first Rector Georg Friedrich Parrot" that received the Best Scientific Event category at The Estonian annual museum award Museum Rats.

**Members of the networks:**

Not

**Members of International organisations:**

Epi Tohvri - European Early American Studies Association liige

Zenia Kotval - Fellow of the American Institute of Certified Planners

Zenia Kotval - Board Member, Planning Accreditation Board 2015-18

**Conferences:**

Epi Tohvri. Keynote speaker. Georges Frédéric Parrot and his idea of a university. XXVIII International Baltic Conference on the History of Science On the Boarder of Russian Emipr: German UNiversity of Tartu and its first Rector Georg Friedrich Parrot. May 18-20 2017 Tartu

Aime Ruus. Determination of hygrothermal performance of clay-sand plaster: influence of covering on sorption and water vapour permeability. 11th Nordic Symposium on Building Physics June 11-14. 2017 Trondheim, Norway

**Publicatins: (1.1)**

Vares, O.; Ruus, A.; Raamets, J.; Tungel, E. (2017). Determination of hygrothermal performance of clay-sand plaster: influence of covering on sorption and water vapour permeability. Energy Procedia, 132, 267–272..

Raamets, J.; Kutti, S.; Ruus, A.; Ivask, M. (2017). Assessment of indoor air in Estonian straw bale and reed houses. WIT Transactions on Ecology and the Environment, 211, 193–196.

**Monographies (2.1)**

Maiste, Juhan; Polli, Kadi; Kodres, Krista; Keevallik, Juta; Lainvoo, Linda; Levin, Mai; Hansar, Lilian; Tohvri, Epi (2017). Eesti kunsti ajalugu 1770-1840. Estonian Academy of Arts