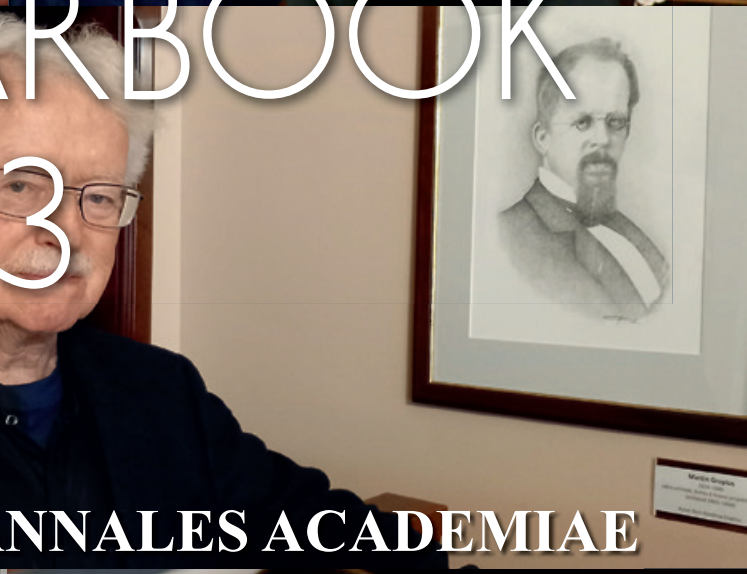
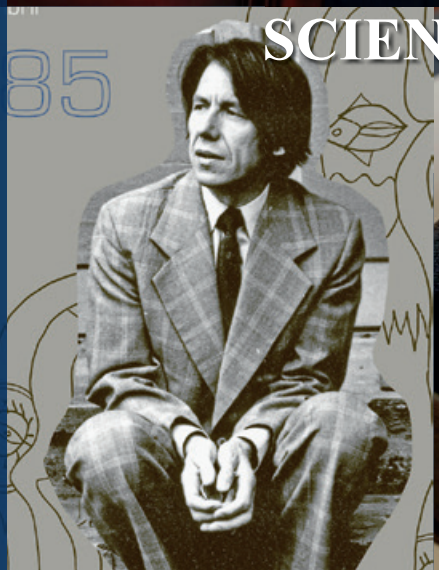
EESTI TEADUSTE AKADEEMIA

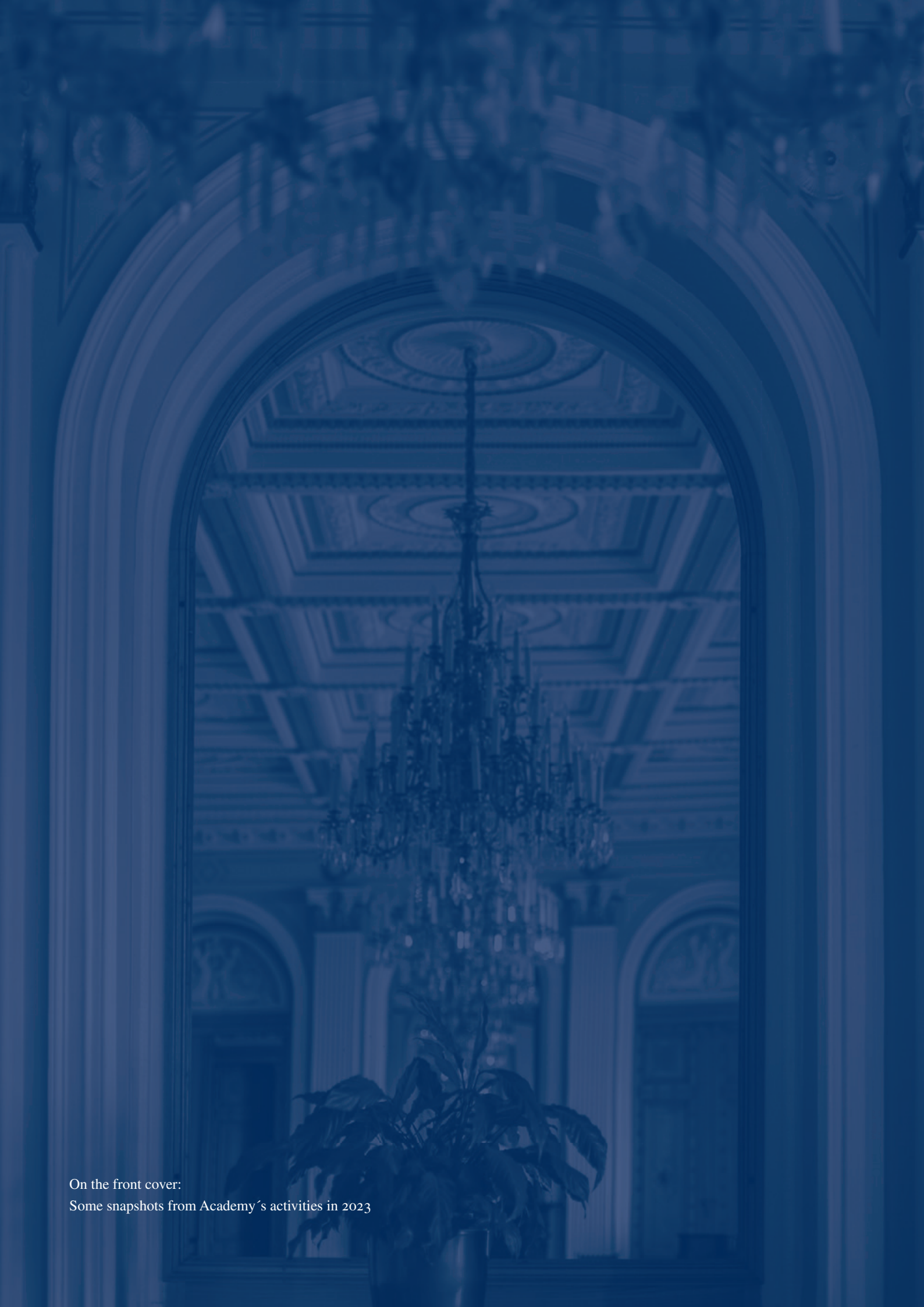
ESTONIAN ACADEMY OF SCIENCES YEARBOOK 2023



ANNALES ACADEMIAE SCIENTIARUM ESTONICAE

XXIX (56)





On the front cover:
Some snapshots from Academy´s activities in 2023

EESTI TEADUSTE AKADEEMIA

Facta non solum verba

ESTONIAN ACADEMY OF SCIENCES YEARBOOK 2023

ANNALES
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ESTONICAE

XXIX (56)

TALLINN 2024

CONTENT

FOREWORD

The more complicated the times, the more vividly the reference made by Toomas Hendrik Ilves stands out: Francis Fukuyama did not write so much about the end of history, but about the direction along which and towards which history progresses. It is just that this direction – a reasonable and peaceful democratic society – seems to drift ever farther away. While we could still think at the end of 2022 that the full-scale war launched by Russia in Ukraine would pass like a horrible nightmare, by the beginning of 2024 we have seen the birth of even more brutal conflicts.

The more complicated the times, the greater the value of knowledge and the original solutions based thereon. This way of thinking became a reality in the form of the International Year of Basic Sciences for Sustainable Development in 2022. It actually lasted for two years, ending in autumn 2023, and lent a massive impetus to the launch of the International Decade of Sciences at UN level. There is a deep sense in engaging all knowledge. Without the development of basic sciences, there is no technological progress, but without the contribution of social sciences the logical development of society as a whole may not necessarily be possible. And, in turn, without the humanities it would be next to impossible to understand where we have come from and who we are.

The more complicated the times, the more we need mutual support, cooperation and a sense of standing together. One of the results of this realisation is the ever tightening relationships between academies at the level of the Baltic countries, the Baltic Sea, the European continent and the entire world. For example, this way of thinking is expressed by the organisation of ventures aimed at the enlightenment of society in cooperation with the oldest Finnish academy of sciences, the Finnish Society of Sciences and Letters – the 18th Baltic Conference on Intellectual Cooperation – or the ever tightening cooperation with several German academies of science.

The more complicated the times, the more important it is both to talk about the necessary changes and to foster actions that have the potential to make the world a more sensible and healthier place. The voice of a lone academy is weak. Ideas and proposals formulated together with sister academies are of much greater might. Be it the already mentioned joint promotion of science, the formulation of climate change problems at the level of new challenges, a future vision for scientific publishing[1] keeping the sound advice provided by academies independent from political winds,[2] or assuming the underlying values of research ethics and integrity, and offering an adequate interpretation of those values in rapidly changing conditions. For science and academies of sciences have a common core value: reputation. And these can, to a degree, be measured through trust. Should that be lost, even the best of all knowledge would be of little value.

The more complicated the times, the broader the spectrum of tasks arising for the academies of sciences. Naturally, the membership of the academy must be renewed, the home front (i.e. the functioning of the Office and the support services) must be secured, the best must be recognised and those who have contributed significantly must be thanked. But we must also keep our finger on the pulse of developments in society, both in our country and on the continent of which we are a part. Whether we want it or not, in such times everything we do and often even more what we do not do acquires a political tinge.

The more complicated the times, the more we have to support our country by making sure that, aside from scientific and science policy aspects, the agenda of the associations and joint events of academies also reflect the foreign policy priorities of our country. Making sure that we are always and everywhere at the table and not on the menu. By learning from the wiser about all the things that can be done with the tools of science diplomacy, and by using such tools creatively. Sometimes recalling our Western friends who supported our endeavours 30 to 35 years ago. Now is the time to start repaying this debt. And it's also the time to shape the policy of the networks of academies and to establish goals.

The more complicated the times, the more exciting it is to live in them. In the words of Terry Pratchett: 'Seeing things a human shouldn't have to see makes us human.' It is simply the time in which we now live. An abnormal time, which must not become the new normal. The essential task of academies in such times is to remain fortresses of reason.

Tarmo Soomere
9 March 2024

1 https://council.science/publications/key-principles-for-scientific-publishing
2 https://council.science/current/news/joint-isc-iap-statement-academies

MESSAGES FROM THE ACADEMY

THE ACADEMY IN A TENSE SOCIETY

On the basis of Tarmo Soomere's presentation at the General Assembly in December 2023

The Academy operates in the complicated field of society's wishes, needs, values, possibilities and preferences. It has increasingly become the country's ambassador in international relations. In the field of science, the Academy's role is as a developer and representative of science. In Estonia, the Academy is the only institution with a mandate and an obligation to advise the state. We also contribute to the functioning of the state in several other ways. The organisation of the Academy's inner workings must also keep up with the times.

Content creation by the Academy's committees

Committees are our central instrument in our relations with society and the field of science – and partly with the state. We are quite pleased with developments in this area. The activities of the Committee on Education, led by Jakob Kübarsepp, have gained momentum. The activities of the Committee on Cyber Security were launched to much fanfare – a separate conference on security.[3] In many ways, the success of the 10th science policy conference,[4] 'Science as Estonia's Development Driver', was ensured by the Chairman of this Committee, Dan Bogdanov, who chaired the event in the *Riigikogu* conference hall and held a relevant and memorable discussion panel.

The Committee on Nature Conservation and the Committee on Phylogeny and Taxonomy have been reorganised

Photo: Maris Krünvald

Academy President Tarmo Soomere at the Academy's General Assembly on 6 December 2023.

3 https://www.akadeemia.ee/en/events/conference-on-trust-and-reliability
4 https://www.akadeemia.ee/sundmused/teaduspoliitika-konverents (in Estonian).

Photo: Maris Krünvald × 2

Moments from the Academy's General Assembly of 6 December 2023.

into the Committee on Environment led by Urmas Kõljalg. Similarly to the Committee on Marine Sciences and the Polar Research Committee, the ambitions of this committee are international – it seeks a mandate to represent Estonia in the Red List of the International Union for Conservation of Nature.[5]

As a representative of Estonia, the Committee on Marine Sciences advised the United Nations (UN) on new marine technologies. This is an absolute top level of excellence in advising, a value in itself, which took place for the second time. The Constitutional Law Endowment is working hard at the Academy on the development of constitutional law science.

We offered our knowledge in support of Ida-Viru County in a new format. The presentations of Academy members at several schools and venues in the county were like a landing operation in an area that really needs the support of smart people. In the current geopolitical situation, this is the frontline, not the periphery.

5 International Union for Conservation of Nature's Red List of Threatened Species, www.iucnredlist.org

With support from the Ministry of Foreign Affairs, the corps of research professors expanded towards research on Russia. The first Academy-formulated thematic research professorship for the Estonian language and teaching the Estonian language was established. Under the leadership of female Academy members, a new award was established – the Alma Tomingas medal for the promotion of cross-sector synergy.

The Ambassador of Estonian science

The war raging on in Ukraine for two years now has captured a considerable part of society's attention. Partly due to this, a relatively large part of the Academy's work was focused on international aspects this year also. We had two important instruments to use. In September, we handed over the presidency (2020–2023) of the European Science Advisors Forum (ESAF, see pp. 86–87) to Italy. We continue to hold the presidency of the European members' group of the International Science Council (ISC, see pp. 88–90). It was through this that we brought the voice of the European academies of sciences to the big stage of the 2023 Mid-term Meeting of ISC Members: Capitalizing on Synergies in Science of the International Science Council after several years.

The International Year of Basic Sciences 2022 ended in the autumn, with Arvi Freiberg organising events from our side. At the festive final event, we were represented by the members of the Young Academy of Sciences. This endeavour technically lasted for two years and gave an impetus for establishing the International Decade of Sciences (see pp. 59–61).

Together with our sister academies, we participated in the preparation of the climate declaration of the European academies of sciences in Warsaw in May (see pp. 13–15). In August, we re-held the Treaty of Nystad (Uusikaupunki) symposium together with the Tuglas Society and the Finnish Society of Sciences and Letters. The latter is the oldest Finnish academy of sciences that is going to organise the next Baltic Conference on Intellectual Cooperation in 2025. We established official relations with the Heidelberg Academy of Sciences and are now in partnership with four German academies out of seven.

Together with the Latvian and Lithuanian academies of sciences, we brought the festive event of the L'Oréal-UNESCO outstanding female scientist scholarships to our hall (see pp. 70–71). This represented another step towards expanding cooperation between the Baltic academies of sciences. However, this matter is far from straightforward. L'Oréal is continuing production in Russia. Although the production involves essential commodities, it means that a dark cloud hangs over the money supporting female scientists. The Estonian, Latvian and Lithuanian academies of sciences and the UNESCO National Commissions of the three countries therefore decided to suspend the cooperation for 2024.

We began to gain an increasingly strong foothold in the area of science diplomacy. These included official visits of the South Korean and Czech parliamentary delegations, various joint events with foreign partners, such as visits of delegations from Saxony and the German Research Foundation, as well as a Science Afternoon dedicated to polar

Photo: Maris Krūvald × 2

research,[6] the Gulf of Finland marine science cooperation conference, and the visit of astronaut Nicole Aunapu Mann, who has Estonian roots (see p 94). In applying for observer status on the Arctic Council, Maarja Kruusmaa is playing an important role with her research and presentations in the Arctic Circle conference series. An invitation to give a presentation at the first EU Conference on Science Diplomacy in Madrid was a logical next step in our foreign policy activity (18–19 December 2023) (see pp. 84–86). The election of Helen Eenmaa, the former Vice President of the Young Academy of Sciences, as President of the Young Academies Science Advice Structure (YASAS) is the cherry on top of the joint cake of the Estonian academies of sciences (see p 116).

The sky is not cloudless

The Academy's present and future are not without their obstacles. Quite the opposite, in fact: we are facing several intrinsic and structural challenges. Although the Academy's visibility in society remains the same – if we consider the 'Through the Scientist's Eyes' column (see pp. 9–13) or the tens of opinions of Academy members on various channels and in various publications –, it still seems that the Academy's influence in Estonia and in shaping the science landscape is waning.

We were unable to ensure that the Academy's point of view would be reflected in the recently concluded competition of centres of excellence. We thought it important that the quality of the research groups would be evaluated as a separate grade and that it is clear how exactly the applications must be linked to the needs of the state. The filter applied in the evaluation was so fine that only outstanding applications made it to the second round, and therefore the selection was definitely very good. However, if we leave the four centres of excellence run by Academy members who belong to the absolute top of the world aside, we notice an absence of correlation in earning the National Research Awards, for instance, and the status of the head of a centre of excellence. This is not necessarily a negative feature, as it usually takes many years from the inception of a great idea to it achieving recognition in the world of science.

It seems that the science advice system being designed in Estonia does not have a place for the Academy or the Young Academy at all.[7] It feels like we have done something very wrong. Perhaps we have, in communicating with society, drifted away from where science policy and state policy are being shaped. This is even though we are all the time engaged in advising the leading figures in politics, be they ministers, the Research and Development Council, the European Commission or even the UN. We have dropped out from the level in between. Or are dropping out. The next elected leaders of the Academy therefore face a complicated task and perhaps also difficult choices.

We were involved in the Pere Sihtkapital (Family Endowment) scandal via the fact that I am a member of the council of that institution, being personally invited to take up the role by the then Minister of Justice. Some areas of social sciences suffered a heavy blow, and organising research in those areas may not necessarily be easy in the near future.

From the Academy's viewpoint, we handled this matter with the idea that no scandal must go to waste. We dissected it together with top international experts (see pp. 34–37) and walked the chain of events through step by step with Estonian labour and data law experts, hoping to at least make it into an illustrative learning tool. It seems that we succeeded. Despite everything, having research ethics and integrity in the focus of society's attention for at least some fleeting time is encouraging and will hopefully pave the way for the European Code of Conduct for Research Ethics[8] – which was published in Estonian at that very time – becoming ingrained in the Estonian research landscape and society.

6 https://www.akadeemia.ee/en/events/polar-research-in-estonia

7 European Commission and Joint Research Centre (JRC) 2023. Involved experts and analysts: Marju Raju, Benjamin Klasche, Andres Koppel, Lorenzo Melchor, Kristian Krieger, Mara Silva, Almeida, Piret Tõnurist, Stéphane Jacobzone. Building capacity for evidence-informed policymaking in governance and public administration in a post-pandemic Europe. Diagnostic report. Estonia. Administrative and internal document.

8 ALLEA 2023. The European Code of Conduct for Research Integrity. Revised edition 2023. https://allea.org/portfolio-item/european-code-of-conduct-2023. doi: 10.26356/ECOC

The dark future of sustainable development goals

The obligation to elect new leaders for the Academy in 2024 is drawing increasingly nearer. They and the Academy as a whole will be facing much broader problems, but also opportunities.

The United Nations' decision to declare the coming ten years a decade of sciences in support of sustainable development presents a significant opportunity. This includes not only basic sciences or natural sciences in the traditional English meaning of science, but also social sciences and humanities as well as probably new areas, such as citizen or hobby sciences.

The initiative derives from the admission that things are not good with Agenda 30 and the related sustainable development goals[9] announced by the UN in 2015. This most certainly concerns academies, as the goals were formulated in cooperation with the UN and two international consortia of academies, the ICSU and the ISSC. Since then, these two have merged to become the International Science Council.

The objective was and is to end poverty and inequality in the world by 2030 in such a way that the environment is not significantly impaired in the process. This is about the same time line offered as the European Union's Green Deal. Seventeen goals and 169 targets were formulated. In summer 2023, the UN's independent committee assessed their fulfilment. The main message was sombre. At the current pace, none of the 17 goals will be fulfilled. Of the 169 directions, achieving one tenth is perhaps realistic. One third of the indicators are in deep stagnation or degeneration. For instance, abolishing gender discrimination would take 300 years at the current pace.

We are therefore facing the possibility that the entire sustainable development framework is failing and will continue to do so unless something radical is done. A lack of financing is considered to be one of the reasons why the sustainable development goals have not been fulfilled. It is thought that if we invested another 2.5 trillion dollars every year, we could, perhaps, reach the goals. The current investment towards the goals is 4.5 trillion dollars. However, it is hard to believe that money is the only issue.

When things are blindingly or deafeningly bad or unbearably costly, scientists are always summoned for help. To put it a tad sarcastically: in order to wiggle out of this situation, high stakes have been placed on science. And not just the exact sciences, which are important in solving the central scientific-technical problems, but also on the humanities and social sciences. The central desire is to create a discussion between scientists and politicians, so that politicians would more often take into account evidence-based recommendations in their decision-making. Estonia is not alone here by far.

It is possible that a significant amount of additional money will be invested in science in the hope that new development opportunities will be found, new phenomena will be discovered and new technologies will be launched. This also entails significant risks. What if scientists are not able to meet the expectations? What conclusions will then be drawn about science? Unfortunately, quite a few of the established goals are in essence contradictory. For instance, global energy security and man-made climate warming. In some regards, they may even entail a wish to breach the laws of nature. So, we are facing interesting years. A lot more interesting than fulfilling Estonia's own strategies.

Building the home front

Great challenges require a strong home front, i.e. a well-functioning organisation, and thinking outside the box. Estonia and our science landscape are rather small compared to many other countries. This does not prevent us from being great in mind. The Estonian Academy of Sciences fulfils the tasks of academies of classic natural sciences as well as academies of medical science, engineering, agricultural sciences, and humanities and social sciences. The Academy's mission is to offer the state the best information in solving the complex tasks the state is facing.

This year's selection directly reflects the broadness of the spectrum of competences we have to cover. We became wealthier thanks to three new colleagues elected to regular seats from different fields of science. Plus foreign member Markku Kulmala, a top-level global scientist – one of those who has the actual potential to receive the Nobel Prize and who is also both a broad-minded thinker and a visionary.

In light of the above, the everyday routine and distribution of tasks of the Academy's Office have changed. The new structure of the Office, in reflecting the altered tasks and work distribution, was technically approved. The work of the Office is mostly invisible – and the more invisible it is, the higher its quality. This work is mainly visible to the outside, either via the Academy's newsfeed or the fact that the Wikipedia articles about most of the Academy members – both deceased and current – are organised according to a certain structure.

There are doubtlessly more challenges to meet and good ideas that are worth trying. This is in line with Isaac Asimov's thought that a true solution comes from overcoming hardship, not from avoiding it.

9 https://sdgs.un.org/goals

FORTY OPINION PIECES BY ACADEMY MEMBERS WERE PUBLISHED IN THE 'THROUGH A SCIENTIST'S EYES' COLUMN

Krista Tamm, Communications Officer of the Academy of Sciences

Since the creation of the 'Through a Scientist's Eyes' column in *Postimees* at the end of August 2021, a total of 97 opinion pieces by Academy members had been published by the end of 2023, 40 of which were brought out in 2023.

Each story in the online edition of *Postimees* was read an average of 2,539 times in 2023. The opinion piece by Jaak Vilo, 'Tehislik tark mees taskus oskab peaaegu kõike' ('The artificial wiseguy in your pocket can do almost everything'), published on 18 February, was read the most – 10,759 times. The readership of the print version of *Postimees* is added to these figures.

Jaak Aaviksoo wrote that understanding the laws of nature makes it clear to us what we can and cannot do. Once we know the laws of nature, we can move in a direction that is more suitable for us. However, if we ignore them, nature forces us to accept our stupidity. At the heart of this is the recognition that emissions are an inevitable by-product of all human activity and development – there is no such thing as an emission-free world, and all we can do is reduce emissions to a point that has the least impact on our evolution.

Dan Bogdanov and Brigadier General (retd) **Jaak Tarien** wrote about cyber state defence. They highlighted that the capability created in Estonia for analysing the security properties of complex IT systems and for creating and selecting defence measures helps both our defence industry and that of our allies, and the sector will definitely develop rapidly in the coming years. The first information security related research and development agreements concluded in Estonia will undoubtedly not be the last. In addition to cyber state defence, information security will in the future also have a role in defending our one and only homeland.

In another opinion piece, Academy member Bogdanov wrote that the definition of trust is also being used increasingly when talking about technology. As a result of collaboration between Estonian and foreign scientists, an article was published in the *Current Psychology* journal in 2023, which summarised the results of the surveys held at the time of the past three parliamentary elections in Estonia. The surveys show that countries that wish to introduce electronic voting must work on increasing trust towards the respective technology. For this, we must understand the general properties and risks of those technologies, analyse the properties and risks of specific voting systems, explain the procedures related to the technologies and show how humans can control the technologies.

A picture drawn by artificial intelligence: 'Through a Scientist's Eyes', a column of Academy members' opinion pieces in the Estonian newspaper *Postimees*.

Jüri Engelbrecht conceded that as a society we focus more attention on everyday problems and tend to forget the longer perspective and time-consuming activities. A small society faces both the same problems that affect the rest of the world and the issues caused by its smallness from both a material and psychological aspect. There are two important keywords here: education and communication.

In another opinion piece, Academy member Engelbrecht wrote about two reports from the International Science Council (ISC, see pp. 88–90), which were published in July 2023 and sketch out a roadmap for future activities. Their theses focused attention on mission-oriented research for sustainable development or, in other words, on science for

resolving society's problems. The ISC recommends building well-functioning centres related to sustainable development problems, and linking these into a network. In order to do this, we need an understanding both in political circles and across society as a whole, particularly in helping to see the big picture.

Arvi Freiberg wrote in his opinion piece that for the first time in nearly 200,000 years the technological revolution that has led to a chat bot is endangering our evolutional self-perception. Although artificial intelligence today still falls short of the capabilities of the human brain by orders of magnitude, the memory and computing capacity of smart devices are evolving exponentially. Compared to that, the evolutional development of the human brain is endlessly slower.

In another piece, Academy member Freiberg wrote that if we remain on our current trajectory, none of the 17 Sustainable Development Goals,[10] which were established by the United Nations at the recommendation of academies in 2015 under the historic mission called Agenda 2030, will be fulfilled by the established term. The UN General Assembly has now announced a Decade of Sciences for Sustainable Development 2023–2033, in order to unite as many areas of science and formats of knowledge as possible to resolve the challenges. Academy member Freiberg pointed out that the unattainability of reliable data will be the ultimate obstacle in the global crisis aid role assigned to science.

Jaak Järv wrote about the publication of research articles in these changing times. Although there are three fundamental obstacles today to research publication becoming cheaper, it can be said on the basis of the journals of the Estonian Academy Publishers that these obstacles can be overcome.

Anne Kahru wrote in her opinion piece that people have often attached the green label to technologies and products that are not actually environmentally friendly. For instance, people have not been given sufficient information about the environmental footprint of bioplastic, wind turbines, solar panels and electric cars, although all of these have unwanted environmental effects at some stage of their life cycle. There is no point in unnecessarily slowing down technological progress, but we must not achieve it at a cost to human and environmental health.

Kalle Kirsimäe discussed the possibility of a green welfare economy. It is hypocritical and unsustainable to think that the world can be made a richer and better living environment by pushing all the polluting, disturbing or horizon-contaminating phenomena and activities behind a faraway border and hoping that this solves the problems. A green welfare economy is possible, but it requires understanding, societal consensus, a willingness to compromise and prudent conduct.

In another opinion piece, Academy member Kirsimäe wrote about the winding roads of (science-driven) innovation. With a few exceptions, the majority of the interesting science conducted in Estonia will never reach research-intensive business. This is primarily because the path to application is arduous and may take decades. Nevertheless, the situation in research-intensive innovation in Estonia does not seem hopeless thanks to the establishment of applied research centres and various programmes that support research and development.

Jarek Kurnitski wrote about a paradigm shift sparked by the COVID-19 pandemic in the area of ventilation. Since the location of the virus source is not known in advance, the ventilation system must be able to remove the source of contamination as effectively as possible from any location. The emergence of a new point source of contamination has upended the principles of air distribution design. As a result of seeking solutions to the problems that arose during the pandemic, a new European post-COVID ventilation design method proposal was born, in which Academy member Kurnitski also played a significant role. The introduction of that will enable us to create more efficient and safer ventilation solutions in both ordinary and pandemic conditions.

In another opinion piece, Jarek Kurnitski wrote on the topical matter of renovating homes, particularly old apartment buildings. The renovation support rates have varied greatly. Some have a negative impact on the state, while others have a neutral effect, bringing approximately the same amount of money back to the exchequer in the form of value added tax and the labour taxes of those involved in construction. It would be sensible to implement neutral-rate renovation support to the maximum extent that the apartment associations are seeking. This would allow people to renovate at an affordable and sensibly increasing pace. In conclusion, this would benefit apartment associations, the state and companies.

Urmas Kõljalg wrote about creating a digital twin of nature. In simple terms, a digital twin is a computer model that simulates an object or process from the real world. It is tempting for scientists, politicians, officials and entrepreneurs to promise to create – over just a few years – a model of living nature that is so good it will allow us to make appropriate and sustainable decisions about any place in the world in real-time. It would, however, be sensible to be patient and first develop digital twins for smaller objects or processes. Estonia is definitely a place where, thanks to its small size and embedded digital culture, one of the first national digital twins of living nature could be developed.

10 https://sdgs.un.org/goals

Jakob Kübarsepp discussed how critical raw materials influence the development of cars. The mass introduction of electric cars requires significantly more critical raw materials than the production of internal combustion engine vehicles. This is the price we have to pay for the transition to environmentally friendly electric cars. There has been less talk about vehicles in which hydrogen either fully or partly replaces petrol, diesel or gas. That would allow us to continue using the internal combustion engines we have been using for more than one hundred years, while inflicting a lot less damage on the environment. It would also significantly reduce the need for critical raw materials.

Maris Laan wrote that the principal phase for DNA changes takes place at the foetal age. The intensity of those changes throughout the life cycle also depends on the person's lifestyle and choices. Each one of us can contribute to our genome and our own health by choosing a healthy lifestyle and standing for a clean living environment.

In another opinion piece, Academy member Laan focused on education in Estonia. She wrote that Estonians have throughout time been a people who believe in education. This should also be the case in the 21st century, but we have to preserve suitable education opportunities to this end. Every small child must have the opportunity to attend school near his or her home, just as it was 100 years ago. We do not perhaps place enough value on a way of thinking that feels natural to the majority of our society – the uniform and free-of-charge accessibility of education for everyone, regardless of their place of living, family situation or social background.

Enn Lust's opinion piece spoke about the role of storage technologies in green energy. He pointed out that by combining the output of the planned offshore and onshore wind farms and solar fields we would be able to produce enough electricity to power all of Estonia, and more. The surplus electricity would have to be valorised and stored as hydrogen or reagents. Considering the environmental sustainability of electrochemical technologies and green hydrogen, developed countries will make the transition to new technological solutions in the coming 10 to 20 years. This will deliver a cheap and crisis-resistant energy supply to society.

Lauri Mälksoo wrote about comparative constitutional law, from which we can learn and thereby become more aware of the situation in our country. The Baltic countries and Taiwan are sometimes compared as formations located on geopolitical 'frontlines'. However, in terms of constitutional and international law, there are significant differences here. There is no question today with regard to the status of the Baltic countries as subjects of international law. Taiwan's situation is more disputable. For instance, the 1947 Constitution of the Republic of China still applies there, a text which is based on the unity of all of China.

Ülo Niinemets wrote that the growth of project-based activities has a limit starting from which the costs exceed the benefits to society. The project-based use of funds has been consistently growing in the public sector. Supporters of the project-based approach claim that it is the best way to increase the transparency of using public money, and to reduce costs. However, instead of flexibility, the project-based approach in reality results in more bureaucracy and formalism, more rigid structures and overregulation.

Karl Pajusalu examined the definition of a mother tongue in the mirror of the Livonian language. He wrote that one's mother tongue does not have to be the language learnt first and can change in the course of a lifetime, just like one's national identity or self-understanding can change.

Anu Realo wrote that general trust is currently at a global low, according to experts. It is thought that one of the reasons for the decline in general trust is the loss of a perceived sense of security, which has been increasingly deepened by the COVID-19 pandemic, the war in Ukraine and the economic crisis. At the same time, the successful functioning of today's democratic societies without a standard of general trust is difficult, if not impossible.

In another opinion piece, Academy member Realo wrote about the social consequences of the war in Ukraine. Millions of annihilated homes and destroyed lives are a direct consequence of Russia's military invasion of Ukraine. The actual impact of the war is global and extends beyond Ukraine's borders. The war has shaken the foundations of the rules-based world order and triggered a chain reaction of various social, political, economic and environmental processes. We will only be able to assess their true extent in the years to come.

Jaan Ross focused on the development and most pressing problems facing Estonian science in the second period of independence. He admitted that having himself been a member of the Evaluation Committee of the Estonian Research Council, he can conclude that the attempt to distribute the funds necessary for research only among 'the tops of the tops' ended in a fiasco. According to the author, the attempt resulted in very strong teams of scientists competing for relatively large amounts of research money. And as there were no actual indicators to assess their ranking, it was like comparing apples and oranges.

Ellu Saar wrote the opening and closing pieces of the year. In January, she wrote that there is no single solution for reducing the gender-based salary gap, as its development is influenced by several interconnected factors. The problem is not in the demand and supply ratio in the labour market or in women's career choices, but more generally in the very different salary levels across different professions and in the extent of social inequality.

In December, Academy member Saar wrote about poverty in Estonia and about those it endangers the most. She pointed out that while various benefits and pensions in Finland, Norway and Ireland, for example, are able to reduce the rate of poverty by more than 50 percent, in Estonia the figure is nearly half that. The Estonian social protection system has therefore not done enough to reduce poverty among certain risk groups. Ellu Saar emphasises the need to ask whether support is aimed at the population groups that need it the most, as well as the need to take into account the impact of differentiation when imposing new taxes.

Tarmo Soomere published five opinion pieces in the column during the year. In the first piece, he wrote that we live in a world that is shaped by an increasingly rapid onslaught of new knowledge. The number of facts presented in scientific articles alone, i.e. strictly justified facts, is doubling about every nine years. The skill to screen out scientists whose work has the potential to change the world is becoming ever more important.

In another opinion piece, he pondered on history to mark the publication of the compendium 'Eesti merenduse ajalugu I' ('Maritime History of Estonia I') – as after all, Estonia's history is largely a history of the relationship between us and the sea.

In his third piece, he pointed out that laws are an instrument of trust creation, and one of the few at the state's disposal. Laws must therefore be concrete and unambiguous, and they must withstand the test of time.

In the fourth opinion piece, Academy member Soomere wrote about the European Marine Board's recent recommendation regarding the angle from which it would be reasonable to observe changes in coastal regions, how to measure the condition of beaches and the most appropriate way to intervene in the course of nature or human impact. This is all based on the understanding that beaches are an incredibly complex system where natural forces, a specific environment, and human dreams and needs collide. When we need to reap benefits or when we need to intervene, we must do so harmoniously, by understanding and adapting to the rules of the functioning of beaches and taking into account different sectors and stakeholders.

In the fifth opinion piece, Tarmo Soomere focused on research ethics and integrity. He wrote that we are increasingly witnessing the expansion of the area of use of research ethics. The foundation on which trust towards sciences and scientists is based is, much like the problems related to climate change, becoming a political tool. A lever for manipulating, achieving ambitions or defending one's professional dignity, and increasingly a stick with which to beat unwanted colleagues or competitors. In other words, we are entering a society where research ethics and ethical conduct are two radically different things.

Martin Zobel wrote about a decrease in biodiversity based on species going extinct. In the assessment of the scientists at Kew Botanic Gardens in the United Kingdom, nearly 600 plant species have gone extinct on our planet over the past 250 years, and up to 40 percent of plant species are endangered. Similarly to human society, stratification also takes place among plant species – into a few winners and a lot of losers. The global impact of human activity on nature is the greater: the more people there are, the more each person consumes and the greater the ecological footprint of the product or service consumed.

Marek Tamm wrote about new horizons in humanities. He claimed it is very possible that humanities are of critical importance in coping with the huge problems humankind has managed to create in the few past decades. Humanities scientists are increasingly seeking cross-sectoral cooperation and creating interdisciplinary research directions that would allow us to assign as comprehensive a meaning to human activity as possible.

In another opinion piece, Academy member Tamm wrote that humanities is one of the most crowded and diverse areas of the Estonian science landscape. As Estonian humanities scientists have to date lacked a forum for joint discussions and critical self-reflection, the humanities scientists of several universities decided to initiate a new tradition – annual conferences of humanities in Estonia. The first conference will be held in April 2024.

Tiit Tammaru wrote in his opinion piece that while politicians and urban planners have adopted the idea of a 15-minute city, scientists are also pointing out its downsides. Ultimately, a 15-minute city may lead to the emergence of spatially encapsulated settlements. Academy member Tammaru emphasised the need for more diverse urban planning solutions in order to avoid excessive encapsulation and to ensure that people can partake in the opportunities offered by cities both close to their home and farther away, and move about in a way that is as environmentally friendly as possible.

In another piece, Academy member Tammaru wrote that since the beginning of the war in Ukraine, nearly one in every seven Ukrainians has left the country. It is quite probable that as the war draws on, many refugees will settle for good in the hosting countries. Remigration studies show that even a few years of living in a new homeland significantly reduces the desire to return to the original homeland. If Ukraine can achieve success on the battleground as quickly as possible, it has a chance to win back its occupied regions and entice back those who have sought refuge abroad.

Tõnu Tannberg wrote about the foundation of the Estonian Academy of Sciences 85 years ago, and about the complicated fate of the first Academy members. The foundation

of the Academy of Sciences in 1938 was an important step in the reorganisation of the former university-centred science system. The loss of our state in 1940, however, also proved fateful for the Academy, as the communist powers dissolved it.

Elmo Tempel and his twin brother, chemistry and physics teacher at Pärnu Sütevaka Upper Secondary School of Humanities, **Erkki Tempel**, wrote about how science begins from the grassroots level. There is no recipe for spawning top scientists from young people. However, we can create an environment that facilitates a career in sciences, and the creation of that environment starts from the school desk. Teachers, scientists and society as a whole play an important role in shaping the environment.

Jaan Undusk wrote about jealousy, which seems to be the reference point for the Russian state and in turn Russian people in their attitude towards their neighbours. Students here once had a common saying which ran through the then treatment of history like a red thread: "Russia cannot abide that regions located so close to its borders do not belong to it." This is the logic of Russian statehood.

Jaak Vilo wrote about artificial intelligence and its recent rapid developments which have taken things to a new level of quality. Technologically, ChatGPT is not an entirely new thing – rather a result of the consistent evolution of science. The last leap does, however, seem incredible. At the same time, we are facing several important questions – for instance, which base data of language models do we trust and which base data do we input in such solutions, when even the so-called historical truths are not yet in mutual accordance.

About ten days after publication in the print edition of *Postimees*, all the articles are published on the Academy's website.[11]

11 https://www.akadeemia.ee/paevik/teadlase-pilguga/ (in Estonian).

Photo: Stefanie Kirsch

Discussing risks associated with increasing complexity of infrastructure and mobility in Staszic Palace, Polish Academy of Sciences, on 16 May 2023.

WARSAW COMMUNIQUÉ ON CLIMATE CHANGE IN EUROPE

The inaugural European Climate Conference[12] has convened 90 scientists from 45 countries across Europe and Central Asia to assess climate change and the progress towards reaching climate neutrality in Warsaw on 15–16 May 2023. The assembled scientists presented the ensuing communiqué on 23rd May 2023.

1. Climate change is happening, and planet Earth is in the age of the Anthropocene. Global warming and its consequences are caused by human activities, and this is one of the most pressing challenges of our time. Climate change impacts lives, businesses, settlements, and ecosystems. No individual and no planetary component remains unaffected.

12 https://europeanclimateconference.eu

2. The extreme manifestations of climate change include: heat waves, droughts, forest fires, heavy rain, floods, severe storms and cyclones. Additionally: changing seasonality, longer atmospheric pressure blocks, loss of glaciers and sea ice, sea level rise, ocean acidification and warming, and changes in ocean circulation. All these are highly likely to amplify by 2050.

3. The principal ecological manifestations are aggravated by climate change, but are primarily driven by deficient land, soil and water management. These include: loss of biodiversity, loss of ecosystem functions and services, soil degradation and desertification, and deterioration of freshwater resources.

4. The range of risks and the magnitude of transformations must be considered systemically and sequentially (phasing-in-phasing-out). Transformations need to be just, both within and among societies. The impetus for transformation is still not ambitious enough. We need to act faster and more comprehensively. Handling climate change requires harmonising mitigation and adaptation strategies, always in a cross-sectoral approach.

5. For energy and industry, the following measures are a priority:
(a) accelerate the decarbonisation of energy production mainly through renewables, considering wide-scale electrification, cost and consumption efficiency, and negative emission solutions;
(b) develop the Super Smart Grid (Europe, Central Asia, North Africa), combining engineering and market solutions to manage the variability of electricity from renewables with AI-based grid management;
(c) invest in large-scale, long-term electricity storage (e.g. chemical storage through hydrogen);
(d) support innovative approaches to defossilise industry and enable circular and low-carbon economy.

6. For biodiversity and ecosystems, the following measures are a priority:
(a) significantly limit the causes of biodiversity loss and ecosystem degradation, especially deforestation, intensive agriculture (monocultures and overuse of pesticides) as well as overfishing, pollution, landscape fragmentation and land use conflicts;
(b) opt for nature-based solutions to support climate mitigation and adaptation of species (e.g. by increasing genetic diversity);
(c) implement the 2022 Kunming-Montreal Global Biodiversity Framework.

7. For agriculture and water, the following measures are a priority:
(a) avoid soil degradation and carry out soil restoration;
(b) integrate the management of land, soil and water, including water conservation, efficient irrigation and renaturation, and climate stress-resilient crops and livestock species;
(c) limit resource-consuming agricultural production, especially for livestock (also to reduce methane emissions), and minimise food loss and food waste.

8. For infrastructure and mobility, the following measures are a priority:
(a) follow new principles of integrated, resilient and responsive infrastructure planning, by connecting it to smart grids, resource efficient mobility development, and low-carbon footprint building;
(b) invest in electric mobility of people and freight, and simultaneously expand public transport;
(c) consider climate risk management in business development and industrial policy, and in public administration and civil defence.

9. The regional diversity of climate (change) should receive more attention and be used as a strength in mitigation and adaptation actions. Local and regional knowledge should be translated into national- 2 / 2 and continental-level action for maximum effect. Using inherent potentials in Europe and the neighbouring Central Asia and North Africa,

Photo: Polish Academy of Sciences

Participants of the climate conference in from of Staszic Palace, Polish Academy of Sciences.

particularly for climate-neutral energy and food systems, should be prioritised and done in a fair, cooperative manner.

10. Policies and market-based instruments – especially game-changer, such as the European Green Deal, national green investment packages and national or supranational CO_2 pricing – should never work against each other. Climate and biodiversity policies should not be decoupled. Regulations should be used wisely to stimulate and scale technological and social innovations to achieve transformation. Research-based and transparent communication between politicians, citizens and scientists should become the norm to increase acceptance and reduce negativism and denialism. Generational equity and participative policymaking should be a matter of course.

SUMMARY

The scientists participating in the inaugural European Climate Conference, representing 45 European countries, acknowledge that evidence-based scientific advice should be the basis for political and personal decisions for climate neutrality, and that scientists should engage more to increase climate change literacy of their fellow citizens. Effective actions for climate neutrality mean deep transformations of most aspects of the economy, the energy system, international markets, and the global cooperation framework. These measures should harmonise mitigation and adaptation strategies, and resolve transnational, national and regional trade-offs. Regional climate change and the global-local relationship should be more in the focus. Neither science, nor politics, nor collective civil action, nor education, nor public or private investments alone are enough. The window of opportunity for reaching the Paris Agreement goal is closing, and this leaves very few realistic options open.

The primary recommendation is to accelerate mitigation measures aligned with the Paris framework, while simultaneously deploying adaption measures. Regulation and financial instruments, such as CO_2 pricing, should be used to stimulate climate neutrality. This also includes incentives for openness toward green technologies, for rigorous reduction of greenhouse gas emissions, and for counteracting environmental pollution and ecosystem degradation, especially deforestation and biodiversity loss. Europe and Central Asia should make better use of their inherent potential to manage climate change: renewables, connectivity, market economy, people, knowledge, and innovations. Let us embrace these far-reaching potentials to accelerate the pace of transformation towards a climate-neutral future for our continent and for our planet.

BIG AMBITIONS OF THE RENEWED COMMITTEE ON CYBER SECURITY OF THE ACADEMY OF SCIENCES

Dan Bogdanov, Chairman of the Committee on Cyber Security of the Academy of Sciences

The security of Estonia's e-State systems is a topic that is continuously discussed. Our signatures and votes are digital, just like communication with our country via websites and e-mails. Digital wallets and mobile e-State are on their way in. The Estonian people's understanding of cyber security has, however, not kept pace with all of this change. The state institutions, which have to sustainably ensure the security of services in the midst of new technologies and attacks, are also encountering difficulties. In order to analyse these difficulties and propose possible solutions, the Academy of Sciences convened the Standing Committee on Cyber Security in its new composition.

The Committee is now headed by Dan Bogdanov, who was elected as an Academy member in 2022 and works as Director of the Information Security Research Institute at Cybernetica AS. Dan Bogdanov has led scientific research in information security and data protection in Estonia and with partners from the European Union, the United States and Japan. He chose the study of the security of election technology as the Committee's first focus of work. For that purpose, he invited scientists who are closely familiar with the technological and societal specifics of information security to the Committee. Representatives of state institutions involved in the development of election technology were also invited to the Committee. The composition of the Committee was approved in June 2023.[13]

The Committee began its work in August 2023. After the initial principles and work plans were established, the conference on Trust and reliability was held in the Mirror Hall of the Academy of Sciences in October, at which the latest research results in the areas of information technology and social studies were presented.[14] We learned that the level of trust towards election technology is high in Esto-

13 The composition of the Committee is available on the website https://www.akadeemia.ee/en/academy/contact-structure-facts-of-history-councils-and-committees-associated-institutions-associated-organisations-home-page-councils-and-committees

14 https://www.akadeemia.ee/en/events/conference-on-trust-and-reliability

Piret Ehin, Professor of Comparative Politics at the University of Tartu, and Mihkel Solvak, Associate Professor of Technology Research at the same university, spoke about the trustworthiness of elections and election technology.

Tiit Riisalo, Minister of Economic Affairs and Information Technology, presented the state's visions concerning the development of election technology.

nia compared to the rest of Europe, and we also learned how people gain trust in technology and through whom. We were given an overview of the extent to which an information technological system can be made reliable (e.g. auditable), and the participants held discussions concerning the state's innovative plans to start using smartphones in elections.

The presenters were drawn from several fields, including the Supreme Court, the media and election observers. Experience was also provided from abroad – we heard how trust towards election technology has been built up and lost in other countries, using examples from Czechia and Australia. The head of the conference concluded the event with the golden rule of elections as relayed in the children's book *The President of the Jungle* – candidates must never eat their opponents.

The Chairman also announced the Committee's work goal for the first year at the conference – the preparation of a public and systematised security analysis of election technology. Indeed, this is what the Committee has been working on in the months since the conference. The focus has been on elections with smartphones, but the

Photo: Aavo Kaine × 3

On the first panel, (from left) Priit Vinkel, Senior Expert at the e-Governance Academy, Nele Siitam, Supreme Court of Estonia, Tanel Tammet, Tenured Full Professor at TalTech, and Ronald Liive, journalist at Geenius Meedia, discussed whether engaging more with society would increase trust.

On the second panel, (from left) Liisa Past, Head of the National Cyber Security Department of the Ministry of Economic Affairs and Communications, David Dueñas-Cid, Researcher at the Gdańsk University of Technology, Carsten Schürmann, Professor at the IT University of Copenhagen, and Tomáš Rabas, Expert at the Czech National Cyber and Information Security Agency, discussed how countries are developing trust and trustworthy services.

plans are even broader. Over time, the Committee hopes to use the developed security analysis methodology to analyse the entire electoral system – on paper, computers and smartphones. As the Committee members receive no remuneration for their work, the Chairman cannot demand a fast pace of work. However, the goal was established to have the first draft of the security analysis completed by the summer of 2024.

Photo: Aavo Kaine × 2

Academy member Dan Bogdanov.

Photo: Krista Tamm

Meeting of the Committee on Cyber Security at the Academy of Sciences on 13 September 2023.

Photo: Alar Madisson

Jüri Engelbrecht.

THE POWER OF WORDS IN THE STORY OF THOUGHT

Academy member Jüri Engelbrecht's presentation at the conference 'A poet by nature, an Estonian by profession' dedicated to the 85th birthday of Academy Member Hando Runnel, held on 24 and 25 November 2023.

We are incredibly fortunate that the idea to start publishing The Story of Estonian Thought (*Eesti mõttelugu*) book series was initiated under the leadership of Hando Runnel 30 years ago. Hando Runnel himself wrote: 'Even the most valuable piece of mental creation is as good as dead if it is not moving in the thoughts and memory of the contemporary living.'[15] I suppose that is the power of words.

That was how the epic journey began. In 1995, the first book in the series was published, which brought together the thoughts of Juhan Luiga (1873–1927) and was titled *Riot and Illness of the Mind* (*Mäss ja meelehaigus*). In the same year, another of his books, *The Looks of the Power of the Soul* (*Hingejõu ilmed*, the sixth book in the series), was published. These words are apt in characterising all the books in the series. It is worth recalling that a particular projection at the time did not come to pass: initially, the plan was to publish about one hundred and fifty authors. By November 2023, 174 volumes had been published. True, more than one title has been published from some authors, such as Jaan Tõnisson, Lennart Meri and others. All in all, in short, this is an astounding series. We have good reason to be proud that we have created such a repository of thoughts and ideas, which is not yet full by far, but is constantly growing.

So what is this series about? Is it an Estonian theory or simply a thinking Estonia or a reply to Jakob Hurt who thought that we have to become great in mind? Or genuflecting to past thinkers whose writings were suppressed during the Soviet era, if not banned outright? Let us try and find a more general embracing idea. Kalevi Kull and Academy Member Marek Tamm stipulate[16] that

15 Runnel, H. 1998. Jooksu pealt suudeldud. Ilmamaa, Tartu (The Story of Estonian Thought; 23) (in Estonian).

16 Kull, K. Tamm, M. 2015. Eesti teooria. Akadeemia, 2015/4, 579–624 (in Estonian).

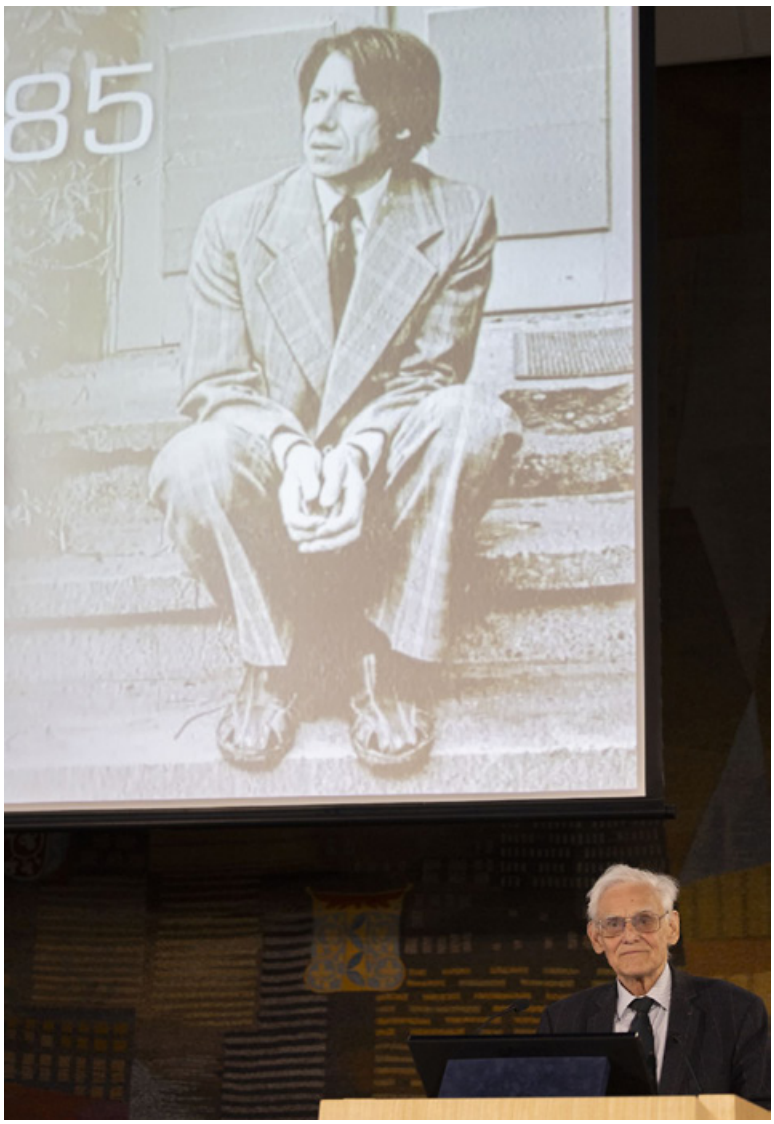


Photo: Alar Madisson

Jüri Engelbrecht at the conference dedicated to Hando Runnel's birthday.

the Estonian theory is 'a set of outstanding views which belong together to a certain degree and originate from scholars related to Estonia and which may have a value of interest for the entire intellectual world'. It has also been said that it is a national essay epic or an encyclopaedia of Estonian intellectual life.

Hando Runnel himself says that the important thing 'is their [the thinkers'] life truth – their feelings, their knowledge, their skills of thinking and assigning meaning to things; the radiance of their mind on their time and environment as well as across time – their appeal.[13]

I have just listed a number of keywords, each of which would be worthy of a longer discussion in itself. I suppose it is important to first emphasise the skills of the authors of the series in giving meaning to the truth of life and the radiance of their minds both in their time and across time. But the books are not merely receptacles for the knowledge of the sons and daughters of this small country as well as their moral liberty to assign meaning to that knowledge – the books are also of value for the entire intellectual world.

I would like to recall a few words of wisdom that I have also highlighted elsewhere. 'The whole is greater than the sum of its parts', said the old Greek, Aristotle. And today's French philosopher Edgar Morin claims: 'Not only is the part inside the whole, but the whole is inside the part.'[17] These statements also reflect the series concept – a repository of the ideas of a small nation, which is a part of the work of thought of the whole intellectual world, and vice versa.

The authors of the series come from different walks of life: intellectuals from the Estonian Awakening era, theologists, pedagogues and historians, politicians and legal scholars, scientists from astronomers and biologists to linguists and many more besides. Although the initial idea was to leave fiction out, the authors also include writers with their essays. The writings of Karl Ristikivi, Anton Hansen Tammsaare and Eduard Vilde relate to today's problems in all aspects. Lennart Meri[18] emphasised that a strong Estonian language and culture is a prerequisite for the survival of our country.

When we think about the original idea of an Estonian state, we had characters like Kristjan Jaak Peterson

17 Morin, E. 2006. Restricted complexity, generalized complexity. Presented at the Colloquium 'Intelligence de la complexité'. Cericy-La-Salle, France, 26 June 2005. Translated by Carlos Gerhenson.

18 Meri, L. 1996. Presidendikõned. Ilmamaa, Tartu (The Story of Estonian Thought; 9) (in Estonian).

('Yet could not the language of this land…') and Juhan Liiv ('There will be an Estonian state…'), in addition to Jakob Hurt. On the occasion of opening the Estonian Book Year in 2000, Lennart Meri said[19] that a word cut in paper has great power. He himself used words masterfully, as we can time and again witness in his speeches and writings, whether he was discussing the state's concerns or achievements. In line with his words, we have good reason to proudly say that the small country of Estonia has built up a higher academic education and we teach high-level physics, genetics, medical sciences and much more. Would that have been possible without the ideas gathered between the covers of the Story of Estonian Thought? I would think not.

One term for characterising relationships in society is 'stigmergy'. It is an indirect mechanism of coordination between actions, in which the trace of an action left in an environment influences or stimulates the performance of a subsequent action. The term was originally used in biology, but it has been determined that processes that take place in human society – like the development of a disposition as well as intellectual life – can also be characterised by stigmergy. In everyday life, we just know that memory and impressions of the past shape our actions today. Isaac Newton knew already a long time ago that we stand on the shoulders of giants.

The effect of The Story of Estonian Thought books on the development of our nation definitely exists and would perhaps require a more thorough examination. After all, it is a story of the development of values through layers of time, reflecting the spiritual strength of the nation. Using this, it is also possible to better define our common interests, particularly today (*anno* 2023), when there is a crisis of trust, aside from society's other worries. The impact of The Story of Estonian Thought books reaches farther than Estonia, as we are a part of Europe, a part of the culture of the world. These relationships have been analysed by many (Arthur Võõbus, Lennart Meri, Jaan Kaplinski and others). At the same time, The Story of Thought is in Estonian, for people can best express themselves in their mother tongue. This was emphasised by our internationally reputed sociolinguist Els Oksaar whose thoughts have not (yet?) made it to the repository of The Story of Estonian Thought. A question naturally arises: how would the ideas of The Story of Estonian Thought find their way to the intellectual repository of the world. Could we develop a golden series of The Story of Estonian Thought as translations, so that selected parts could reach beyond the scope of the Estonian language?

Photo: Mari Ainso

Hando Runnel measuring The Story of Estonian Thought (2017).

As an avid reader, I have always sought out new thoughts. I would like to name a couple of other books in addition to The Story of Estonian Thought repository. One of these is Toomas Paul's masterpiece 'The History of Bible Translation in Estonia'.[20] In the preface of the book, I noted: 'This is a book about the evolution of the written Estonian language and the story of the development of Estonian culture from the viewpoint of Bible translation. It is a contemplation of culture and cultural identity, a picture of disputes in shaping the written Estonian language, a picture of the Estonian school and of history in general.' Using the same train of thought, we could say about The Story of Estonian Thought that it is a panoramic picture of the story of the development of Estonian culture.

19 Meri, L. 2001. Riigimured. Ilmamaa, Tartu (The Story of Estonian Thought; 41) (in Estonian).

20 Paul, T. 1999. Eesti piiblitõlke ajalugu. Proceedings of the Mother Tongue Society 72, Tallinn (in Estonian).

Another book I would like to mention here is an overview of Estonian engineers and architects who studied at prestigious European universities before World War II.[21] From their studies, they brought back not only skills, but also a mentality in the most general sense, which the young Estonian state urgently needed. After all, the culture of technology is also related to the way of thought that serves both needs and the sense of beauty. Buildings erected in Estonia in the period between the two world wars are a good example here, particularly when compared with the 'opera magna' of Soviet architecture.

Choosing favourites from the series is difficult. My mind has definitely been captured by the thoughts of Lennart Meri and Ain Kaalep, whose grasp connects Estonia to the wider world. The Story of Estonian Thought also brings to the Estonian reader the spiritual strength and achievements of many of those who were forced to leave their homeland. Endel Tulving, Ernst Öpik, Ragnar Nurkse and many others have left their mark in the repository of science in their area of specialisation and given meaning to it in numerous writings. For me, learning about the life work of Arthur Võõbus was a surprise.[22] Võõbus was a world-renowned Syriologist whose research was not limited to early Christianity, but instead built a whole from the parts. His book about the European history of the spirit starts from early Christianity in Syria and also reaches the stories of Estonians, focusing on the part which the Moravian Brethren played in our history.

In studies concerning Arthur Võõbus, his monumental masterpiece of 14 volumes, 'Studies in the History of the Estonian People' has been in special focus. As Amar Annus says in the afterword of Võõbus' book, the book is more an ideological monument than a thorough research paper. We are left to ask whether our historians have found it a worthy place in the repository of Estonian history research. In the introduction to his masterpiece, Võõbus says that he was particularly interested in the spiritual, ethical, educational and intellectual heritage of Estonians.[23] When describing his work in the midst of manuscripts, he says meaningfully: 'And then I suddenly understood what they mean – teachers!' These sayings of his are also well suited for characterising The Story of Estonian Thought.

Besides the exercises of thought of statesmen, philosophers and theologists, my attention has, of course, also been drawn to the works of the representatives of the world of science, which make up about one third of the volumes published to date. In addition to the top-level scientists mentioned before who worked away from Estonia, the thoughts of scientists who have worked or are working in their homeland have found a place between the covers of The Story of Estonian Thought. It is true that the writings of Ernst Öpik, Harald Keres and Jaan Einasto sometimes also contain mathematical formulae and tables of calculations, but the authors' polished clarity of thought is captivating, whether they are discussing the existence of dark matter or problems in determining the distance of galaxies. And aside from cosmic spacetime, Harald Keres gives us social spacetime. Several books of The Story of Estonian Thought have been written by Academy members, and the author of this text is naturally pleased that they show the part of the Estonian Academy of Sciences not only in the development of science, but also in carrying the mantle of Estonian intellectual culture. This, of course, includes not only the aforementioned physicists, but also literary scientists and philologists, such as Oskar Loorits, Ilse Lehiste, Paul Ariste and Jaan Undusk, as well as Hando Runnel, Gustav Suits and Jüri Uluots. We should also add Loit Reintam, Endel Tulving and Juri Lotman to this list. Two Presidents of the Estonian Academy of Sciences have also shaped their thoughts into a Story of Estonian Thought. I cannot possibly list everyone, but a characteristic trait is evident in the thoughts of the scientists – they can link their discussions to the large picture of the world and to other thinkers, although they are talking about Estonian things. After all, we are a part of the whole.

I have asked before whether another country or language has such a repository to offer that is an equivalent to The Story of Estonian Thought series. The history of the world covers a considerably longer period than from the beginning of the 19th century until today and many languages of the world have been known as written languages for centuries, if not longer. I cannot assess the heritage of the Orient, but I asked my colleagues at European academies of sciences. I did not conduct a scientifically based study, but my colleagues were unable to point out anything similar. Yes, the London-based publishing house Routledge is specialised in the publication of series, the number of which reaches many hundred. However, these do not include a generalising series focused on the story of thought, the authors of which are the thinkers of one country or another, regardless of whether they belong among exact scientists, philosophers, politicians, social figures or others. Our Story of Thought is a unique series, an equivalent to which cannot be found elsewhere in the world.

Verba volant, scripta manent.

21 Liibek, T., Pullat, R. 2020. Oma alma mater'it otsimas. Estopol, Tallinn (in Estonian).

22 Võõbus, A. 2009. Kummargil käsikirjade kohal. Ilmamaa, Tartu (The Story of Estonian Thought; 86) (in Estonian).

23 Võõbus, A. 1969. Studies in the History of the Estonian People. ETSE, Stockholm.

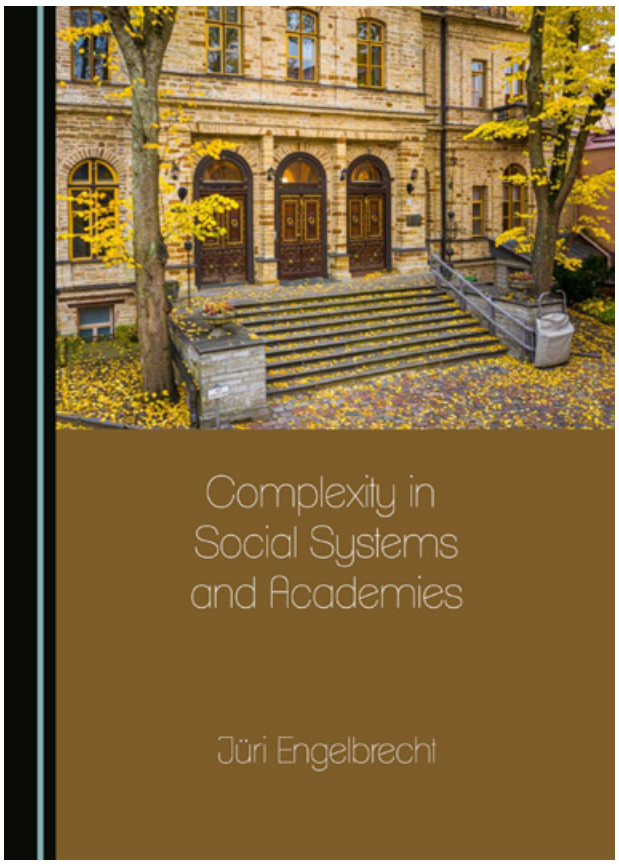
BOOKS FROM THE MEMBERS OF ACADEMY

International monographs and collections

- **Engelbrecht, J.** 2023. Complexity of Social Systems and Academies. Cambridge Scholars Publishing, Newcastle.
- Simon, Z. B., **Tamm, M**. 2023. The Fabric of Historical Time. Cambridge University Press. (Elements in Historical Theory and Practice.)

Edited collections

- Jacobs, G., Šlaus, I., **Engelbrecht, J.**, Zucconi, A. (ed) 2023. Catalytic Strategies for Conscious Social Transformation: Leadership in Thought. Cambridge Scholars Publishing, Newcastle.
- Russow, E., Dabolinš, V., **Lang, V.** (ed) 2023. From Hoard to Archive. Numismatic Discoveries from the Baltic Rim and Beyond. Studies in Honour of Ivar Leimus. Tartu Ülikooli Kirjastus, Tartu. (Muinasaja teadus; 30.)



Jüri Engelbrecht's book cover image.

PLACE OF OPINION

TRUST, TRUSTWORTHINESS AND RESPONSIBILITY

The presentation of Academy member Anu Realo at the General Assembly of the Estonian Academy of Sciences on 19 April 2023 (abridged version)[24]

The proportion of people who hold that other people can largely be trusted has dropped to just 30 percent globally.

We need to talk about trust

Trust arose as an important topic in the debates before the recent *Riigikogu* elections. Trust is currently a hot topic across the world, not just in Estonia. The latest reports from the UN Development Programme are unanimous in telling us how general trust is globally at a low point.[25] On the basis of the data from the latest round (2017–2022) of the World Values Survey[26], the compilers of the report show that the proportion of people who hold that other people can largely be trusted has dropped to just 30 percent globally. The indicator has seemingly never been this low before. Should we be concerned and why?

Trust, trustworthiness and responsibility

Trust is one of the concepts and topics that is studied by scientists in many different fields, and finding a single uniform definition is therefore difficult. One way to discuss trust is to view it as a psychological process that on the one hand includes the assessment of the trustworthiness of

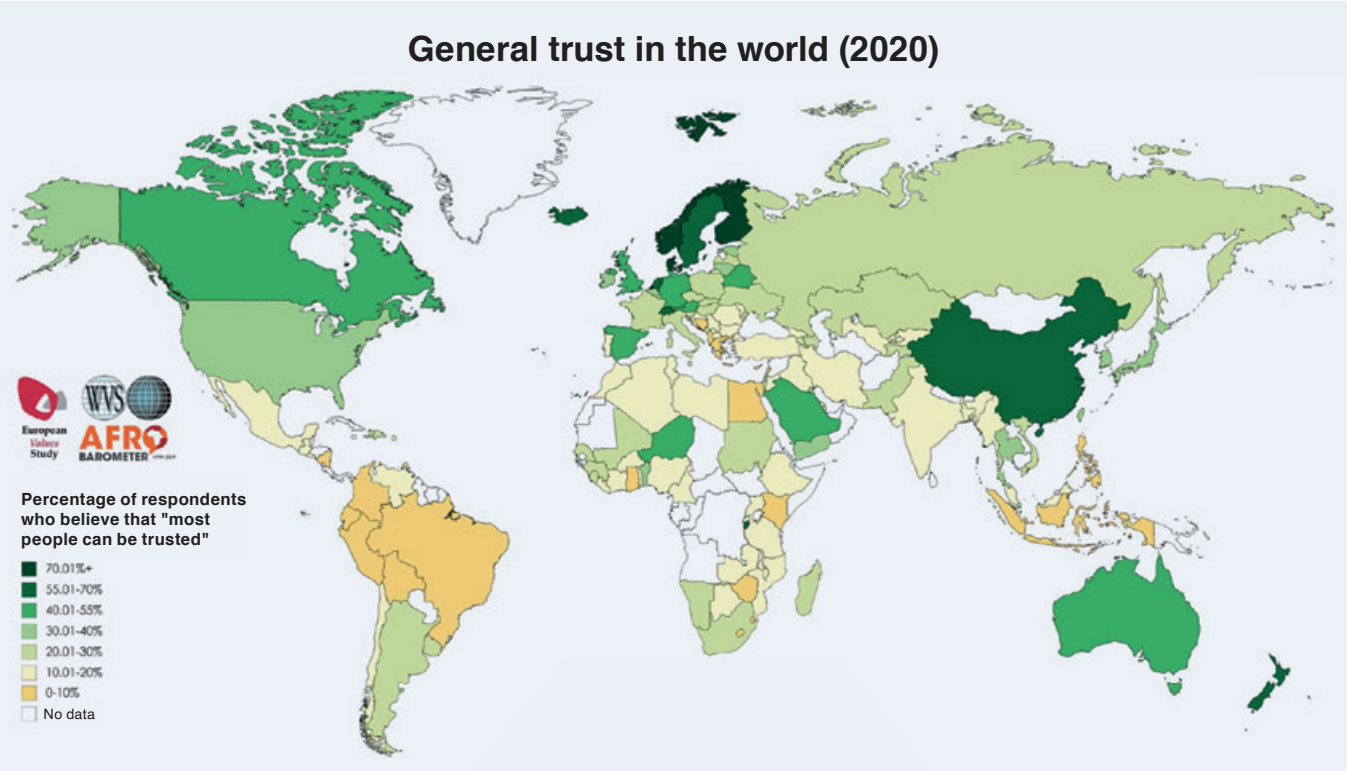
Photo: Maris Krūmvald

Anu Realo delivering the presentation at the General Assembly of the Academy.

24 The presentation was largely based on the article 'Why do we Trust' published in the *Akadeemia* journal (pp. 387–416) in March of the same year, which contains references to studies and sources not separately highlighted here.

25 UNDP 2022 Special Report on Human Security; UNDP Human Development Report 2021–22.

26 https://www.worldvaluessurvey.org/wvs.jsp



The proportion of the number of people who think that most people can be trusted in different countries. Compiled based on the results of World Values Survey 2020, European Values Survey and last data of Afrobarometer.[27]

other people, and on the other hand the admission of one's own vulnerability and acceptance of it in a situation where expectations of other people's intentions or behaviour are positive. Trusting someone therefore inevitably entails a certain amount of risk that things might not necessarily turn out as we hope or expect.

Trust can also be seen as a relationship between two (or more) parties – the one who trusts and the one(s) who is/are trusted. When we say we trust someone, the statement automatically contains an assessment of their trustworthiness. When assessing someone's trustworthiness, we in turn first think about how competent they are. Another important factor is whether we think the trusted person takes us into consideration and whether he or she has honest intentions towards us. When trusting someone, we hold them at least partly responsible for the trust placed in them. Even more so, we expect them to be aware of that responsibility and behave accordingly, thereby justifying our trust. However, attributing responsibility to the person we trust always involves a risk – things may go well, but not necessarily. Nevertheless, we believe, when we trust someone, that in the best case they will stand for our interests and in the worst case they will not intentionally or knowingly harm us. If the latter should happen, we are dealing with a situation in which trust has been betrayed or abused.

Different forms of trust

The process of trust is easy to understand in a situation where we are dealing with a person we know to some degree. When trust is related to specific persons or groups, it is referred to as specific trust. These may be groups to which the person belongs (e.g. family, extended family, neighbourhood, etc.) or whom they personally know, as well as those to which the person does not belong (e.g. people of another nationality or religion), and those they meet for the first time. Trust towards the state or other institutions, such as the government, the court system or the police, is referred to as political trust or, more broadly, institutional trust. The most abstract form of trust is general trust, which can be defined as a belief that the majority of people – including total strangers – can generally be trusted.

The different forms of trust are interrelated, but we cannot say they are one and the same thing. For instance, an analysis of the data from the World Values Survey (2017–2022) shows that general trust and institutional trust towards the legislative body are only moderately linked across 89 countries. In conclusion, it is difficult to imagine someone who says that they generally trust the majority of people, but at the same time do not trust anyone specifically. People who generally trust others are also very likely to trust their family members, neighbours, colleagues and other people of different groups. The opposite may not necessarily be true. When a person fully trusts, say, their family members or the neighbourhood residents, this is a very important precondition for the creation of general

27 Source: https://www.facebook.com/WorldValuesSurvey/photos/a.740780592617912/3580830368612906

trust, but not sufficient for the radius of trust to extend to people this person does not personally know. What's more, high specific trust may instead even reduce general trust – the stronger the relationships between the people in the close circle (e.g. family or extended family), the lower the trust towards other people in general. Thus, although the different forms of trust are interrelated, one does not necessarily extend to encompass another.

General trust – the Nordic gold

General trust is distributed very unevenly across the world. In the World Values Survey (2017–2022), participants were asked, among other things, whether they think most people can be trusted or not. While in Denmark 74 percent of respondents claimed that most people can be trusted, in Zimbabwe only two percent thought so. Among Estonian respondents, the respective indicator was 34 percent, which placed us in 21st place in the comparison of 85 countries. The level of general trust was above 60 percent in just six countries: in addition to Denmark, these were Norway, Finland, China, Sweden and Iceland.

For decades, the Nordic countries have stood out for their high level of general trust, which is why trust in these countries has been referred to as the Nordic gold. Here lies the first answer to the question of why it is important to talk about general trust at all. Gold signifies something precious and valuable for us, and the same goes for general trust. The high level of general trust prevalent in the Nordic countries is a part of the so-called virtuous circle, where the different institutional and cultural indicators of a 'good society' – such as happiness and welfare, wealth, low inequality and corruption, efficient and democratic government – feed and support each other. It is nearly impossible to say whether the high level of general trust is a cause or effect, but all the 'good society' indicators are clearly positively interrelated and mutually enhancing.

China's high level of general trust is more of an exception than a rule in the comparison between countries. Just like other Confucian countries, China is historically characterised by a high level of familism, which establishes narrow boundaries on the radius of trust. One possible explanation for China's high level of general trust is therefore that the Chinese understand 'most people' to mean a relatively small circle of close people whom they trust a great deal. Speculation with regard to China's high general trust indicator being the result of political pressure or the social preferability of responses has not been directly confirmed by the results of studies to date.

Trust and social capital

The fact that trust is a pillar of a cohesive and successful society was already known to Scottish economist and philosopher Adam Smith (1723–1790), although he is mostly referred to in connection with the terms 'free market' and 'invisible hand'. In his book *An Inquiry into the Nature and Causes of the Wealth of Nations* (1776, in Estonian in 2005), Adam Smith wrote about trust being the foundation of the progress of human society, as without trust society becomes the battlefield predicted by Thomas Hobbes (1588–1679), one in which everyone fights everyone else. The contemporary social scientists also hold that trust is like the glue or lubricant that joins people together and facilitates their actions towards common goals.

General trust is discussed a great deal in connection with social capital, which is described as an existing resource or potential gain that is created from people belonging to different groups and networks of affiliation. Beside networks of affiliation, general trust is the core of social capital. For instance, it has been found that countries with more social capital and a higher level of general trust have better economic indicators overall, along with a lower level of crime, greater citizen activity, more democratic and efficient government and lower social inequality. In countries with a high level of trust, people enjoy better mental and physical health, greater psychological wellbeing and greater life expectancy. Although it is again impossible to say anything about the causality of these connections, it is clear that all these positive outcomes are closely interlinked.

A particular example can be given here in connection with the recent COVID-19 pandemic. In 2022, a study was published in the prestigious medical journal *Lancet*, which attempted to explain the differences in the proportion of those infected and vaccinated with COVID-19 in a comparison of 177 countries worldwide. The analysis included various indicators that characterise the functioning of countries, such as democracy, social inequality, the efficiency of state governance, preparedness for crises, the quality of medical care and many other things. The results showed the aspect that best helped predict the number of COVID-19 infections per person in the population was how corrupted people consider the government of their country and how much they generally trust others and their government. Again, it is not possible to assess the causality of the reasons, but if trust towards the government or general trust had been as high as in Denmark in all the countries, the number of persons infected with COVID-19 in the entire world as at September 2021 would, according to the authors of the study, have been 13 or 40 percent smaller, respectively. Why is this? Trust towards other people and the government is related to more careful adherence to public health advice and restrictions. When people trust the government of their country and believe that the government is acting in their best interests, they comply with the conduct and instructions established by the state for the prevention of

the spread of viruses and illnesses, while assuming that other people around them do the same.

It is important to emphasise here that the successful and efficient functioning of a country is facilitated by mutual trust and trustworthiness, not the gullibility and naivety of the people. If society lacks the standard of general trust and there are too few trusting and trustworthy people, the principle 'trust, but verify' is the only chance of survival.

How is general trust created?

If general trust is something good and desirable, a question immediately arises: how does trust evolve. There is no consensus among scientists in this regard. It has been hypothesised that it is a relatively permanent attitude that is shaped by environmental and educational influence at a young age. On the other hand, trust is treated as a partly hereditary personality disposition that characterises how a person responds to the surrounding environment. Although the root cause of trust in these approaches is different – environment *versus* genes –, both claim that the level of general trust does not really change during a person's later life. At the same time, many studies show that the general trust indicator in society may change faster than the change of generations would allow – the increase in general trust in Estonia since the 1990s is a good example here. Thus, the representatives of the empirical approach claim that general trust is more of an attitude that may be significantly influenced by people's different experiences throughout their life, including the extent to which they trust state and public institutions.

Institutional and political trust

American political scientist Russell Hardin (2002) said: 'When we ask people how much they trust certain institutions, we are asking about the trustworthiness of those institutions. If we are worried about a decline of trust in society, we should study trustworthiness [and the factors influencing it], because trustworthiness creates trust.'[28]

Data from the European Social Survey[29] offer a good opportunity to see how Estonian people's trust towards institutions has changed in 2004–2018. Throughout the entire period, trust has been the highest towards the police, with more than 75 percent of respondents trusting them in the latest survey. More than half of the survey participants also trust the Estonian legal system and other people in general, while trust towards the *Riigikogu* and especially politicians and parties is notably lower (less than 25 percent for the latter two). In conclusion, it can be said that trust has slowly increased in all the aforementioned institutions during the period in question.

The data gathered almost on a monthly basis by the Liberal Citizen Foundation (SA *Liberaalne Kodanik*, SALK) allow us to monitor the change in trust towards both the *Riigikogu* and the government of Estonia over the past two years, i.e. from April 2021 to March 2023. In general, the residents of Estonia trust the government more than the *Riigikogu* – in March 2023, 57 and 51 percent of the survey participants, respectively, held that view. The level of trust generally increased and decreased in the same rhythm for both the government and the *Riigikogu*, providing a good reflection of significant events taking place in society. Trust in the government was the highest in March 2022 (68 percent), probably in response to the beginning of Russia's full-scale military action in Ukraine in the preceding month. By June of the same year, trust towards the Government and the *Riigikogu* had decreased considerably (to 49 and 45 percent, respectively), which can probably be explained by the government crisis – at the beginning of June, Prime Minister Kaja Kallas made a proposal to President Alar Karis to remove seven Centre Party ministers from office and began coalition negotiations with Pro Patria (*Isamaa erakond*) and the Social Democratic Party (*Eesti sotsiaaldemokraatlik erakond*).

According to a recent OECD survey[30] (2022), people in 21 member countries trust local government the most, followed by national government and the legislative body. Only in Norway and Finland did survey participants trust the national government more and in Ireland and Sweden the legislative body more than local government. On average, about four out of ten people trusted the government and the legislative body of their country. In Estonia, the level of trust towards the said institutions was a bit higher than average in the surveyed OECD countries and quite comparable to Sweden, but lower than in Finland and Norway, and considerably higher than in Latvia. Other surveys have also shown that the level of both general and institutional trust is very low in Latvia, and one of the reasons suggested for this is the very high level of perceived corruption in Latvia.

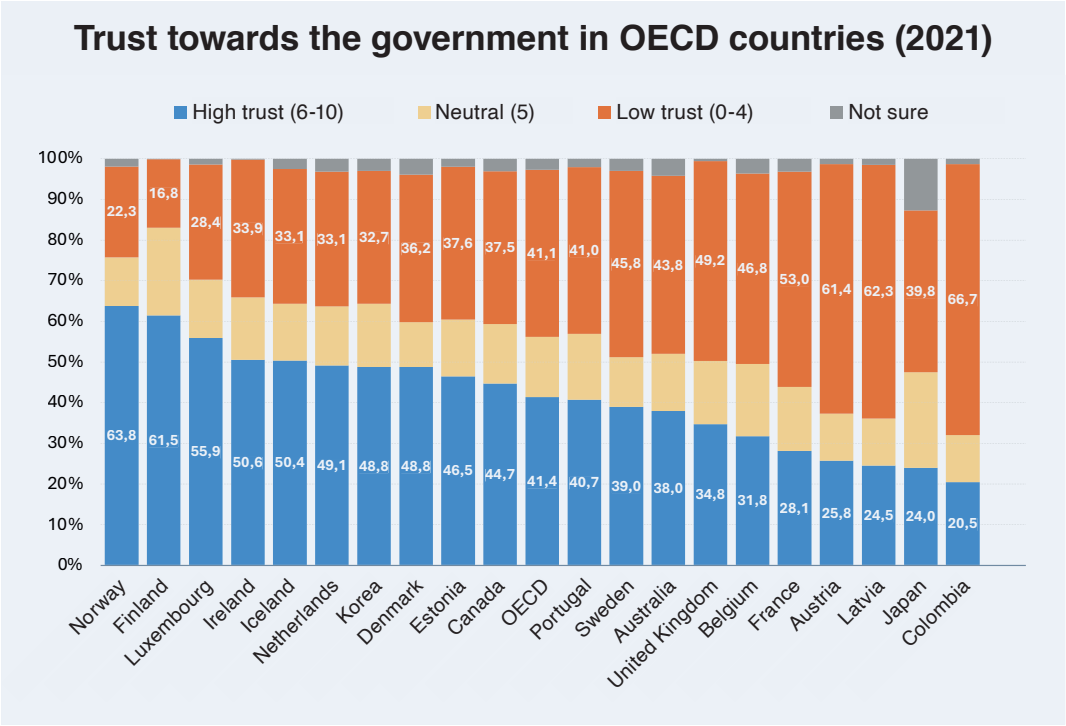
What influences the trustworthiness of the institutions of the state?

According to the aforementioned OECD survey,[30] trust towards the institutions of the state (including the government, legislative body, local government) is primarily influenced by the following factors. The first group is made up of various political, economic and cultural factors, including people's personality traits and attitudes. It is important to note here that people who are less well-off generally trust

28 Hardin, R. 2002. Trust and trustworthiness. New York: Russell Sage Foundation, p 30.

29 https://www.europeansocialsurvey.org

30 Organisation for Economic Co-operation and Development: OECD 2022. Building Trust to Reinforce Democracy: Main Findings from the 2021 OECD Survey on Drivers of Trust in Public Institutions. Paris: OECD Publishing. doi: 10.1787/b407f99c-en



Share of respondents who trust the government of their country in OECD countries in 2021 (0=not at all … 10=completely).[30]

the government less. A survey conducted by SALK in Estonia in March 2023 confirms what had been determined in OECD countries a few years earlier: the government is trusted the most by people with a higher level of education and those who are financially better off. The state government is also trusted more by three groups: ethnic Estonians, people who are more social and conciliatory by nature, and those who generally trust other people more.

The political views of people are also naturally important. In the aforementioned survey conducted by SALK, the respondents were also asked whom they would vote for in elections. It is not surprising that the government was trusted the most by supporters of the Reform Party, which, among other things, held the office of prime minister at the time of the survey. At the same time, trust towards the government was extremely low among supporters of the Conservative People's Party of Estonia (*Eesti konservatiivne rahvaerakond*, EKRE) as well as respondents who would not have voted for any parties. Trust towards the government (and thus towards the *Riigikogu*) is therefore also influenced to a large extent by people's political attitudes.

The second important group of factors that influence the trustworthiness of the government is related to the perceived efficiency, competence and commitment of the government. A concrete example here is how well the government of their country is prepared for the next pandemic in the view of the people. The government is trusted more in countries where people think the government is well prepared for the next pandemic and ready to protect the health and interests of the population of the country. There is also a number of other factors, such as a stable business environment, how satisfied people are with the administrative services provided/coordinated by the state and how able people believe the government to be in coping with global challenges, which are also strongly associated with the overall assessment of the government's trustworthiness.

The third group of influencing factors is related to how honest, open and transparent the people think the government of their country is and how much in their opinion it takes the people into account. Trust towards the government is higher in countries where people can have a say in state matters (or at least they feel they can), where it seems to people that the state's functioning is comprehensible and transparent, and where they believe the legal system is independent and free from political pressure. The level of perceived corruption also plays an important role. In the said OECD survey, 30 respondents were also asked how likely public servants are to accept a bribe in their country. The larger the share of respondents who think public servants would not accept a bribe, the greater the trust in the government.

In conclusion

People's trust is generally greater towards those they know and with whom they feel a certain sense of togetherness. However, this kind of narrow trust is not enough to keep the gears of modern society running smoothly. This requires general trust which, among other things, includes trustworthiness and responsibility. In other words, it is essential for the functioning of a good society that the radius of trust extends beyond family and neighbourhood. The trustworthiness – i.e. the openness, honesty and perceived efficiency – of state authority and other public institutions, as well as their consideration and inclusion of people help increase general trust. People trust the gov-

ernment and the legislative body of their country if they feel that these institutions are responsible and care for them. Therefore, we can say in conclusion that without the standard of general trust the functioning of modern democratic societies is difficult, if not impossible.

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The article was originally written in Estonian and translated into English by Kati Metsaots (OÜ AlienMinds).

CARBON CYCLE IN MANAGED ESTONIAN FOREST ECOSYSTEMS

Academy member Veiko Uri's presentation at the General Assembly of the Academy of Sciences on 6 December 2023

Dear attendees and colleagues! It is a great privilege to discuss my research and the achievements of recent years at the General Assembly of the Academy. Thank you for this opportunity!

Why should we continue to discuss the carbon cycle in Estonian forests? In the process of shaping Estonian forestry and climate policy, it is extremely important to know how much carbon different types of Estonian forests capture and how much they are capable of capturing. These are the main questions to which we are trying to find answers. Another larger group of problems is related to forest management, as this largely changes the carbon cycle. At the same time, management can also increase the climate benefit of forests. The important question is: how can we achieve this?

Although forests are very important carbon sinks, I would like to make a remark here. The main aim of silviculture is not to improve carbon accumulation in forest stands: the primary purpose is the growing of forest stands that are as healthy, productive and stable as possible in order to cater for society's need for high-quality timber now and into the future. Carbon accumulation in forest stands serves as an additional benefit, a bonus you could say.

Our ambition is to compile a general carbon model for Estonian forests, but the high variation of our stands makes

Photo: Maris Krünvald

Veiko Uri delivering the presentation at the General Assembly of the Academy.

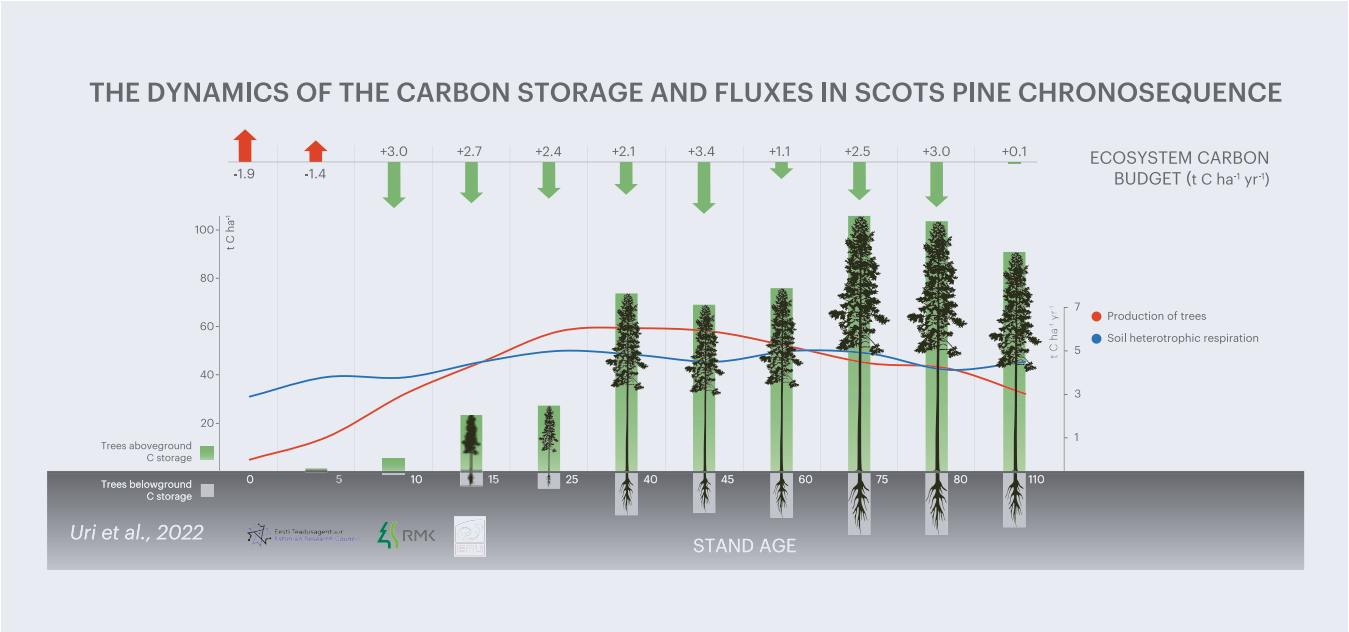


Figure 1. The dynamics of carbon accumulation and carbon storages in Scots pine chronosequence (Uri et al., 2022).[31]

it more difficult to achieve this aim. However, although natural diversity is a favourable feature of forests, it poses a problem for researchers in relation to modelling – after all, there are seven different forest tree species of economic importance, which grow in 20 different site types. Taking into account the sub-types, it becomes quite a heterogenous system that is difficult to describe with models. In order to characterise the situation, I have figuratively compared it to a puzzle: if we imagine the overall carbon model of forests as a big picture consisting of many smaller pieces, every individual case study is like a piece in the puzzle, and as they are added to the puzzle the overall picture becomes increasingly clearer.

We have succeeded in covering quite a large part of Estonia's more widespread forest ecosystems in our study and have done so more or less within the past ten years. The last to be added to the line of forest types was the Scots pine forest, which was also our most extensive study. I will talk about its results a little more in-depth today. It is a bit odd that an important forest type such as the Scots pine stands has been left as the last in this list of studies. However, pine is the most common tree species in Estonia, and Scots pine forests make up about a fifth of our forests. Of all the pine forests in Estonia, about 40 percent grow on a mesotrophic heath site type. The aim of our research was to describe the changes in the carbon cycle along the development gradient of a pine forest. In other words, to visualise the dynamics of the carbon budget from zero to a hundred years old, i.e. from the emergence of a young forest to the mature forest stage. However, in terms of the studies and the completed work, it is not always important exactly what has been done, but rather what has been done to a larger extent or better compared to other studies. A significant strength of our study is its considerably large extent, or scale. Many studies of the carbon cycle have been conducted in different forest ecosystems, including coniferous forests. Usually, three or four study sites are included in research; in better cases, five to six different sites. Our research is based on eleven study sites.

A small number of stands is included in studies because compiling a carbon budget of a forest is extremely labour-intensive. Figuratively, every such study implies disassembling a forest to relatively detailed fractions and assessing each carbon flux separately in several forests simultaneously. It is therefore quite a resource-demanding study, and one that stimulates researchers to optimise their approach in terms of the number of test sites.

Another important strength of our studies is their complexity and detailed treatment. The main carbon fluxes have been assessed empirically. In compiling the carbon budgets, several fluxes have to be taken into account, but some of them are often difficult to assess empirically. In such cases, researchers mostly use modelling, which is an entirely logical approach. Modelling requires raw data or previous results on the basis of which models can then be elaborated. As there were practically no existing data concerning the belowground part of forests (including ground

31 Uri, V., Kukumägi, M., Aosaar, J., Varik, M., Becker, H., Aun, K., Lõhmus, K., Soosaar, K., Astover, A., Uri, M., Buht, M., Sepaste, A., Padari, A. 2022. The dynamics of the carbon storage and fluxes in Scots pine (*Pinus sylvestris*) chronosequence. Science of The Total Environment, 817, 152973. doi: 10.1016/j.scitotenv.2022.152973

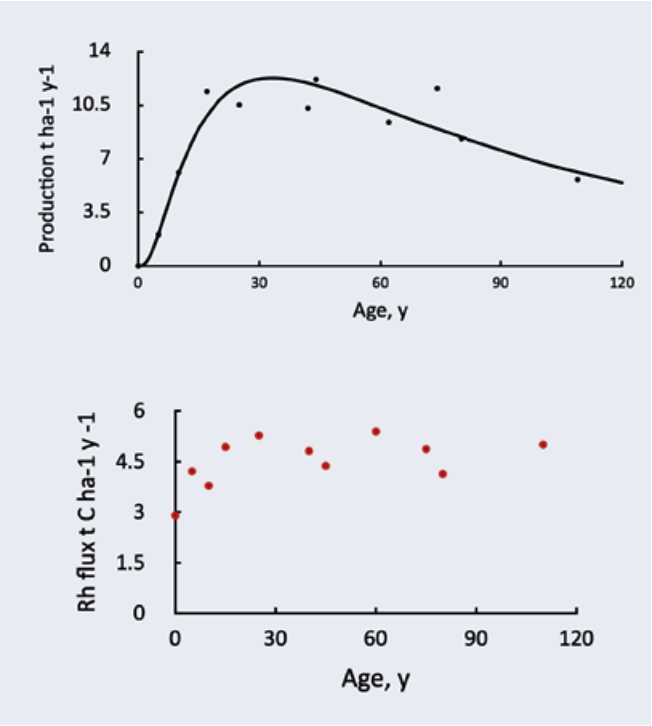


Figure 2. a) Dynamics of tree production in Scots pine chronosequence, b) Dynamics of soil heterotrophic respiration (Rh) in Scots pine chronosequence (Uri et al., 2022).[31]

vegetation) in Estonia to date, we were hard-pressed to gather the information we required and empirical assessment was the only possible way.

One of the most important results of the study indicates that carbon stocks are greater in older stands, but carbon accumulation is instead more intensive in young and middle-aged forests. Therefore, old forests are relatively moderate carbon capturers, while young stands are much more efficient carbon sinks despite their relatively low growing stocks.

Another important finding concerns soil respiration. It was revealed that the output part of the carbon budget, i.e. soil heterotrophic respiration, was quite constant across the chronosequence, not significantly different in middle-aged, young or old pine stands. CO_2 flux from the soil is quite similar in those development classes, remaining within the range of 4 to 5 tonnes per hectare a year.

The obtained results have a significant practical value, significantly improving the modelling possibilities of carbon accumulation at a regional level. On the one hand, carbon accumulation by pine forests in a region can be modelled by using available forest yield models, since the annual increment of stands is directly related to the carbon accumulation capacity. On the other hand, average annual estimates of soil heterotrophic respiration can be used to determine carbon emissions from soil, since that flux is not related to the age of a stand.

The second larger group of questions is related to management, which in most cases means felling. In Estonia and in most of Europe, clear-cutting is the principal harvesting method. A relatively negative attitude towards clear-cutting has evolved or has been shaped in our society and has come to be stigmatised. At the same time, there exists an important reason or even several reasons as to why clear-cutting is so widely used. Furthermore, economic efficiency cannot be the only argument for forest managers when choosing clear-cutting. While economic reasoning can be ignored in the short term or in certain cases, by accepting economic losses over other values, the biological properties of forest trees cannot be overlooked. A very large portion of the trees that grow here are light-demanding species. They are successfully regenerated in opened areas only. The main reason, or at least one of the most important reasons, for using clear-cutting is the fact that it ensures the efficient regeneration of new forests.

Of course, clear-cutting has a significant impact on our landscapes and largely affects the nutrient and carbon cycle. After clear-cutting, forest ecosystems that act as carbon sinks become carbon-emitting systems. In order to adequately assess the effect of clear-cutting as a management method on carbon removal by our forests in a broader sense, we must clarify the following important question: for how long does a clear-cut area emit carbon? In other words, at which time will a young forest start sequestering carbon again?

Before we come to this question, I would like to point out an important detail. Namely, it is often thought that CO_2 emissions from soil intensifies in clear-cut areas. It is true that soil organics start to intensively decompose after clear-cutting, which leads to the annual carbon emission flux increasing. A study in Scots pine forests demonstrated, however, that in clear-cut areas the amount of CO_2 emitted from the soil over a year did not significantly exceed that of growing stands of varying ages. Instead, the flux was even slightly smaller.

However, in areas with different soil conditions and tree species, the post-clear-cut soil respiration flux may show a different pattern. For example, our earlier similar studies in grey alder stands showed that carbon emissions from the soil decreased after clear-cutting. A decrease in soil respiration is related to changed microclimatic conditions. The revealed changes in the soil's water and temperature regimes in turn affect the CO_2 flux from the soil. Naturally, these results cannot be generalised to apply to all clear-cuts and site types. Areas where carbon emission increased after clear-cutting can probably also be found.

In the chronosequence of the studied pine forests, a six-year-old stand was still a carbon source. A ten-year-old stand, however, captured a significant amount of carbon,

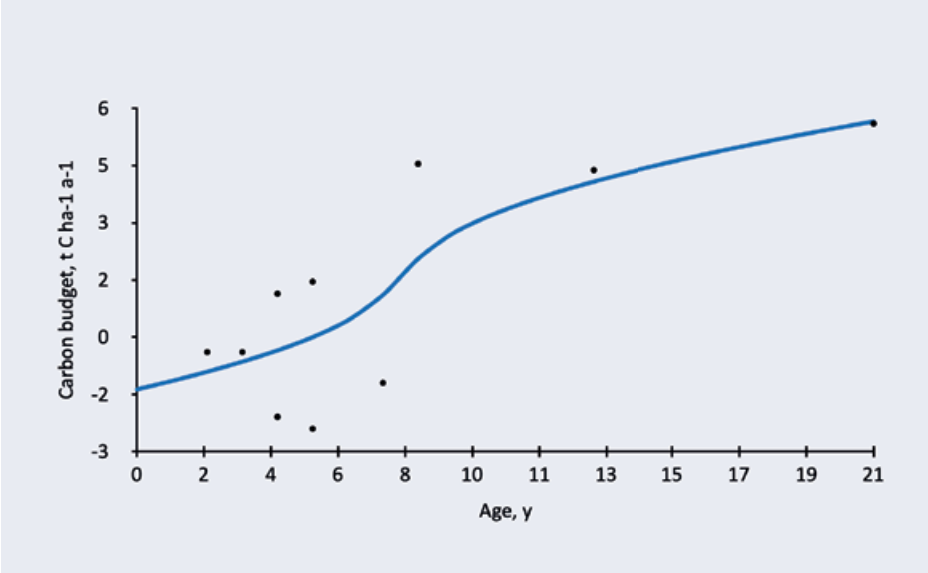


Figure 3. Carbon budget dynamics in young silver birch chronosequence (Aun et al., 2022).[32]

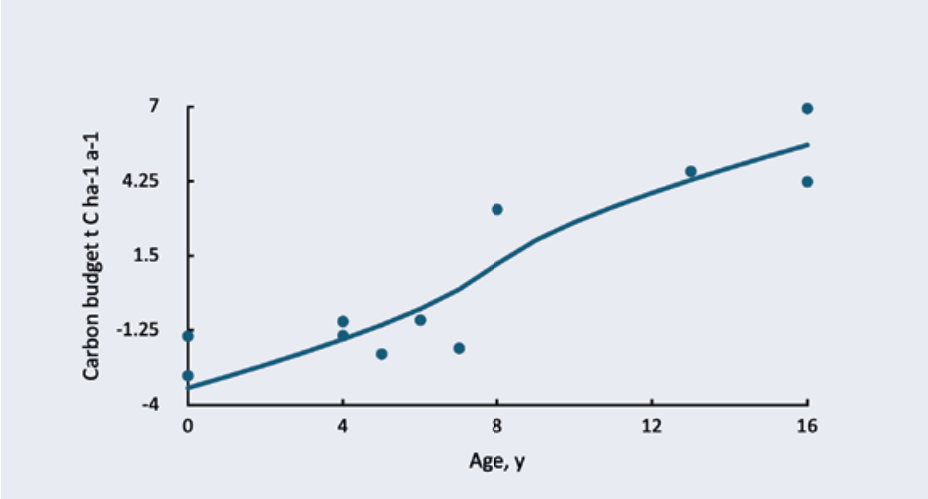


Figure 4. Carbon budget dynamics in young spruce stand chronosequence.

which means that the carbon compensation point is in a seven-year-old stand. The obtained result may only be characteristic of pine forests. It is possible that the post-clear-cut carbon budget dynamics is different in more fertile areas. Our recent studies, published at the end of 2022, were motivated by the question of how the post-clear-cut carbon balance recovers in more fertile areas, for instance in silver birch stands.

The carbon budget dynamics in silver birch stands after clear-cutting showed that the period required for the balancing of the budget is more or less as long as in Scots pine stands, i.e. the stand became a carbon sink at the age of six years.

Our forestry sector has the so-called Three Great Ones that have economic importance: pine, spruce and birch. The respective studies concerning spruce stands were only completed in 2022 and the results have therefore not yet been published. We saw that the carbon budget in young spruce stands recovers in practically the same time as in young pine and birch stands. Or just a little later, at the age of eight years.

Every researcher is satisfied when initial results are later confirmed in a more sophisticated and thorough study. Although we saw the recovery of the carbon budget of pine stands at the age of seven, doubting is still inherent for scientists. Did we measure and evaluate it correctly or did we make a mistake somewhere? It would be great if we could directly measure the exchange of carbon between an ecosystem and the atmosphere in a research area. Such a methodology exists and has already been used for nearly twenty years. This is the eddy covariance method. The method, which has today become routine, reached Estonia about ten years ago. This high-technological method

32 Aun, K., Kukumägi, M., Varik, M., Uri, M., Buht, M., Aosaar, J., Padari, A., Sepaste, A., Soosaar, K., Becker, H., Uri, V. 2022. Recovery dynamics of ecosystem carbon budgets in a young silver birch stand chronosequence after clear-cut – Estonian case study. Scandinavian Journal of Forest Research, 37(5–8), 352–365. doi: 10.1080/02827581.2022.2155235

allows us to measure the speed and direction of movement of air and to simultaneously analyse the concentration of CO_2 in the air. Thus, we conducted two parallel studies in a six-year-old pine stand, assessing the exchange of carbon between the ecosystem and the atmosphere using eddy covariance measurements. At the same time, we compiled the carbon budget of the stand and the obtained results were in good accordance. We are surely not the only ones to combine the biometric method with the micrometeorology method in our studies. There are several comparative studies and discrepancy between the obtained results served as a common outcome. The consistence between the biometric and eddy results obtained in our studies is not very typical. However, it confirmed that our carbon budgets have probably been compiled on relevant bases and the obtained results are reliable.

These results take us to today's climate and forestry policy. I believe you have heard and read news about how Estonian forest land has been turned from a carbon sequester into a carbon emitter (which is ecologically quite impossible). This could only happen if the Estonian forests were hit by an extensive cataclysm, such as a storm of the century or something similar. I found the estimated CO_2 net emission of Estonian forest land for 2021in the Estonian Greenhouse Gas Report[33] published in 2023: nearly 1.4 million tonnes of CO_2, or approximately 0.4 million tonnes of carbon. As Estonia has 2.3 million hectares of forest land, the average emission for every one hectare of forest land would be about 0.2 tonnes.

The situation was more optimistic even a year or two ago. According to the official statistics from 2019, Estonian forests still sequestrated carbon. True, the annual average CO_2 sink per hectare determined on the basis of statistics was about an order of magnitude smaller than that presented in scientific studies. The difference comes from the fact that these estimates are talking about different processes, i.e. the methods used to cover very different indicators. In forest science, *carbon capture* in a forest ecosystem is assessed on the basis of various carbon fluxes. The official statistics, however, are based on the LULUCF methodology[34], which in essence assesses *changes in the carbon stocks* accumulated in a forest. When forest stocks grow, the quantity of carbon in them increases and they are considered a carbon sink. Otherwise, they would be labelled a carbon source. As we saw before, a stand with large growing stocks and thus a large carbon pool does not directly ensure intensive carbon capture.

33 https://keskkonnaagentuur.ee/node/1093 (in Estonian).

34 Environment Agency, Estonian University of Life Sciences. 2021. Maakasutuse, maakasutuse muutuse ja metsanduse sektori sidumisvõimekuse analüüs kuni aastani 2050. https://kliimaministeerium.ee/elurikkus-keskkonnakaitse/metsandus/lulucf (in Estonian).

If you hear or read for example about poor carbon capturing in Estonian forests, you should regard such messages with certain reservations.

But there is good news as well. I hear the 2022 official carbon budget of forests will again be positive. True, still an order of magnitude smaller than the scientists' estimate, but positive nonetheless.

Lastly, I would like to talk about a forest management method called thinning. The substantive difference between the methods described previously can be more closely demonstrated on the basis of a thinning study. Thinning is an extremely important silvicultural method, in fact the main silvicultural tool of a forester. It can be argued that without thinning, growing a valuable high-quality forest would be practically impossible in our conditions. At the same time, research into their impact on the carbon cycle has been extremely scarce. The articles published by our workgroup a couple of years ago are so far almost the only ones to address the impact of thinning on the carbon budget at the level of an ecosystem. It is entirely logical that the number of trees and the carbon-capturing biomass is reduced after cutting, which in turn reduces carbon uptake. But would soil respiration increase or decrease? The compiled carbon budget showed a decrease in carbon removal after thinning, but only within 20 to 30 percent comparing to an intact stand, while all the thinned areas remain carbon capturing. If we take a closer look at one of the studied stands, we can see that carbon capture by trees decreased, the carbon uptake by understorey vegetation increased a little and soil respiration remained practically the same.

Therefore, carbon accumulation slightly decreased in the thinned stand, but the ecosystem maintained a C-sink status in all the cases. However, if we performed the analogous calculation according to the LULUCF rules, which is based on changes in the carbon stocks, moderate thinning would result in a huge carbon emission, nearly 11 tonnes per hectare a year. This is because when compared to a control area, the carbon stocks in the thinned area are significantly reduced due to removal.

It is important to keep in mind if you hear or read for example about poor carbon capturing in Estonian forests, you should regard such messages with certain reservations. Even if it may officially or statistically seem like that, in reality our forests keep growing and keep capturing carbon. Like a well-known Estonian radio host says every weekend: It would be good to close now with this understanding. Thank you!

ETHICS IN RESEARCH

THE EUROPEAN CODE OF CONDUCT FOR RESEARCH INTEGRITY, REVISED EDITION 2023 (ECOC 23)[35]

Krista Varantola, Tampere University and the Council of Finnish Academies Chair of the Drafting Group of the ALLEA Permanent Working Group on Science and Ethics

This text is based on the online talk given at a seminar of the Estonian Academy of Sciences on 24 November 2023. In my talk I focused on the recently revised edition of the European Code of Conduct for Research Integrity (ALLEA 2023) and on its practical implications.

I will first deal with the principles of the code and its intended purposes and then move on to its practical implications. The European Code of Conduct (ECOC) applies to all disciplines. The approach is non-punitive. In other words, it concentrates on good, responsible research practices. Yet, it also describes misconduct and violations of good research practice. Misconduct, the most severe forms of violation, is usually defined as fabrication, falsification or plagiarism, i.e. the big sins in research, but violations also include other unacceptable practices.

The ECOC describes what the current understanding is with regard to responsible research behaviour and applies to all actors in the research community. It outlines the basic principles of how to follow good research practices and how all the elements of the whole research community – including its institutions, research leaders and funders, and even those who decide on the funding formulae – are responsible for their part and should contribute to making it possible for researchers to follow the fundamental principles defined as reliability, honesty, respect and accountability. Conducting trustworthy and honest research, showing respect for one's colleagues and being accountable for the whole research process from the research plan to the potential social impacts are essential practices for any researcher in any research environment.

Therefore, ticking a respective box in a research report is not enough; the ethical issues need to be kept in mind throughout the research process.

The ECOC is a framework document produced by ALLEA (All European Academies) and undergoes several stakeholder rounds before its approval by the ALLEA Board. From ALLEA's point of view, the ECOC is a recommendation based on self-regulation. This means that the research community corrects and monitors its own behaviour. However, the ECOC also has another status in the EU context. The code has been adopted by the European Commission as a legal document that needs to be complied with by those who receive EU research funding. However, as a framework document, it needs to be applied and adapted to suit specific disciplines or specific contexts.

The crucial question therefore for anybody applying the code is "What does ECOC mean in our case?" For example, if I understand correctly, the Estonian national code on

35 ALLEA 2023. The European Code of Conduct for Research Integrity. Revised edition 2023. https://allea.org/portfolio-item/european-code-of-conduct-2023. doi: 10.26356/ECOC

Photo: Liisa Takala

Krista Varantola.

research integrity is based on the 2017 version of this code. However, the code also needs to be adapted at the level of EU-sponsored research projects, which requires the project leader and members to consider what actions need to be taken to comply with the principles expressed in the code.

What are the main changes that have taken place between the 2017 version of the ECOC and the current 2023 edition? In the past five years, the EU has funded many projects on research integrity and research ethics. That is why we now have at our disposal several practical tools for conducting ethical checks for different purposes. I will just mention one project that was finished in 2022 and is called the SOPS4RI toolbox.[36] It is a big toolbox that is full of checklists and procedures for the different actors operating in the research community.

The new edition of the ECOC clearly focuses more on improving research environments and the research culture instead of placing the emphasis solely on the responsibility of individual researchers. In other words, the focus of the code has shifted from individual responsibility to collective responsibility in the whole research system. This is needed if we want to avoid counterproductive incentives for researchers and research institutions. A full, versatile toolbox thus includes guidance for individual researchers and research institutions, different disciplines, policymakers, funders and reviewers of research proposals, and publishers of research outputs.

Targeted research integrity guidelines are directed at varying levels of assuredness but are compatible with the ECOC. They serve as guidelines that will hopefully lead to harmonisation of ethical thinking, rather than to normative uniformity. They aim at finding practical and solid implementations in various contexts, at both national and institutional levels. Hopefully, these tools will also help decision-makers design what I would call healthy financial incentives, funding criteria based on collaboration, respect, quality and an understanding of what research and innovation are all about.

Researchers and research leaders need to see research integrity guidelines as helpful tools for their work, as a mindset that makes their work easier. In order to internalise this mindset, training is needed and this training needs to be both timely and hands-on, i.e. integrated in the research process and not a one-off event. Both junior and senior researchers and institutional leadership need to understand the benefits of integrity, and institutions need to have the necessary procedures in place. The most critical realisation in the research community is recognising that research integrity is a fundamental component for enhancing quality and quality assurance in research. Unfortunately, this aspect

36 Standard Operating Procedures for Research Integrity, https://sops4ri.eu

Photo: Liis Tamra

ALLEA's updated Code of Conduct has by today been translated from English to another 12 European languages, including Estonian.[37]

is often neglected in today's competitive and cut-throat academic environment.

Is self-regulation more binding than a legal requirement? In some countries, research integrity guidelines are based on law, while other countries rely on self-regulation of the academic community. In my opinion, self-regulation places tougher expectations on researchers than if research behaviour is governed by law. This is because breaches or violations of good research behaviour form a continuum ranging from clear cases of misconduct to unacceptable behaviour, such as disrespect for colleagues or various types of authorship manipulation in publications.

It is often asked whether self-regulation works. I have tried to answer the question in a tri-partite reply: Yes, Yes-but and No. There are numerous examples of how unacceptable practices have become customary in academic contexts. Undeserving authors are added to funding applications to enhance the academic standing of the project group. Authorship is manipulated, salami publications are encouraged, bibliographies are extended unnecessarily and so on. Rumours exist of unhealthy practices in the system. Researchers are afraid of speaking out against authoritarian or overambitious leaders due to fear of repercussions, such as discontinuation of temporary contracts. Collegial practices, cronyism and even institutional cover-ups still exist, although more transparency in the system has helped in this respect. Unsupportive leadership has left researchers on their own if they have been targeted by social media because of their sensitive research themes.

Self-regulation is more a matter of values, conscience, right or wrong, fair, unfair and other factors. I would therefore claim that ECOC is first and foremost intended to create an ethical mindset and promote ethical vigilance in the research community. Bad or dishonest research does not advance our knowledge and understanding of the world.

Research integrity and research ethics are based on fundamental values. Opinions vary as to whether research integrity is part of research ethics or vice versa. In practice, these intertwined concepts are usually kept separate by referring to research integrity when focusing on honest and respectful behaviour, both individual and collective, in all disciplines, whereas research ethics encompasses field-specific ethical norms including legally binding norms and regulations where needed.

Ethical reviews are an integral part of research ethical processes. These reviews take place before the actual research begins. They are often conducted at institutional or local levels and serve as a form of insurance for researchers.

37 https://allea.org/code-of-conduct

In addition, GDPR has imposed new duties and restrictions on data usage. That is why it is important that the role of ethical reviews is made clear to all researchers when they are still at the planning stage. By submitting their research plans for ethical review, researchers obtain the backing of the ethical review committees or are able to make decisions based on the recommendations provided by the committees. Nowadays, ethical committees are not only needed in medicine and medical areas; they are also required in many areas in social sciences and humanities. Reviews are often necessary because of the need to protect vulnerable groups such as the elderly and children or because of the need to guarantee the proper handling of data.

So, what is still needed to promote the responsible conduct of research? I believe that individual characteristics of good behaviour need to be extended to the collective consciences of institutions, funders and policymakers. Institutional responsibilities need to include training and guidelines, setting good examples, establishing clear procedures, and fostering discussions about ethical values and responsibilities.

Ultimately, why would any serious researcher want to chance breaking the internalised rules of responsible research practices? Why would they risk their academic future and lose their reputation among colleagues? One area that still needs a lot of work is responsible research and innovation. What has recently come up in many AI contexts is the belief that if something is technologically feasible, it will be done, and the ethical aspects will be figured out afterwards. However, ethical considerations are an integral part of any research process from the beginning, not something to be added afterwards.

The good news is that there is a paradigm shift in the making in Europe about researcher performance and the indicators used for that purpose The COARA initiative (Coalition for Advancing Research Assessment)[38] is a sign of real progress. What research assessment should entail is not only quantitative results but in essence qualitative and comprehensive judgments for which peer reviews are central, and supported by the responsible use of quantitative indicators. A fundamental change in assessment criteria will also help in promoting good research practices in academia.

To summarise, what does ECoc mean in practice? In my opinion, it means creating a mindset favourable to research integrity, eliminating the tick-the-box mentality, inspiring discussions of what the ECoc guidelines mean in any particular context, recommending the application of adequate tools for implementation of specific procedures, providing training for different target groups, emphasising institutional responsibilities in providing an adequate infrastructure for ethics and focusing on non-punitive approaches by prioritising best practices over sanctions.

Finally, the ECOC has become an influential code thanks to its EU legal backing. Furthermore, the legacy of the 2017 edition is extensive, as it has been applied in many national codes. However, the ECoc remains a framework code which in practice needs to be applied in an adequate fashion. Any code needs to be internalised before it becomes powerful, and the ECoc is a summary of collective thought processes and a shared vision among stakeholders.

Further reading:
The ethical principles of research with human participants and ethical review in the human sciences in Finland. Finnish National Board on Research Integrity TENK guidelines 2019.[39]

38 info@coara.eu

39 https://tenk.fi/sites/default/files/2021-01/Ethical_review_in_human_sciences_2020.pdf

NEW ACADEMY MEMBERS

NEW ACADEMY MEMBERS AND A NEW FOREIGN MEMBER[40]

In December 2023, three scientists were elected as new members of the Estonian Academy of Sciences, along with one foreign Academy member. The conference of Academy member candidates[41] was held on 24 October 2023. The interviews were published in the National Public Broadcasting portal Novaator in the present wording before the elections.

Academy member in engineering sciences Maarja Grossberg-Kuusk[42]

Tenured Full Professor Maarja Grossberg-Kuusk, Director of the Tallinn University of Technology (TalTech) Department of Materials and Environmental Technology, defended her doctoral degree in 2010 at TalTech, where she studied the optical properties of multinary semiconductor compounds used in solar batteries. After graduating, Maarja has worked at TalTech as a researcher and senior researcher, an associate professor on tenure track and a tenured full professor.

In her research, Grossberg-Kuusk is focused on the development of new environmentally friendly materials and technologies for photovoltaic applications. The research group led by her has developed a photovoltaic element technology that is unique in the world and allows for new applications in building-integrated and product-integrated solar panels.

Photo: Maris Krünvald

40 Estonian Academy of Sciences Yearbook 2022. Annales Academiae Scientiarum Estonicae XXVIII(55) 2022, https://www.akadeemia.ee/en/publication/estonian-academy-of-scieences-yearbook-2022-xxviii-55, pp 18.

41 You can read more about the election of new Academy members from our previous Yearbook.

42 https://www.akadeemia.ee/sundmused/akadeemikukandidaatide-konverents-2023 (in Estonian).

According to the Google Scholar search engine, Maarja Grossberg-Kuusk is the (co)author of close to 150 research publications. Her works have been cited more than 3,300 times and her 29 scientific articles have each been cited at least 29 times (i.e. her *h*-index is 29).

Two master's theses and four doctoral theses have been defended under her supervision. She is currently supervising three doctoral students. She is a member of several professional associations. She was the President of the Estonian Young Academy of Sciences in 2021–2023.

In 2020, Maarja Grossberg-Kuusk was awarded the L'Oréal-UNESCO Baltic programme 'For Women in Science' scholarship and in 2021 the Estonian National Research Award in engineering (as a member of a group).

What do you consider the most enjoyable experiences of your life to date, and to what extent do these coincide with the reasons for which the public know you?

The most enjoyable moments in my life are related to my family and friends, such as the births of my two daughters, marrying the love of my life and great times with friends. All in all, both simple everyday moments and great achievements make me equally happy. Life has taught me to be grateful for everything and everyone I encounter!

With regard to work, I enjoy mulling over a scientific matter without time constraints. The feeling when an idea is spawned and reveals itself, layer by layer. I enjoy the surprises in solving a problem, engaging in teamwork with my colleagues and the sense of personal growth upon discovering every new topic. I naturally feel good when I manage to make a significant contribution through my work to the development of an area.

I guess the public knows me best as a result of my coverage of the solar energy topic in the media. Introducing one's research and the related area to society is every scientist's duty and I truly like doing it. I enjoy writing the best, but I am also happy to speak to children at a school or at the open-air Opinion Festival in Paide.

What are the main challenges in your area in Estonia and in the world as a whole?

My research focuses on the development of new environmentally friendly materials and technologies for solar energy applications. This is the fastest-growing area of renewable energy in the world. And the importance of the field is growing over time, certainly in light of the ambitious climate neutrality goals.

In order to produce large quantities of solar panels, we need technologies that use non-toxic and common elements from which we can produce solar panels in energy and material efficient technological processes. We have functioning solutions in the form of silicon-based solar panels. We also need new environmentally friendly and efficient technologies that make usage more diverse.

The title of Academy member means greater responsibility to society to stand for research, studies and innovation in my field. (Maarja Grossberg-Kuusk)

People are currently looking for ever more new possibilities for producing solar power, such as by combining solar cells with building materials to get a two-in-one solution. This way, roofing material can automatically be an electricity producer. This allows us to produce more electricity from solar energy, particularly in urban conditions.

In addition, increasingly more effective solar cells are being developed in order to capture considerably more solar power from a smaller surface. Tandem cells are of note here, as they combine different materials in order to use the majority of the solar radiation spectrum.

With rapidly growing production volumes, the sensible use of the resources of the earth's crust in the area of solar energy is also a very important matter. Efficient technologies are therefore being developed for the reuse of the components of solar panels after the end of the useful life of panels.

From the viewpoint of science, the aforementioned challenges in the area of solar energy are the same in Estonia and around the world. One big regional objective is the restoration of the solar energy industry in Europe. Why not establish a high-technology solar panel industry in Estonia? In order to do so successfully, we would need well-trained specialists and strong area-specific research and development to form a basis for studies at all the higher education levels.

How do you see the role of Academy members in 21st century society and how visible should they be in everyday life?

An Academy member should, above all, be an internationally recognised top-level scientist in his or her area and an outstanding and active spokesperson. With regard to the international grasp, communication with Estonian society is very important, so that the best specialised knowledge and skills are applied in our everyday life.

In the current era of information abundance, it is the duty of every scientist, whether Academy member or not, to actively stand for the application of a scientific way of thinking in society. I am happy to say that the Estonian Academy of Sciences has in recent years become more visible in society and I hope this trend will continue.

As Estonia has also established the Estonian Young Academy of Sciences, of which I am honoured to be a member, I believe closer cooperation between different generations of scientists is of paramount importance. This is where I think one of my roles lies, should I prove to be elected as an Academy member – to act as a bridge between the Estonian Young Academy of Sciences and the Estonian Academy of Sciences in a rapidly changing world where the challenges facing the scientists of every next generation are different.

What would the title of Academy member mean to you personally and how would it change your life?
The title of Academy member would be a great honour for me, and significant recognition for what I have achieved; at the same time, I am still a young scientist and hopefully have much awaiting me. I wish to be a spokesperson for my area in Estonia and a representative of Estonian science in the international world of science. I believe that as an Academy member, I would be able to fulfil this role even better and more diversely.

The title of Academy member means greater responsibility to society to stand for research, studies and innovation in my field. I care deeply about the overall development of the area of science and education in Estonia. I would like to have a say here and continue what we started at the Estonian Young Academy of Sciences.

Photo: Maris Krünvald

Academy member in biomedicine Pärt Peterson

Pärt Peterson, Professor of Molecular Immunology at the University of Tartu, defended his doctoral thesis in the area of endocrine autoimmune diseases at the University of Tampere in 1996. He worked as a scientist at the Finnish Academy, as an international senior researcher at Wellcome Trust and since 2003 as Extraordinary Professor and Professor of Molecular Immunology at the Faculty of Medicine of the University of Tartu. In 2009–2012, Pärt Peterson was Research Professor at the Estonian Academy of Sciences.

Pärt Peterson's research is aimed at solving the molecular mechanisms of the immune system. The main goal of his research is to understand how the immune system ensures tolerance towards its own body while being able to fight pathogens. In recent years, the workgroup he leads has been studying ageing-related changes in the immune system, and since 2020 they have published various research articles on the topics of SARS-CoV-2 and COVID-19.

According to the Google Scholar search engine, Professor Peterson is the (co-)author of more than 300 research publications. In total, his works have been cited more than 22,300 times and his 68 scientific articles have each been cited 68 times (i.e. his *h*-index is 68). He is the co-author of seven patented inventions.

Pärt Peterson has supervised eight master's theses and 15 doctoral theses. He is currently supervising eight doctoral students. He is a member of the editorial board of several international research journals and a member of the COVID-19 science council of the Government (now the Ministry of Social Affairs).

On two occasions (2009 and 2022), Pärt Peterson was awarded the Estonian National Research Award in medical sciences.

What do you consider the most enjoyable experiences of your life or career to date, and to what extent do these coincide with the reasons for which you were nominated as a candidate for Academy member?
Science offers excitement and scientists are people who want to discover a new world. The worldviews of a good scientist and a good artist share similar traits – whatever the situation, one must be able to conduct science and the other must be able to create art. Being a scientist is more

a lifestyle than a job. It accompanies you all the time and everywhere, but it is an interesting life.

My scientific interest has been to understand how the immune system works. The immune system's task is to defend us against infections. The big question is how the immune system distinguishes what is a virus and what is a part of the human body. The understanding of this develops in the thymus gland where the human T-cells are produced. In distinguishing between friend and foe, one specific gene assumes the main task – this gene is called the autoimmune regulator, or AIRE.

I am one of the scientists who discovered the AIRE gene. Since then, we have been working on that topic with our group, and the meaning of the AIRE gene has reached the pages of every immunology textbook. It is a proud feeling when you as a scientist find something that ends up becoming standard knowledge throughout the entire world.

What are the main challenges in your area in Estonia and in the world as a whole?

There will be several new challenges in the area of immune system research in the coming years and these will reflect on other areas too. For example, mRNA (messenger-RNA) vaccines which proved themselves in the COVID-19 pandemic and the use of which is expanding, treatment with immune cells which are increasingly used in cancer therapy, or the immune system's different links to nutrition, sleep or age-specific changes. One challenge is to understand immune system changes in elderly people whose immune response to viruses and vaccines has decreased and who run a greater risk of developing tumours and inflammatory diseases.

Ageing has a noticeable effect on our immune system. It is largely linked to the aforementioned thymus, which diminishes over a person's life and finally disappears. With the disappearance of the thymus, the production of new T-cells ends and that has an impact on the effectiveness of our immune system. Restoring the thymus and recreating the immune response is one of the challenges of immunology. The discoveries made by immunologists offer increasingly more practical treatment solutions for many clinical areas that use biological medicine.

How do you see the role of Academy members in 21st century society and how visible should they be in everyday life?

By its essence, an Academy member's relationship with society does not differ from any other scientist's role in society. The duty of a scientist today includes ever-increasing communication with the public and that can never be overdone.

A dearth of expert opinions will remain, as society needs new opinions and explanations. We all want to know more about new things, even if there is too much information. At the same time, many scientists are introverts. I dare say that introverted people are better suited for science work. Scientists are not trained to communicate with the media and instead learn it through experience. Finding a balance between different roles may be difficult.

The words of an Academy member have more weight, but they must also be backed up by more deliberation. (Pärt Peterson)

The words of an Academy member have more weight, but they must also be backed up by more deliberation. It is the duty of both Academy members and ordinary scientists to offer their opinions and input in political decision making, but a scientist should not be the one to lobby for a certain political decision. That task and responsibility must be left to politicians.

As a scientist, I am increasingly concerned about the [small] numbers of young scientists. For many young people, engaging in sciences is complicated. The reasons for this are manifold. Maintaining the number of new scientists is one of the most important challenges for Estonian science and requires greater attention.

Another important topic is the increasing role of ethical and data protection related issues in research. Ethics establishes societal standards and rules. Taking these into account is the foundation of the trustworthiness of science. I am sure that all Estonian scientists wish to act ethically. However, scientists must still have the opportunity to ask scientific questions within these boundaries of ethics.

What would the title of Academy member mean to you personally and how would it change your life?

The status of Academy member unarguably entails a great honour. But that would not change my attitude to science, people or life.

Academy member in ethnology and folkloristics Mare Kõiva

Mare Kõiva, Leading Research Fellow and Head of the Department of Folkloristics, defended her doctoral degree at the Institute of the Estonian Language in 1990 where she studied Estonian charms. Since graduating from university, Kõiva has worked as Researcher and Leading Researcher at the Institute of the Estonian Language, Head of the Centre of Excellence for Cultural History and Folkloristics,

Photo: Maris Krünvald

Director of the Centre of Excellence in Estonian Studies and Leading Researcher and Leading Research Fellow at the Estonian Literary Museum.

Mare Kõiva has for a long time focused on studying Estonian folk religion, mythology and modern folklore. Among other things, she has analysed and made presentations on Estonian folk religion, incantations, the phenomenon of folk doctors, folk astronomy, internet lore and the ethnic stereotypes of Estonians. The focus of her research also includes the historical-cultural specifics of the lore of emigrants, the multimedia nature of folklore today, various manifestations of religious tradition and beliefs and practices related to sacred places.

According to the Google Scholar search engine, Leading Research Fellow Mare Kõiva is the (co-)author of 136 research publications. Her works have been cited nearly 450 times and her 9 scientific articles have been cited at least 9 times.

Mare Kõiva has supervised three master's theses and four doctoral theses. She is the founder, editor-in-chief, co-editor and member of the editorial board of several international research journals and a member of professional associations.

In 2003 and 2006, Mare Kõiva was awarded the Cultural Award of the Cultural Endowment of Estonia and in 2017 the Order of the White Star of the 4th Class.

What do you consider the most enjoyable experiences of your life or career to date, and to what extent do these coincide with the reasons for which you were nominated as a candidate for Academy member?[43]

In my profession, I have been captivated the most by fieldwork, be it observing a night-time ritual or an opportunity to be among people spontaneously speaking around a fire, to discover that the only written record of the story that was just told was made a hundred years ago. Fieldwork does, of course, entail certain challenges, such as when you spend the night writing an article and forget your proper footwear and gloves at the camp and end up slipping all over the place on damp autumn leaves. To retain your dignity, you have to talk to every leaf and branch that help you maintain your balance and calculate what effect expensive technology might have on the situation; ultimately, what helps complete the journey is the knowledge that extraordinary people await at the end of the adventure.

Experiments at e-journals were and are definitely very enjoyable. In the 1990s, e-journals and digital databases were developed in many research areas, and 1996 seemed like the perfect time to launch the same thing in folkloristics and religion studies. We were among the first in the world in the humanities with peer-reviewed journals; it was a proud feeling to share our experience in front of a large audience at the annual meeting of the American Folklore Society in the 20th year of activity of our journals.

There have been many wonderful meetings with scientists in all corners of the world. And with natural scientists who have admitted that they find reading our journals interesting and that our journals have given them the impetus to do something similar in their particular field. When we founded the journals, the goal was to disseminate Estonian research results and make young people interested in scientific texts. Today, the technical and content-related possibilities are broad and we are constantly testing new formats for science communication.

These are, of course, the enthusiastic attempts of scientists in a small institution, but it is the idea that counts, along with good companions.

It is a unique experience when a computer analyses in seconds several hundred thousand text corpora, and creates statistics, schematics, distribution densities, etc. I guess that feeling of happiness is fully understood by those who have prepared card catalogues and created typologies on the basis of different archives, or then scrutinise all over

43 The interview was conducted in 2021 – ed.

In my profession, I have been captivated the most by fieldwork, be it observing a night-time ritual or an opportunity to be among people spontaneously speaking around a fire, to discover that the only written record of the story that was just told was made a hundred years ago. (Mare Kõiva)

– digitising, tagging, creating databases within the extent of their skills.

In folkloristics, computer analytics began in the 1970s with the works of Ingrid Rüütel and Academy Member Arvo Krikmann. Back then, it was an opportunity for a few and a dream for many. Our text types often consist of 4 to 6 verses where every line changes, variability is great and manually finding order or constellation is difficult. Text was the performers' creation and they changed it according to their skills. The better the possibilities become, the clearer it is that if we started today, we would get faster results.

The possibilities in computer analytics are promising. In humanities, a bigger leap is definitely still ahead. The large corpora digitised by researchers as well as their self-developments give us the hope of making future analysis more efficient and faster with the help of professionals.

I have prepared several thematic handwritten card indices on the basis of handwritten notes, updated them, then started to digitise and tag digital versions – which is why I take great joy in the possibilities actually changing.

In religion and myth studies, publications concerning nearby areas and contact cultures are important. New studies of the apocrypha and their folk matches are of great benefit, not to even mention large databases. The database of motifs developed by Juri Berezkin, a foreign member of the Estonian Academy of Sciences, is one such.

The subject matter at the disposal of researchers has changed significantly. For instance, with regard to incantations which date back to the distant mists of time (used 4,000 years before the so-called Common Era), the transliterations and translations of the early high cultures have increasingly opened up. Access to texts from the Middle Ages and the Early Modern Period has grown notably broader. The number of printed subject matter accumulated today (also as a result of our activities) is also growing. The extensive gatherings of youth and children's folklore in 1992, 2007–2008 and 2018 highlighted surprising changes in values and language and communication models. Observing that is like a door to a renewing tradition.

There is definitely reason to be happy about two centres of excellence in humanities, the first of which evolved in cooperation between closer areas of specialisation, while the second one involved broader areas of specialisation, six institutions and – besides humanities scientists – the speech and language researchers of the University of Tartu and TalTech. Twelve non-formal research groups engaged in inter-institutional cooperation and discussions on novel topics, and shared their results.

Our team consists of scientists of different base education, but most have attained a doctoral degree in folkloristics. Discussions, seminars and research cooperation are the reasons why we have the only humour research centre in Europe, as well as short-form and religion studies linked to paremiologists across the world. We have been able to text our ideas together with colleagues, from small experiments to joint articles.

I am proud that our department has had scientists who are important to today's humanities – creative developers in the field. Some have started breaking ground within the framework of other areas of specialisation or significantly broadened our area of research. I think we have reached the broadness of Jakob Hurt and Oskar Loorits, whose approaches to folklore and religion were groundbreaking.

Returning to what I spoke of before, I am very happy about Piret Paal, who began her studies in classic folk medicine and then risked writing and defending her doctoral thesis in Finland about the communication and narratives of Estonian and Finnish cancer patients. She has developed palliative care research in Germany and is currently working as Researcher at the Institute of Nursing Science and Practice of Paracelsus Medical University in Salzburg and as Coordinator at the WHO Collaborating Centre in Salzburg, Austria. Her studies are always interesting to read and she gladly speaks at our seminars.

My post-doctoral student Lina Gergova is a spiritual leader in several projects, including a project that studies the use of water and the impact of flooded areas. She is currently working on a large-scale project that is studying today's pattern of celebrating local and state holidays in Bulgaria. In global diaspora research, her team is responsible for the regions of Asia and Australia. Again, it is exciting to watch a scientist grow.

Under her guidance, I have also reached several multi-religious (used by Muslims, Christians and non-denominational people) less-known megalithic shrines only known in inner circles.

It is good to know that some studies and selections are included in study programmes in several places across the world. I truly enjoy the opportunity of giving lectures.

The video lecture series of our department and the museum started with regular lectures (as one of the first to do so) in April 2019, and it was back then and is, indeed, today an opportunity to continue with cooperation and joint research. I am glad that I have been an invited speaker at virtual conferences in different places in the world and on different topics.

What are the main challenges in your area in Estonia and in the world as a whole?

The situation today is relatively complex. The One World Movement highlights how different the world's languages and cultures are – a question arises as to how to ensure the preservation of cultural and linguistic diversity and what is the role of Estonians in this.

One of the key issues both here and elsewhere is to study rapidly evolving forms of culture (including, for instance, memes, political and catastrophe folklore) and the phenomena of ethnic or regional symbolic value. These include the unique runic verse and vernacular literacy. The question does not just pertain to the Estonian version of globally common phenomena, such as humour, myths, fairy-tales and their later developments, but also their dynamics and changes in values, i.e. how do we interpret the same phenomena today and do they have new equivalents.

I think that besides opera and national epic, every nation is obliged to have a fundamental research-based national catalogue of fairy-tales, myths, folk legends, a mapped overview of today's folktales and legends and various other representative works.

In the case of small nations, studying national narratives and stereotypes is also important, including the subject of pride and heroes, but among other things modern-day people expect an answer to the question of whether we are animists. Many of us, particularly younger generation city folk, do not have any ties to forests or trees or springs. They do, however, still have a mindset that allows them to accept such associations, and to fabulate.

Story creation is an important modern-day aspect of text analytics, for instance on topics that do not actually exist as a narrative, physical and mental reactions, e.g. dream narratives that are developed with global interpreters, making formerly ordinary ritual activities and texts excessively magical. We create and disseminate narratives and activities that are illogical in both time and space, whether these are for a new identity, self-balancing or simply to justify our own actions.

Today's subject matter highlights the need to study how we overcome cognitive dissonance, the mental feeling of unease in the case of conflict situations, contradictory beliefs, stereotypes, values and viewpoints, how we make choices in such situations and what coping mechanisms we use. This is a circle of problems that interests scientists in many regions.

A primary task in our area is to ensure the survival and development of the Estonian language and national culture at their different levels of use along with the relevant fundamental and applied research, including preservation of the Estonian national scientific and cultural heritage as archives and scientific collections. This means a comprehensive development of collections, new gathering work and presenting the results to the public and international science circles. It also means cooperation and the need for an elementary material base.

The special situation related to the COVID-19 pandemic has also created positive new opportunities – well-known centres, for instance, have made a technological leap and the Harvard religion researchers have opened their lecture series and conferences to participation free of charge. Researchers taking part in thinktanks and lectures there focus on aspects that cannot yet be found as articles, while also providing summaries of significant research results. For our department, this has been an important form of cooperation and a continued research communication opportunity.

With our technical support, we host the seminars of the Ritual Year working group of the International Society for Ethnology and Folklore (*Société Internationale d'Ethnologie et de Folklore*, SIEF). The pandemic very quickly led us to an almost global video lecture series, where some universities or research centres invite us to present our research results. These are becoming increasingly common.

How do you see the role of Academy members in 21st century society and how visible should they be in everyday life?

Scholars need a pan-institutional association and an academy is ideal for this. Scientists are currently working in separate institutions and lack a common body. An academy of sciences has a leading role in research funding and administration management. Such an initiative exists in the form of the Young Academy of Sciences.

The role of Academy members is to initiate discussions and make choices. We need a common roof that links institutions. As restoring interrupted knowledge is difficult, studying emblematic phenomena, including observing language and its diverse styles and registers, should be ensured. The same applies to the diversity of forms of culture and the creation of grassroot-level values.

What would the title of Academy member mean to you personally and how would it change your life?

I think it would be an opportunity to make humanities more visible and continue to develop cooperation between scientists of different regions, and of course contribute to improving Estonia's visibility in the global science landscape.

Foreign member Markku Kulmala

Markku Kulmala, Finnish Academician of Science,[44] a member of the Finnish Academy of Science and Letters, Professor at the University of Helsinki and Honorary Professor of the University of Tartu (2008), is an exceptionally prolific scientist, research leader and supervisor, a global leader of the climatology of aerosol physics and chemistry, and the founder of (micro)meteorology of ecosystems as a new research field.

He established the SMEAR (Station for Measuring Ecosystem-Atmosphere Relations) international network of research stations, which conduct the monitoring and quantitative studies of the atmosphere and the near-ground environment from Finland to China and determine and measure the effect of human activities and natural processes on air quality and the climate. These are both complex phenomena which have an effect on both local and global climate and air quality. His research contributes to achieving the wellbeing of the environment as well as social and economic wellbeing.

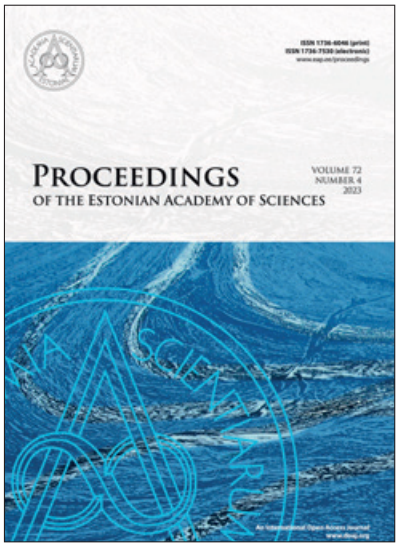
According to the Clarivate Analytics (Web of Science) database, Markku Kulmala is among the most influential scientists in the world. He has twice been awarded the Advanced Grant of the European Research Council. Academician Kulmala leads various international and national networks. He is linked to Estonia through his long-standing and close research cooperation in the area of environmental science.

Photo: Research Council of Finland, Kari Likonen

44 In Finland, Academician of Science is an honorary title awarded by the President of the country – ed.

ACADEMIC PUBLISHING

The most exciting messages from the 2023 articles and thematic editions of the scientific journals of the Estonian Academy Publishers.



Proceedings of the Estonian Academy of Sciences
Jaak Järv, Editor-in-Chief

The Proceedings of the Estonian Academy of Sciences (Eesti Teaduste Akadeemia Toimetised) journal published 37 scientific articles and 4 overview articles in 2023. The range of areas of science in the published articles was broad, including research papers from the areas of optical solitons, data mining, toxicology, contamination, topological algebra, the mechanics of liquids, mathematics and mathematical physics, chemistry, administration of medicine and pharmacokinetics. The results of research into marine habitats were published, along with several articles on materials science. A research paper concerning the impact of laser fading on the physico-mechanical properties of denim fabrics caught the attention of the *Novaator* science portal of the Estonian Public Broadcasting.[45]

Although the specialised sections of the *Proceedings* are diverse, for a long time the journal lacked articles on healthcare. This changed last year. Covering an international conference[46] held in Tallinn, the third issue of the journal included 17 articles pertaining to medical sciences and medicine. The focus was on patient health and well-being, the treatment and prevention of chronic diseases, mental health, treatment coordination, healthcare management, healthcare training, specialised nursing, occupational health and work culture.

The fourth issue of the year was dedicated to Academy member Jaak Järv on his 75th birthday.[47] The articles were written by his former and current students who are working at research institutions and companies in Estonia and abroad. The main focus was on bioactive compounds and the possible mechanisms of their effect. To do this, several papers used the research methods of chemical kinetics, which have also been applied in the development of bioanalysis methods and the accompanying equipment. The

45 https://novaator.err.ee/1609097711/eesti-toostusdoktorant-leidis-kestliku-teksakanga-valemi (in Estonian).

46 The International and Interdisciplinary Conference 'Empowerment of Public Health, Health Care and Wellbeing – Education, Research and Practice', organised by Tallinn Health Care College on 10 November 2022, https://www.ttk.ee/en/international-and-interdisciplinary-conference-2022

47 https://kirj.ee/proceedings-of-the-estonian-academy-of-sciences-publications/?filter[year]=2023&filter[issue]=1475&v=a57b8491d1d8

studies also used the computational modelling of proteins, which allows for more in-depth analysis of phenomena related to biocatalytic control at molecular level.

Linguistica Uralica
Gerson Klumpp, Editor-in-Chief

2023 was an exceptional year for *Linguistica Uralica* because the journal featured two thematic issues. The issue published in June[48] consists of four articles, which are based on selected papers presented at a workshop organised by the research project 'The grammar of discourse particles in Uralic'[49] at the conference 'Subjectivity and Intersubjectivity in Language and Culture' held by the Centre for Excellence in Estonian Studies (CEES) in Tartu on 12–13 May 2022.

The articles on various problems of modal particles and discourse markers in Estonian, Udmurt and Hill Mari were written by authors from Estonia (Anna Verschik and Helin Kask, Tallinn), Finland (Mari Saraheimo, Helsinki), Hungary (Rebeka Kubitsch, Szeged), Germany (Timofey Arkhangelskiy, Hamburg) and Russia (Aleksey Kozlov, Aigul Zakirova, Moscow).

In December, a collection of Mansi studies dedicated to the 70th birthday of Elena Skribnik, Professor Emerita at Ludwig Maximilian University in Munich, was published.[50] Originally from Novosibirsk, Elena Skribnik is an internationally renowned specialist of the Mansi language and an important mediator of eastern and western research traditions in Finno-Ugric Studies and beyond. The contributions came from Estonia (Gerson Klumpp, Tartu), Finland (Susanna Virtanen, Csilla Horváth, Helsinki), Hungary (Bernadett Bíró and Katalin Sipőcz, Szeged, Nikolett Mus, Budapest), Sweden (Rogier Blokland, Uppsala) and Austria (Jeremy Bradley, Vienna). While the bulk of the articles deal with North Mansi, which is the only Mansi variety still spoken today, the contribution by Gerson Klumpp pertains to West Mansi.

With the two thematic issues, the proportion of articles published in English grew considerably in 2023: fourteen in English, two in Russian and one in German. In the preceding years, the issues looked quite different: in 2022, there were eleven articles in Russian and five in English, while in 2021, there were nine articles in Russian, six in English and one in German. Thematic issues are also expected in the future, but probably not more than one special issue a year.

Estonian Journal of Earth Sciences
Olle Hints, Editor-in-Chief
Tõnu Meidla, editor of the special issue

For the *Estonian Journal of Earth Sciences*, 2023 was a year of developments. The journal's design, unchanged since 2007, received a significant update. The new design is more colourful and attractive both on and between the covers. The longer pages and narrower margins leave more space for content, which is particularly important for drawings, diagrams and tables. Another important change concerns the journal's publication frequency. As of 2023, the *Estonian Journal of Earth Sciences* is now published twice a year – in June and December. For quite some time, the tradition has been that edited articles reach the readers electronically as soon as possible, and the number of readers of the online version exceeds that of readers of the printed publication by order of magnitude. The importance of the printed version has therefore been gradually decreasing, and the day when its only function will be archival in selected

48 https://kirj.ee/linguistica-uralica publications/?filter[year]=2023&-filter[issue]=1469&v=a57b8491d1d8
49 https://dipu.ut.ee
50 https://kirj.ee/linguistica-uralica-publications/?filter[issue]=1487&v=a57b8491d1d8

libraries is probably not that far away. Readers who prefer paper will naturally always have the option of printing the articles of interest.

2023 was also ground-breaking for the *Estonian Journal of Earth Sciences* in terms of contributions. In total, the journal published 86 writings, with 33 of these ordinary and short articles and 53 annotations; this was thanks to the June special issue dedicated to the 14th International Symposium on the Ordovician System.[51] The conference was for the first time held in Estonia from 15 to 26 July 2023 and brought together 100 geologists from 20 countries. For Ordovician researchers, Estonia is well known for the common occurrence, good preservation and thorough investigation of the rocks dating to that period.

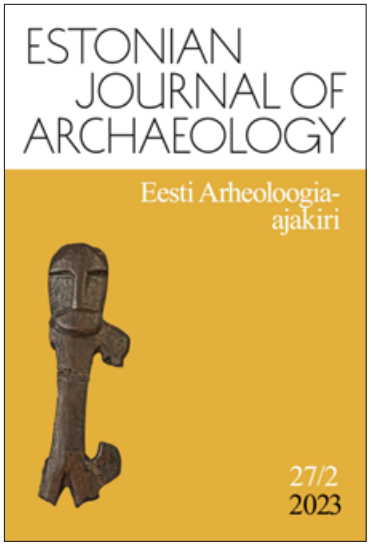
The Ordovician period (about 485–444 million years ago) bore witness to significant plate-tectonic activity, palaeocontinents, extensive fluctuations in sea levels and climate change. All of these had a significant impact on the development of the planet's environment and biota. In the Ordovician period, the biota became gradually more diverse and complex ecosystems evolved. The end of the period was marked by the extinction of invertebrates – one of the five mass extinctions in Earth's history. The short articles and annotations of presentations published in the *Estonian Journal of Earth Sciences* discussed Ordovician stratigraphy, geochemistry, palaeontology, regional geology, impact events, development of biodiversity and many other aspects, and it provided a thorough overview of the latest studies and discoveries worldwide.

The special issue articles are available on the Academy Publishing website,[52] and the special issue as a whole can be downloaded from the Geo-literature portal.[53]

Estonian Journal of Archaeology

Valter Lang, Editor-in-Chief

The 27th edition of the *Estonian Journal of Archaeology* (2023) was more fruitful than before: a special issue was published in addition to two regular issues. In a total of six articles, 23 authors from Estonia, Finland, Sweden and the United Kingdom offer an exciting read about the Stone Age, Early Iron Age and Middle Ages, i.e. from the beginning of human settlement in Estonia until the 15th and 16th centuries. The articles discuss different types of items and the materials the items are made of, as well as the burial



customs of different eras and underwater archaeological discoveries. A special issue dedicated to topics related to medieval and early modern foodways was published in 2023 (27/3S).[54] The compilation edited by Lembi Lõugas and Erki Russow included eight articles from ten authors from the University of Tartu and Tallinn University.

An article about a pre-Roman Iron Age (4th century BC) triple burial discovered on the Pärnu Road 41 plot in Tallinn in the course of rescue excavations in 2019 is worth highlighting.[55] The team of researchers led by Maris Niinesalu-Moon, a doctoral student at the University of Tartu, comprehensively analysed the burial of a woman and two children, using various natural scientific methods. Above all, the burial place is rare for Estonia due to the fact that the deceased individuals were placed in a pit grave and not in a stone grave; what we know about the burial customs of that period is mainly based on stone graves. Burials in pit graves have been presumed, though they have been rarely found and studied to date. Second, the grave contained grave goods, one of which – a bronze bell-pendant – was the first of its kind found in Estonia. It was also interesting that the grave was sprinkled with grains – no such custom has so far been identified elsewhere in Estonia. And finally – a large quantity of magnetic shards was found in excavating the burial place, which tells us that an iron smithing site was previously at that location.[56] Local smithing that old has also been previously presumed, but never proven – so it is now the oldest iron smithing site in Estonia. In order

51 Meidla, T., Männik, P. (eds) 2023. Proceedings of the 14th International Symposium on the Ordovician System. Estonian Journal of Earth Sciences, 72(1), 170 pp.

52 https://kirj.ee/earth-publications/?filter[year]=2023&filter[issue]=1468&v=a57b8491d1d8

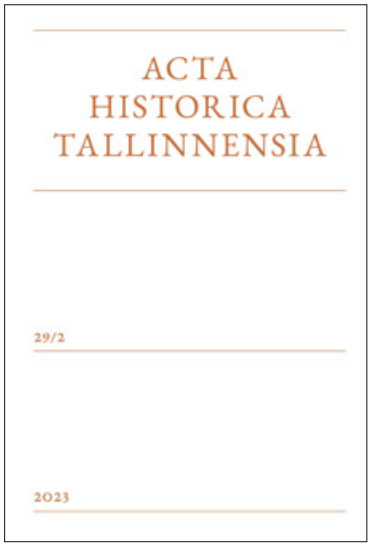
53 https://kirjandus.geoloogia.info/reference/47403

54 https://kirj.ee/estonian-journal-of-archaeology-publications/?filter[year]=2023&filter[issue]=1486&v=a57b8491d1d8

55 Niinesalu-Moon, M., Randoja, K., Lillak, A., Oras, E., Tõrv, M., Johanson, K., Saage, R., Lucquin, A., Hiie, S., Kriiska, A., Lang, V. 2023. Pre-Roman Iron Age inhumations: a multi-proxy analysis of a burial complex from Tallinn, Estonia. Estonian Journal of Archaeology, 27(2), 129–158. doi: 10.3176/arch.2023.2.03

56 A place where iron smithing – either smelting iron from bog iron or forging – was undertaken at some time in the past – ed.

to analyse the triple burial more thoroughly, osteological analysis of human bones and isotope analyses of strontium, carbon and nitrogen were performed in addition to purely archaeological studies, together with an archaeobotanical study of plant remains found in the grave, accelerator mass spectrometry dating of various organic materials, an analysis of pottery lipids and a metallographic analysis of magnetic shards. You can read about the results of the studies more thoroughly in the article itself.



Acta Historica Tallinnensia thematic issue about the history of the Baltic climate
Marek Tamm, Editor-in-Chief

The 2023 second issue of the *Acta Historica Tallinnensia* journal was dedicated to the history of the Baltic climate in the 18th and 19th centuries. Today, the interwoven nature of climate and society is a generally accepted piece of knowledge. It is also impossible to ignore the fact that global climate changes are taking place and will probably necessitate radical changes in the living environment and trigger complex and unpredictable societal processes. One way to handle these processes is to look into the past and find out where the roots of today's problems are, examine in what ways the combined effect of human activity and climate change has previously manifested, and determine how it has been understood prior to this point.

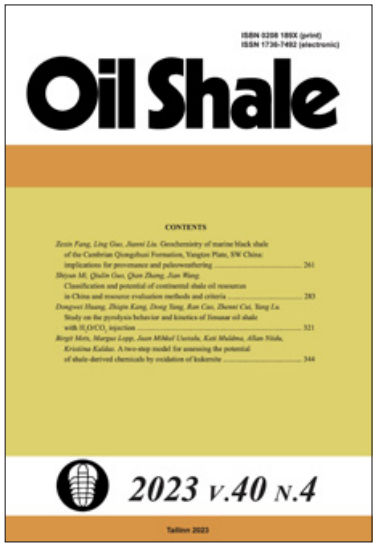
The thematic issue was drawn up by Tallinn University historians Ulrike Plath and Priit Raudkivi. One of the main aims of it was to provide an interim summary of research conducted to date in the area of historical climatology with a focus on the Baltic Sea region in the 18th and 19th centuries. It is also an attempt to encourage more active research into the past relationships between climate and society in Estonia. A longer introductory article entitled 'Cause and effect. Historical climatology as a science discipline' written by Priit Raudkivi, Kaarel Vanamölder and Ulrike Plath provides an overview of research previously and currently being conducted on the Baltic region in the area of historical climatology against the backdrop of development trends in the international world of research. Dominik Collet, a historian at the University of Oslo, discusses the problems of the collapse of the Polish-Lithuanian Commonwealth from the viewpoint of climate history in the English-language article 'Abusing climate: The 1770s anomaly and the first partition of Poland-Lithuania'. Poland-Lithuania served as Europe's grain basket for centuries. However, its ecological abundance also attracted hostile intentions. In the early 1770s, the country experienced a twin catastrophe: a war of invasion by its neighbours coinciding with a severe climate anomaly. In the article, Collet analyses the interaction of these factors more closely.

Priit Raudkivi's contribution, 'The 1837 spring high water in Latvia and Estonia from the viewpoint of historical hydrology' explores the topic of the great flood of 1837. This constituted a hydrological event of catastrophic dimensions in the basin of the Väina (Daugava) and Lielupe rivers, which had a significant effect on the water regime of inland waterbodies in both Latvia and Estonia. The records of the bridge courts that operated in the Livonian Governorate of the Tsarist state clearly show that the high water resulted in extensive proprietary damage, although there are few surviving reports from that time.

In their article 'Storms in air and on land – severe storms in the Baltic provinces in the second half of the 19th century based on a comparison of media messages and a post-analysis of weather data', Kaarel Vanamölder, Mait Sepp and Krister Kruusmaa attempt to combine narrative and measured observation data of historical climatology. Severe storms in the Baltic provinces in the middle to late 19th century are in the focus as weather phenomena. The authors are seeking an answer to the question of which analysis possibilities the combined use of two seemingly very different data sets – narrative messages gathered using humanities methods and data concerning historical storms modelled using natural science methods – could offer in the future and whether these databases would be able to complement each other.

The thematic issue is available free of charge on the Academy of Sciences website.[57]

57 https://kirj.ee/acta-publications/?filter[issue]=1484&v=7516fd43adaa



Oil Shale

Andres Siirde, Editor-in-Chief

Oil Shale continues to be the world's only journal specialising primarily in oil shale issues. The journal publishes articles covering the geology, mining, genesis, composition, methods of processing and combustion of oil shale, as well as economic matters and environmental protection problems related to the use of oil shale and bituminous sands.

The valuation of oil shale as a resource and the possibilities for sustainable resource utilisation can only be supported through application of our skills and knowledge. Worldwide, oil shales differ in composition, and consequently, in their thermal and chemical behaviour. However, oil shales share a common organic part known as kerogen. Kerogen is a mixture of high-molecular-weight polyfunctional organic substances derived from the remains of organisms that lived in water bodies.

In 2023, the journal published 18 articles from Estonia, China, Morocco, Saudi Arabia, Algeria, Tunisia, Kuwait and Brazil. The articles presented new insights into the thermal processing of oil shale, mining technologies, environmental issues and new oil shale deposits.

As the world moves towards carbon-neutral energy, oil shale studies are turning towards the investigation of kerogen as a promising raw material for the chemical and pharmaceutical industries. This topic is discussed in detail in an article by Birgit Mets, Kristiina Kaldas, Jaan Mihkel Uustalu and Margus Lopp 'The Lille-Blokker model – an excellent tool to describe the structure of kukersite'.[58]

The structure of kukersite organic matter has been a matter of scientific investigation and dispute for over a hundred years. The researchers show that kukersite is well described by a model proposed simultaneously and independently by Ülo Lille and Peter Blokker at the beginning of this century – in turn called the Lille-Blokker model – and may become a basis for new oil shale technologies.

The content of Trames in 2023

Urmas Sutrop, Editor-in-Chief

The topics of *Trames* were rather diverse. Significant importance was placed on articles that analysed Russia's war of aggression against the Ukrainian state and nation as well as its historical roots and the movement of volunteers assisting the army in Ukraine (e.g. with food, first aid supplies, uniforms and weapons) in order to defend their homeland against the aggressor. This war is a sharp conflict between two countries with a different political, economic and cultural system, which affects the entire region and relations between the two countries and threatens to destroy the system of international law. The Russian-Ukrainian conflict has deep historical roots. The main aim of the movement of volunteers is not only to defend the state, but also to ensure the rebirth of the nation, develop a national self-consciousness, understand and accept basic moral values and ideas, and build a democratic state based on the ideals of equality and justice.

The journal's 2023 special issue discussed relations between Estonia and Japan and was an important milestone.[59] Its articles provided a multifaceted overview from three focal points – the geoeconomic and geopolitical viewpoint, international relations and sustainable green

58 Mets, B., Kaldas, K., Uustalu, J. M., Lopp, M. 2023. The Lille-Blokker model – an excellent tool to describe the structure of kukersite. Oil Shale, 40(3), 234–243. doi: 10.3176/oil.2023.3.04

59 https://kirj.ee/trames-publications/?filter[year]=2023&filter[issue]=1473&v=a57b8491d1d8

economy – and they discussed the future prospects of how and in which fields Europe and Japan could forge ties. The question is also about how the European Union and Japan strive to propose an alternative model to China's political and economic initiative. There was an in-depth discussion of barriers to European business activities in Japan (formal barriers such as customs tariffs, as well as informal barriers such as social norms). The slower than expected implementation of the Economic Partnership Agreement between the EU and Japan due to the aforementioned barriers is also an obstacle to the development of relations. A positive example of overcoming such obstacles is the Nordic countries' cooperation with Japan. Attempts are being made to identify convergencies in policies in adapting the smart city concept in Japan and the EU. A concrete example is given of how both Japan and Italy made their urbanisation concept and energy production and distribution systems more sustainable in implementing the smart city idea after major earthquakes. It is found that the smart city idea motivates and facilitates cooperation between different parties.

After World War II, Japan began using 'soft power' in their advertisements, and the related complex of values became a significant factor in developing the country's export capabilities. Japan's soft power is based on the concept of *kawaii*, which is a mixture of different values and conditions such as nostalgia, vulnerability, cuteness, innocence and purity.

COOPERATION

134 YOUNG SCIENTISTS HAVE EXPERIENCED THE CAULDRON OF SCIENCE IN THREE MINUTES

Piret Suurväli, main organiser

The Science in Three Minutes presentation contest initiated by the Academy of Sciences in 2015 has been held on eight occasions. Over that time, 134 young scientists have honed their presentation skills. The event has increased in popularity each year both among participants and attendees. Here are some figures from recent years to illustrate how the event has reached wider society. The final gala of the 2023 contest was held in front of 2,712 audience members. The articles published on the Estonian National Broadcasting's science website *Novaator* at the beginning of 2023 had by 14 February in the same year been read by more than 44,000 people. Video clips have been watched on *Novaator* more than 20,000 times. According to the editors of *Novaator*, these figures are considerably higher than ordinary for both articles and videos. The winning 2023 videos drew an average of 50,000 viewers per working day on *Terevisioon*.

Increasingly, the former Science in Three Minutes participants are becoming the best promoters of the event, as they actively share their impressions on internal forums of research institutions and encourage other doctoral students to take part in the contest. Now, it is young people who have long prepared and planned for the contest reach the final round.

We have written about the structure of the event series in our previous yearbooks.[60] 3-day training at the old schoolhouse in Heimtali is one of the most important parts of it. The training consists of the following:

- practice – how to prepare your body for performing;
- video practice – performing in front of the camera and analysing the results;
- lectures about conveying scientific messages and writing popular science articles;
- a practical overview of where performance anxiety, anxiety disorder and other such issues occur, and how to alleviate performance tensions.

The Heimtali training was followed by intense training in writing popular science articles, in close cooperation with a science journalist. Right before the final gala, another video training session took place, where the presentations were given the final polish at the venue for the final gala – the Academy's Mirror Hall.

60 Read about the contest in the Estonian Academy of Sciences Yearbook 2022. Annales Academiae Scientiarum Estonicae XXVIII(55) 2022, https://www.akadeemia.ee/en/publication/estonian-academy-of-scieences-yearbook-2022-xxviii-55, p 52.

The 2023 finalists (laureates on a darker background):

LIILI ABULADZE Tallinn University	The effect of confident relations on health
MARIT ALAS Institute of the Estonian Language	Preservation and loss of place names on the Vergi Peninsula
MARIA HANSAR Estonian Academy of Arts	How do we remember the future?
JÜRGEN KARVAK University of Tartu	Streams – the hotspots and connection paths of urban nature
KERTU LIIS KRIGUL University of Tartu	Antibiotics – a wolf in sheepskin?
MEETA MOROZOV Estonian Academy of Music and Theatre	Regarding the writing of Estonian music history during the Soviet era, or Tallinn that is never completed
ANNETTE MILLER Tallinn University of Technology	More beneficial, but not sweeter – the synthesis of prebiotic breast milk sugars
KEIU PAAPSI The National Institute for Health Development	Tumours know no age limits
MADLI RAUDKIVI Tallinn University	Foster family – for whom and for what?
KRISTO RAUN University of Tartu	A direct path to decisions – conformance checking on stream data
HEIGO ROSIN Estonian Academy of Music and Theatre	Soloist and orchestra: a competition or cooperation?
GERTHA TEIDLA-KUNITSÕN Tallinn University	Regarding digitally strong education or ICT in the everyday life of our school students
HANS TIISMUS Tallinn University of Technology	3D printing makeover for motors
MARTIN SARAP Tallinn University of Technology	Cooling of electrical machines using the additive method
LIZA SEDLER Estonian Academy of Arts	Home kitchen design as a battleground of ideologies

Photo: Reti Kokk x 2

The best five of the 2023 contest (from left): Annette Miller, Keiu Paapsi, Kertu Liis Krigul, Madli Raudkivi and Martin Sarap.

The festive closing event of the 2023 contest was hosted by Margus Saar. The jury members: Yoko Alender (politician, member of the *Riigikogu*), Peeter Jalakas (theatre manager, director), Tuuli Jõesaar (journalist), Kristel Kruustük (entrepreneur), Karl Martin Sinijärv (writer) and Tarmo Soomere.

The 2024 finalists:

GUIDO ANDREESEN Tallinn University of Technology	Risk based substation equipment management in future electricity systems
MIKK GRANSTRÖM Tallinn University	Why do we need to learn to learn?
MARTIN HAAMER University of Tartu	Does taking the bus have to be so slow?
STEN HEINOJA Estonian Academy of Music and Theatre	Regarding the role of a contemporary interpreter in the example of Mart Saar's piano preludes
MADIS JÜRVISTE University of Tartu and Institute of the Estonian Language	Job titles in the oldest Estonian dictionaries
KADI KAJA Estonian Academy of Music and Theatre	Why is music worth learning?
SIGRID KIRSS Tallinn University of Technology	New discoveries in the hidden world of Alzheimer's disease
KATRIIN KRISTMANN Tallinn University of Technology	From Earth to the Moon with fool's gold solar batteries

KRISTIINA KURG University of Tartu	Melanoma diagnosis from a drop of blood – is this truly possible?
TAIRI LEIS University of Tartu	Today's economic environment – an enchanted forest from which a path of decision-making logic leads out
LAURA MAURING University of Tartu	Genetic eye diseases: an enemy in the dark
MARK METS Tallinn University	The global importance of Ukraine in Twitter
JANE REMM Estonian Academy of Arts	Regarding the possibilities of art to communicate with other species and to create together
HANNA BRITT SOOTS University of Tartu	Mathematics helps us understand the world better
INGE VARIK Tallinn University of Technology	The secrets of the ovary
ANNIKA VOLT Tallinn University	Flexible learning paths predict the future

The five winners of the 2024 contest, who have the opportunity to take part in the largest European science forum EuroScience Open Forum (ESOF2024)[61] together with the Academy's President: (from left) Sten Heinoja, Martin Haamer, Katriin Kristmann, Hanna Britt Soots, Inge Varik and Tarmo Soomere. This year's ESOF will take place in Katowice, Poland. Its topic 'Life Changes Science' matches the topics of our finalists very well.

61 https://www.esof.eu

Photo: Reti Kokk x 2

The 2024 contest participants waiting for the jury's decision.

The 2024 final gala was hosted by Anu Välba. The jury consisted of Andrus Durejko (Chairman of Management Board of Eesti Energia), Urmas Jaagant (journalist), Pille Kaisel (head of school), Hannes Tamjärv (businessman), Karl Laumets (director and actor), Kadri Tali (politician, music producer) and Tarmo Soomere.

The contest has been supported from the TeaMe+ programme and, in the 2023/2024 season, by the national science communication project contest of the Estonian Research Council.

Young scientists highly value the contest and the offered training. They have made proposals to also organise follow-up events to which the finalists in all iterations to date would be invited. In addition to promoting presentation skills, the Academy also contributes to the efficient integration of scientists with this event.

Here are some impressions and thoughts of the finalists.

What did Science in Three Minutes lectures give you?

- A priceless experience of how to speak concisely and precisely of my research. A terrific opportunity to put my stress tolerance to the test. An extremely good networking experience.
- In-depth training in clearer self-expression. The knowledge that it is my business to make myself clear to others. And an opportunity to introduce my work to a broader circle of people and thereby receive cooperation offers. The fact that our group was very tight-knit and mutually supportive with friendly banter was doubtlessly a value in itself. We had jokes and laughs as well as serious work. Some group members will also be accompanying me in my future work.
- The fact that we could do it all in Estonian was particularly good, as my work as a doctoral student tends to be increasingly in English. For me, the opportunity to publish an article of my work on *Novaator* was another cherry on the cake. I am very happy that I got to meet so many doctoral students from other schools and areas of specialisation and to create a great network for myself.
- An experience in presentation, coping with stress and communicating academic research. A peek into the Academy of Sciences, and make valuable acquaintances.
- The contest gave me a push to formulate my research topic in a concentrated manner and to highlight the most important aspects. The simultaneous preparation of different presentation formats was a good way to focus on the important things in an understandable manner while making sure the point was still there.
- The self-confidence to discuss and write about my science in a simplified manner.
- Very cool, interesting and useful contacts, particularly my fellow finalists. The courage to perform and the skill to express myself simply, using Estonian terminology.

Participants in the 2023 contest expressing their gratitude to the organisers after the gala evening.

- I think these were the tensest three minutes in my recent life. How to pull myself together to the maximum degree for three minutes, to concentrate and convey my point to people of different (cultural) backgrounds, knowing I only have the one chance – it was a true challenge to my personal limitations.

THE GREAT-GRANDCHILD OF THE ARCHITECT OF THE ACADEMY'S BUILDING WAS THE MAIN GUEST AT RESEARCHERS' NIGHT

On 29 September 2023, the Researchers' Night Science Afternoon (26th) on the topic 'The Ungern-Sternberg city palace – the latest Berlin fashion in Toompea architecture' was held at the Academy. The focus was on the Academy's building on Kohtu Street, which is a unique structure in the architectural landscape of Tallinn. The architecture of the building was discussed in two contexts: its place in comparison with the architecture of other buildings in Tallinn and Toompea, and in the context of the entire creation and time period of the building's designer, Martin Gropius.

The event presented the great-grandchild of Martin Gropius, Professor Emeritus **Arnold Körte** from Germany, as the main guest. Arnold Körte is also an architect as well as an architectural historian, and he has thoroughly studied the works of his forefather. His lecture in English, 'The Ungern-Sternberg palace in the context of the other works of Martin Gropius', highlighted, among other things, that the Academy's building, built in 1865–1868, reflects the artistic development of Martin Gropius at the time, and it can only be understood in the context of his other works. It will be 200 years from the birth of Martin Gropius on 11 August 2024.

Academy member **Mart Kalm** delivered a brief overview of the life of the main speaker Arnold Körte and spoke of the design story behind the Academy's building,

The event attracted a big audience to the Academy's building.

the disposition of rooms and the various uses of the structure. Following the lecture, those who were interested were permitted to take a closer look around the building under his guidance.

The event is available to view on the Academy's YouTube channel.[62]

62 https://www.youtube.com/watch?v=ARBp2DeW0z4

Arnold Körte visited Tallinn for the first time; seeing his forefather's monumental work made it a kind of homecoming.

Mart Kalm and Arnold Körte on Researchers' Night.

Photo: Julien Ordan, IYBSSD

A panel discussion at the final forum of the Year of Basic Sciences.

THE YEAR OF BASIC SCIENCES ROUNDED OFF

Toomas Vaimann, President of the Estonian Young Academy of Sciences (EYAS) and Erik Abner, Head of Communications of the EYAS

The International Year of Basic Sciences for Sustainable Development (IYBSSD2022) initiated by the United Nations was rounded off with a forum held at the European Organisation for Nuclear Research (CERN) in Geneva, Switzerland, on 15 December 2023. The initiative was initially meant to cover only 2022, but due to problems related to the COVID-19 pandemic the commencement of the activities was postponed and one year became two.

The main aim of the Year of Basic Sciences was to invite both national and global research institutions to clearly show to the political and business leaders as well as the public of the world how the basic sciences help ensure the inclusive, balanced and sustainable development of the planet. The initiative stemmed from the sustainable development programme Agenda 2030,[63] under which the UN Member States have assumed the aforementioned ambitious obligations. Academy member Arvi Freiberg wrote about the Year of Basic Sciences and its links to the Agenda 2030 programme in greater detail in the Academy's 2022 Yearbook and in the *Postimees* newspaper.[64]

Basic sciences have an important contribution to make to the implementation of the Agenda 2030 programme. They provide the essential means to meet crucial challenges, such as universal access to food, energy, health coverage and communication technologies. They enable us to understand the impact of the approximately eight billion people currently living on the planet and to act to limit and sometimes even to reduce this impact: depletion of the ozone layer, climate change, depletion of natural resources, extinction of living species.

In many ways, the Year of Basic Sciences was inspired by the current situation where the emphasis is on technological development that is relatively easy to assess. At the same time, people do not sufficiently recognise the contribution of basic, curiosity-based sciences without which it would not be possible to make significant technological progress. Together, they represent the source of innovation and are essential in training future specialists. UNESCO is well aware of this and clearly emphasises the importance of bringing together politicians, scientists, diplomats, international organisations, entrepreneurs and society. Thus, the main message of the Year of Basic Sciences was that the basic sciences are an important first link in the chain of research and development, the full application of which allows us to achieve sustainability in nature and society.

63 https://sdgs.un.org/2030agenda

64 Estonian Academy of Sciences Yearbook 2022. Annales Academiae Scientiarum Estonicae XXVIII(55) 2022, https://www.akadeemia.ee/en/publication/estonian-academy-of-scieences-yearbook-2022-xxviii-55, pp 12–15.

Erik Abner (on the left) and Toomas Vaimann at the closing event of the Year of Basic Sciences.

The importance of communication between scientists, science financers, politicians and entrepreneurs was repeatedly stressed at the final forum. The importance of and the need to recognise scientists working outside the academic structure – whether in business, the public sector or the general education landscape – was also underlined. Importance must also be placed on the transparency and meaningfulness of the organisation of academic careers, which would help to motivate young people to choose the career of scientist and actively contribute to it.

The same thoughts have surfaced repeatedly in Estonia too. It is promising to note that we positively stand out in many respects. In several countries, these problems are considerably more acute than here, though we must not rest on our laurels. After all, we can sense that things could be significantly better than they are also here, and that work towards the better cohesion of science, society, politics and economy along with the greater popularity and attractiveness of the career of scientist must be intensified.

A resolution of the Global Young Academy was initiated within the framework of the Year of Basic Sciences in order to confirm the role of basic sciences in achieving sustainable development through strengthened and fair support for basic studies and early-career researchers. The Call for Action[65] disclosed at the final forum of the Year of Basic Sciences recognises the historical effect of basic sciences on humankind – such as in the development of the COVID-19 vaccine – as well as the fact that digital technology has its roots in basic sciences. By emphasising continued challenges, it highlights inequity within the research sector. Early- and mid-career researchers, especially in low to middle income nations, are now facing a significant disadvantage, which ultimately results in an uneven quality of scientific research in different regions of the world.

The Call for Action proposes a number of feasible actions to connect basic sciences with sustainable development. The proposed actions include supporting interdisciplinary research, which is in line with Sustainable Development Goals, enhancing transitions from fundamental research to innovative solutions and acknowledging the global inequality that is prevalent in research capacity and capability. The Call for Action seeks global cooperation and urges stakeholders to recognise the profound significance of basic sciences in shaping a sustainable and fair future. The Estonian Young Academy of Sciences was among the 30 young academies that signed the Call for Action.

What comes next? This call from young scientists shows that sustainability concerns have not been resolved and must be increasingly focused on in both science and society. It was highlighted at the forum that in addition to acknowledging the importance of basic sciences, attention must also be paid to cooperation between basic sciences and applied sciences as well as to ever stronger interdisciplinarity in research, which would most certainly allow us to achieve significantly better results.

65 https://globalyoungacademy.net/wp-content/uploads/2023/12/IYBSSD-Statement-final-Dec2023-incl-logos.pdf

A view of CERN's ATLAS building where the Control Room for the detectors used in discovering the Higgs boson is located. A mural of the detector, drawn by American artist Josef Kristofoletti, decorates the building. The detector is located 100 metres underground.

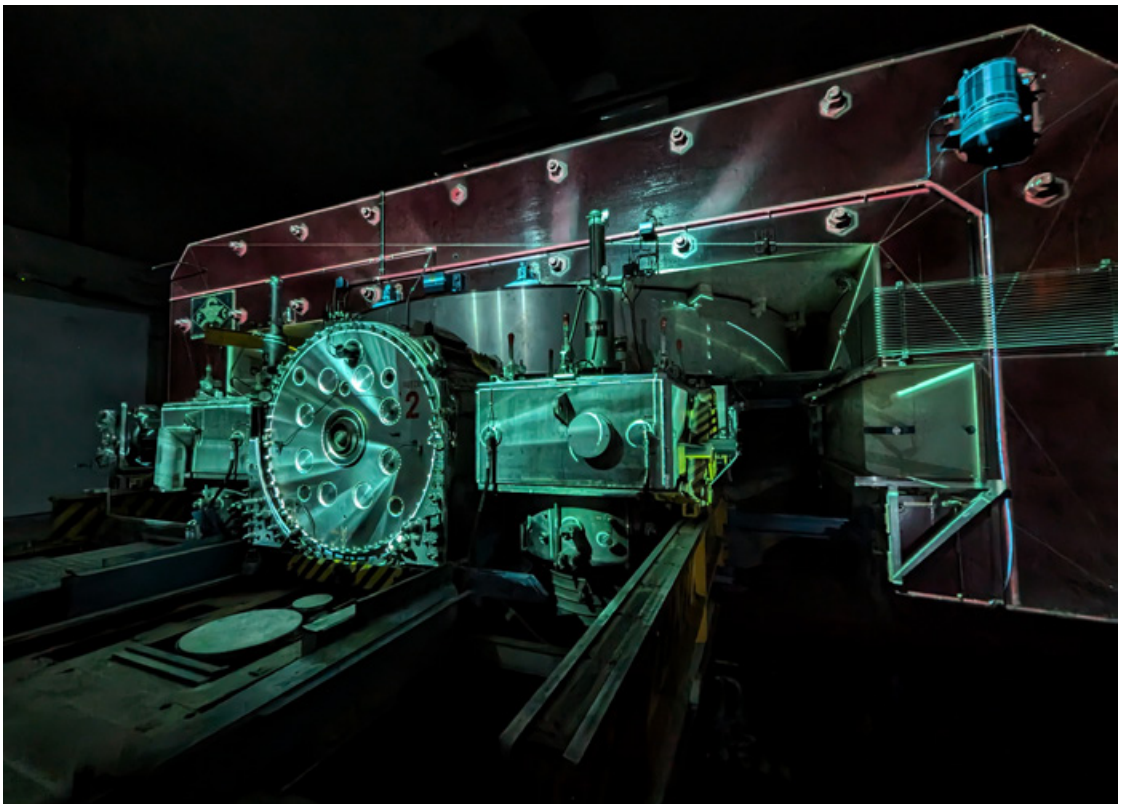


Photo: private collection x 3

CERN's first accelerator, the Synchrocyclotron.

Inspired by these statements, the United Nations has announced the International Decade of Sciences for Sustainable Development 2024–2033. As all the fields of sciences are included on this occasion, this provides a wonderful opportunity to draw unprecedented attention to science, sustainable development and their common features. Let us act together for a better future!

MEDALS, PRIZES, SCHOLARSHIPS

THREE MEDALS OF THE ACADEMY

The medals of the Estonian Academy of Sciences[66] are bestowed on individuals for either exceptional service in contributing to the development of Estonian science or a significant contribution to the fulfilment of the goals of the Estonian Academy of Sciences. The original concept behind the recognitions is simple: it symbolises the highest honour to people who have achieved considerably more than prescribed in their employment contract or job description. Unlike the Academy's memorial medals which are awarded for excellent achievements in science, one's scientific qualification or the citation numbers are not determining factors here.

In 2023, the Academy recognised member of the Council of the Constitutional Law Foundation (formerly Constitutional Law Endowment) at the Academy of Sciences **Uno Lõhmus**, who was awarded a medal for his service in launching the work of the Foundation and leading its Council, implementing the Foundation's projects and promoting Estonian constitutional law studies.

Uno Lõhmus is one of the architects and leaders of the rebirth of Estonian constitutional law studies and the first chairman of the Council of the Foundation, and he directed and bore the main weight of its work in the first years of operation in 2018–2022. He was also the initiator of various scientific studies into Estonian constitutional law, as well as the founder and first editor-in-chief of the Constitutional Law Yearbook series. Lõhmus' titanic work as Editor-in-Chief of the Commentaries on the Constitution of the Republic of Estonia deserves special attention, recognition and gratitude. His contribution to the development of constitutional law thought in Estonia as a spokesperson to wider society and a formulator of expert opinions has constituted a basis for the Commentaries. His compilation *The Rule of Law and People's Rights* (*Õigusriik ja inimeste õigused*) published in the Story of Thought series (see pp. 19–22) contains writings which, as a whole, have changed the Estonian world of thought.

Photo: Maris Krūnvald

Tarmo Soomere and Uno Lõhmus.

Urmas Tartes was recognised for his long-standing work in leading the Commission for Nature Conservation of the Academy of Sciences.

Urmas Tartes is a recognised biologist, entomologist, natural science promoter, author and co-author of several nature books, sought-after programme guest, photography teacher and excellent nature photographer. He has been leading

66 https://www.akadeemia.ee/en/medals-prizes-scholarships/medal-of-the-estonian-academy-of-sciences-2

Photo: Maris Krünvald × 2

Urmas Tartes receives the Academy's medal.

A medal was also awarded to Ülle Sirk.

the Commission for Nature Conservation of the Academy of Sciences for quarter of a century and has contributed to the implementation of the Academy's ideas and ventures. For many, his numerous writings which push the boundaries of science and its communication as well as his exquisite photos are the primary guides to understanding nature and discovering the depth and beauty hidden in its minute details.

Ülle Sirk, the Academy's Administrative Coordinator in Tartu, was awarded the Academy's medal in recognition of her dedication in fulfilling her administrative role for the Academy for more than 30 years.

"The Academy is so much more than the elected Academy members. The work of the Academy members is supported and coordinated by the employees of the Academy's Office. The better they do their work, the less they are seen. We therefore sometimes have to actually drag them into the spotlight," said Academy President Tarmo Soomere when presenting the medal.

MEMORIAL MEDALS OF THE ACADEMY

The memorial medals of the Estonian Academy of Sciences are bestowed to Estonian scientists who have achieved remarkable things in their area of research. These are the Academy's highest awards which are bestowed seldom, and not more than once every four years: the Nikolai Alumäe medal in informatics and engineering, the Paul Ariste medal in the humanities, the Karl Ernst von Baer medal in life and Earth sciences, the Edgar Kant medal in social sciences, the Harald Keres medal in astronomy, physics and mathematics, the Wilhelm Ostwald medal in chemistry and related areas, the Karl Schlossmann medal in medicine and related areas, and from this year, the Alma Tomingas medal for the promotion of interdisciplinary research and synergy.

Harald Keres medal

In 2023, the Harald Keres medal was bestowed on Academy member **Enn Saar** in recognition for his contribution in discovering dark matter and developing the statistical methods necessary for studying the honeycomb structure of the Universe.

Photo: Liisa Palts

The medal was presented to Enn Saar (on left) on 5 May 2023 by the Vice President of the Academy Arvi Freiberg at the Tartu Observatory of the University of Tartu in Tõravere, where Enn Saar worked in 1968–2015.

His contribution to science and the development of scientific thought has been outstanding. Enn Saar is the author of most of the mathematical methods that the Tartu cosmologists and explorers of galaxies have applied in studying dark matter and the structure of the universe. Besides engaging in science, he has also been an avid athlete and a great mountaineer, as well as one of the importers of LaTeX, a modern tool for the management and layout design of scientific texts.

Wilhelm Ostwald medal

The Wilhelm Ostwald medal was bestowed on Academy member and Professor of Physical Chemistry at the University of Tartu **Enn Lust**, in recognition of his excellent research activities and science communication.

His research is a dazzling and effective mixture of a deep perception of chemical processes and intricate engineering-technical solutions. It's as if Enn Lust sees how individual ions move and settle in the right combination for their elegantly structured sets to start working in an unexpected way. This often results in devices that can accomplish magical things, starting from fuel elements to new types of batteries in which lithium is replaced by sodium and expensive natural graphite by a porous material synthesised from our own local peat. Even more important is Academy member Lust's ability to use these examples to build universal technologies for creating novel materials and high-tech equipment necessary for energy storge and conversion systems as well as his efforts in expanding the production and use of green hydrogen both in vehicles and in the global energy portfolio. A combination of a broad horizon and exquisite science coupled with the skill to apply these for the benefit of society have brought Enn Lust various national and international recognitions. In ultimate recognition of his work, more than 40 scientists who have defended their doctoral degrees under his guidance have further advanced his research.

The first winner of the Alma Tomingas medal – University of Tartu Professor Mari Moora

Academy member Maris Laan

The Alma Tomingas medal of the Academy of Sciences was awarded for the first time in 2023. Mari Moora, Professor of Community Ecology at the University of Tartu was chosen as the first winner. This medal is bestowed on a top Estonian scientist who has promoted interdisciplinary research and synergy and has also made a significant contribution to raising a young generation of scientists.

The Alma Tomingas medal was initiated by the board of female members of the Academy of Sciences and is the first medal named after a female scientist in the Academy's portfolio of recognitions. The medal values cross-sectoral research, which is now a key issue in science. This concept reflect the best part of history of academic science that has historically been performed by people with a broad knowledge base. New ideas have emerged at the touching point of expertise in different areas of research.

Photo: Maris Krünvald × 2

Enn Lust.

Mari Moora with the Alma Tomingas medal.

Professor Mari Moora is an internationally recognised scientist who has dedicated her specialised knowledge in genetics to studying the visible and invisible diversity of plants (i.e. mycorrhiza fungi), and combined it more broadly with the dynamics of biota, soil health and the history of the Earth's nature. These studies have also required a systematic analysis of DNA-based plant science and ecological metadata on various levels. The obtained results are of significant importance from the viewpoint of maintaining and developing a sustainable living environment and agriculture. Professor Moora's research has involved many young scientists, several of whom are now also internationally recognised researchers who carry on the work.

Professor Alma Aline Tomingas (Rakvere, 15 November 1900 – Tartu, 29 January 1963) was an Estonian pharmacist. Her life work involved studying the chemical composition of medicinal plants and preparations made from such plants, with which she advanced the chemical area of research in pharmacognosy. After graduating from the Stroinowsky Private School, she studied practical medical science at the pharmacy of Professor Eberkhart in Rakvere from 1917 to 1922 and then passed the vocational examination for a pharmacy assistant at the University of Tartu. She worked as a pharmacist both in Rakvere and at Tallinn City Pharmacy. In 1925, Alma Tomingas began her studies at the Department of Pharmaceutics of the Faculty of Medicine at the University of Tartu, from where she graduated *cum laude* some years later. The Faculty of Medicine awarded her first prize for her final thesis, 'Regarding the iodine tincture and determining its quantity of iodine'. After 1928, she also worked at the Institute of Pharmacognosy of the University of Tartu. A year after completing her basic studies (1929), she defended her master's degree in pharmaceutics on the topic 'Regarding Estonian state-monopoly ether and its purification possibilities'. She obtained her doctoral degree in pharmaceutics at the age of 33 and defended her dissertation 'Regarding auto-oxidation processes in tallow oils' at the Faculty of Medicine of the University of Tartu (1933). Alma Tomingas later became the first Estonian female professor (1940) and the first female Academy member (1946).

Photo: Maris Krünvald

The Alma Tomingas medal is shaped like a breast watch, which represents scientific work that requires laboratory sterility and precision. The gilded face is engraved with the objects of research of Alma Tomingas' life work – medicinal plants – and the logo of the Estonian Academy of Sciences. The medal was designed and made by jewellery artist Taavi Teevet (the Estonian Academy of Arts).

Photo: private collection

Members of the board of female Academy members together with Mari Moora gathered around the former desk of Alma Tomingas. The desk is currently at the Skytte Institute (Lossi Str. 36, Tartu). Anu Raud and Ene Ergma are seated. Standing (from left): Anu Realo, Maris Laan, Mari Moora and Anne Kahru in the first row and Maarja Grossberg-Kuusk, Mare Kõiva, Krista Fischer, Tiina Randma-Liiv and Maarja Kruusmaa in the second row. Ellu Saar is absent from the photo.

ACADEMY'S GOLDEN BADGE

The Academy's Golden Badge is bestowed on Academy members who have made an extraordinary contribution to the essence and strength of the Academy. The Golden Badge is awarded so seldom that it does not even have its own statutes.

In 2023, the Golden Badge of the Estonian Academy of Sciences was awarded to Academy member Jüri Engelbrecht for his unprecedented contribution in building the Academy up as a modern personal academy as well as being a dignified member of the international family of academies in complicated and momentous periods. He was President of the Academy of Sciences in 1994–2004 and Vice President in 2004–2014. His initiative started the funding of quality-based research in Estonia, the programme of centres of excellence and the provision of advice to the Ministry of Education and Research. Academy member Engelbrecht is one of the authors of the strategies 'Knowledge-based Estonia 2002–2006' and 'Knowledge-based Estonia 2007–2013'. Among other things, he has been a member of the Council of the European Science Foundation (ESF), a member of the European Research Advisory Board (EURAB), a member of the General Assembly of the International Science Council (ISC, formerly ICSU) and an expert at the Organisation for Economic Cooperation and Development (OECD). He started work in the federation of European academies of sciences ALLEA in 1995 and was its President in 2006–2011.

MIHHAIL BRONŠTEIN AWARDS IN ECONOMICS

Academy member Mihhail Bronštein (23 January 1923 – 9 April 2022) Awards in Economics are bestowed in recognition of theoretical developments and their successful practical application by Estonian economists. The initiator and funder of the awards is the family of Academy member Bronštein. The awards were bestowed for the second time on Mihhail Bronštein's anniversary on 23 January 2024.

The 10,000-euro award for significant achievements in economics that have already been applied in practice was bestowed on Senior Researcher at TalTech **Merike Kukk**, Associate Professor in Economic Modelling at the University of Tartu **Jaanika Meriküll** and Adjunct Professor at TalTech **Tairi Rõõm** with the article series 'Distribution wealth in households and wealth inequality'. Besides universities, all three winners also work at the Economics and Research Department of the Bank of Estonia.

The series of scientific articles that earned the award focuses on the assessment of wealth inequality in households. Studies have provided significant new knowledge about wealth inequality in Estonia and across the European Union. The authors applied new approaches and methods in studying the topic. The results are a valuable input into discussions on changing savings and investment habits, which will hopefully help reduce wealth inequality in the future.

The 5,000-euro award for remarkable innovative economic developments was bestowed on Assistant Professor

Photo: Maris Krünvald × 2

The Academy's Golden Badge being presented to Jüri Engelbrecht.

From left: Mihhail Bronštein's grandson Dan Bronstein, Merike Kukk, Jaanika Meriküll, Tairi Rõõm, chairman of the competition committee Urmas Varblane, Merle Küttim and Tarmo Soomere.

in Innovation and Knowledge Transfer at TalTech **Merle Küttim** for the series of scientific articles 'How to commercialise university-generated knowledge?'.

The series of scientific articles by Merle Küttim and international co-authors offers new viewpoints to those studying in the area of knowledge transfer and, more broadly, innovation both in Estonia and abroad. The authors discuss cooperation between universities and enterprises, with a focus on knowledge transfer. Their innovative approach observes knowledge transfer not from the viewpoint of universities and scientists, i.e. the suppliers, but from the perspective of the users of knowledge and the implementers of innovation. In addition, the authors include the viewpoint of finding and using business opportunities.

NATIONAL RESEARCH AWARDS

The tradition of national research awards has continued for more than 30 years. It is older than our newly independent state. On 20 August 1990, Prime Minister signed the regulation on founding the national research awards of the Republic of Estonia. Independence was regained a year later. The first awards were granted in 1991. From the very beginning, brilliant or extraordinary achievements in research have been in focus. The Estonian state has delegated the pre-selection of laureates of national research awards to the Academy of Sciences.

Winners of National Research Awards in 2024

LIFETIME ACHIEVEMENT AWARDS

Jakob Kübarsepp – Academy member,
Professor Emeritus and Senior Researcher at TalTech

Jakob Kübarsepp's life work focuses on using powder metallurgy to make high-strength, durable coatings and wear-resistant lightweight composite materials without strategic, expensive and environmentally hazardous metals such as tungsten or cobalt. Besides pushing the boundaries of knowledge, he has for decades worked on ensuring the maintenance of top-level engineering education and powder materials technology in Estonia. He has done so by teaching, mentoring, writing textbooks and expanding the language base, as well as by organising studies as a Vice-Rector at TalTech and by contributing to higher education programmes and the assessment of education quality.

Raivo Uibo – Academy member,
Professor of Immunology at the University of Tartu

Jakob Kübarsepp at the festive National Research Awards event at the Academy of Sciences on 21 February 2024.

Raivo Uibo at the National Research Awards event.

Photo: Birgit Püve × 2

Raivo Uibo is one of the most outstanding and influential medical scientists in Estonia, a pioneer, leader and pathfinder in contemporary clinical immunology. His life work encompasses scientific work in the broadest sense, starting from teaching and promoting a scientific way of thinking, shaping the necessary background system and upholding the dignity of science to brilliant discoveries and their application – for example, the immunological mechanisms behind chronic inflammations or tests that distinguish between the clinical forms of liver diseases. He has also made an immense contribution to the development of the community of his area of specialisation as well as to the development of science and society as a whole and to nurturing many new scientists.

ANNUAL AWARDS

- *Award in the field of exact sciences for the research cycle 'Mapping the similarities and differences of intelligence and artificial intelligence systems'*
  Jaan Aru – a member of the Estonian Young Academy of Sciences, Associate Professor in Computational Neuroscience and Artificial Intelligence at the University of Tartu
- *In the field of chemistry and molecular biology, the award was shared between two research cycles.*
  For the research cycle 'Tissue regeneration and the extracellular matrix'
  Viljar Jaks – Associate Professor in Cell Biology at the Institute of Molecular and Cell biology of the University of Tartu and Head of the Dermatology Clinic of Tartu University Hospital
  For the research cycle 'Metabolism of copper and possibilities for its regulation'
  Peep Palumaa – Tenured Full Professor in Proteomics at the Department of Chemistry and Biotechnology of TalTech
- *Award in the field of engineering sciences for the research cycle 'Innovative power electronics systems with topology morphing control'*
  A group of researchers at the Department of Electrical Power Engineering and Mechatronics of the School of Engineering of TalTech
  Dmitri Vinnikov (team leader) – Academy member, Leading Researcher
  Andrei Blinov – Senior Researcher
  Andrii Chub – Senior Researcher
  Oleksandr Husev – Senior Researcher
- *Award in the field of medical science for the research cycle 'Molecular mechanisms of and approach to orthopaedic diseases'*
  Aare Märtson – Professor in Orthopaedics at the Department of Traumatology and Orthopaedics of the Institute of Clinical Medicine of the University of Tartu and Head of Clinical Area I at Tartu University Hospital
  Katre Maasalu – Associate Professor in Orthopaedics at the Institute of Clinical Medicine of the University of Tartu and Head of and Senior Doctor and Lecturer at the Orthopaedics Clinic of the Tartu University Hospital
- *Award in the field of geology and biology for the research cycle 'Global approach to the functional diversity of different biota groups'*
  Researchers of the Department and Chair of Botany of the Institute of Ecology and Earth Sciences of the Faculty of Science and Technology of the University of Tartu
  Carlos Pérez Carmona (team leader) – Associate Professor in Macroecology
  Meelis Pärtel – Department and Chair of Botany, Professor of Botany
  Riin Tamme – Senior Specialist, Research Fellow in Macroecology
  Aurèle Éric Toussaint – Research Fellow in Macroecology (until 31 December 2023)
- *Award in the field of agricultural sciences for the research cycle 'Innovative RNAi approach in pest control and implementation of ecosystem services in sustainable agriculture'*
  Eve Veromann – Professor at the Chair of Plant Health of the Institute of Agricultural and Environmental Sciences of the Estonian University of Life Sciences
- *Award in the field of social sciences for the research cycle 'Media innovation, digital culture and culture data studies'*
  Indrek Ibrus – Professor of Media Innovation at the Tallinn University Baltic Film, Media and Arts School
- *Award in the field of the humanities for the research cycle 'Political semiotics and semiotic analysis of information influence activities and conspiracy theories'*
  Researchers at the Institute of Philosophy and Semiotics of the Faculty of Arts and Humanities of the University of Tartu
  Andreas Ventsel – Professor of Political and Sociosemiotics and Lecturer at the Pallas University of Applied Sciences
  Mari-Liis Madisson – Research Fellow in Semiotics

THE ESTONIAN SCIENCE COMMUNICATION AWARD

When I was a little boy, I was given a magnifying glass and a pocketknife as a present. I used to walk along the edges of fields, tapping stones and thinking of all the fossils and other things – I even tried to pry a watch apart because I wanted to see what was inside. I have to admit that that little boy is still here inside me. (Aare Baumer)

The Estonian Science Communication Award has been granted since 2006. Its aim is to recognise outstanding promoters of science and to inspire society to discuss and write more about science. The award is financed by the Ministry of Education and Research and bestowed jointly by the Estonian Academy of Sciences and the Estonian Research Council. The competition committee was led by Academy member Ene Ergma. This time, the winners were selected from 53 candidates.

The Tiiu Sild Memorial Lifetime Achievement Award for the long-standing systematic communication of sciences and technology was granted to **Aare Baumer,** Research and Development Manager of the Energy Discover Centre and a promoter of non-formal science education. He is a passionate science communicator who has been introducing science and nature subjects to a countless number of children and adults in an exciting manner for more than 20 years. As one of the pillars of the Energy Discovery Centre, he has created multiple exhibitions to communicate science and made exhibits that are unique in the world.

The Grand Prize for the Best Communicator of Sciences and Technology was awarded to animal ecologist **Tuul Sepp**, a member of the Estonian Young Academy of Sciences (EYAS) and a professor at the University of Tartu, for her diverse activities in science communication. The second prize was awarded to science journalist **Maarja Merivoo-Parro** in recognition for her professional coverage of science topics in Estonian media channels.

The Grand Prize for the Communication of Sciences and Technology via Audiovisual and Electronic Media was awarded to **Tiiu Rööp** who has edited and hosted more than 455 science communication radio programmes over the past nine years. The second prize was awarded to the Estonian Health Museum's podcast ***Sünaps*** (host **Kent Joosep**).

The Grand Prize for the Communication of Sciences and Technology via the Printed Word was awarded to the book ***Viguriga kaardid – Eesti kujutatuna kaartidel (Maps with a Twist – Estonia Depicted on Maps)*** (led by **Taavi Pae**). Second prize was awarded to the '**Elementaarne!**' series of articles in *Õhtuleht*, written by EYAS scientists (project leader and member of EYAS, **Marju Raju**, editor **Katrin Roht**). A letter of appreciation was issued for the higher education textbook ***Rakubioloogia (Cell Biology)*** in recognition of its Estonian-language science vocabulary (compiled and edited by **Sulev Kuuse** and **Toivo Maimets**).

The Grand Prize for Activities and Series of Activities Communicating Sciences and Technology was awarded to the girls' technology group HK **Unicorn Squad** (project leader **Liis Koser**, idea initiated by **Taavi Kotka** and **Kerstin Kotka**). The second place prize was awarded to **Kadrina Upper Secondary School/CADrina** for the communication of an engineering technical way of thinking (**Krõõt Nõmmela-Mehide**, **Holger Bremen**, **Kristi Aimla-Maripuu**).

The Grand Prize in the category 'New Initiative in Science and Technology Communication' was awarded to **Praktikal Education** (executive manager **Omari Loid**, co-founders **Kaido Reivelt**, **Eva Pedjak**, **Oleg Shvaikovsky**). The second prize was awarded to **Tõrva Astronomy Club** (co-founder, leader and hobby astronomer **Taavi Niittee**). A letter of appreciation was issued to the **People's Observatory** (leader **Vladimir Goman**).

The prize fund of the contest was 35,500 euro. Everyone who has received the award at the contest has the right to use the sign 'Nationally Recognised Science Communicator' in their communication.

Photo: EEstonian Research Council

From the left: Chancellor of the Ministry of Education and Research Kristi Vinter-Nemvalts, Aare Baumer and Academy member Ene Ergma at the presentation of the awards.

L'ORÉAL-UNESCO BALTIC SCHOLARSHIP

In 2023, the 7,000-euro scholarships of the L'Oréal-UNESCO Young Talents Baltic programme 'For Women in Science' went to **Dr Triin Laisk**, who is studying the pharmacogenetics of hormonal contraceptives, and **Kertu Liis Krigul,** who is studying the links between antidepressant use and antibiotics resistance**.**

Associate Professor of Genomics and Reproductive Genetics at the Institute of Genomics of the University of Tartu and a member of the genomic epidemiology workgroup at the Estonian Biobank **Dr Triin Laisk** is studying to what extent human genetics influence the risk of side effects of hormonal contraceptives.

"Although it is known that human genetics influence the effect and possible side effects of medical products, such studies have to date been conducted with regard to hormonal contraceptives. However, information about genetic predispositions can be used to predict the risk. This is why I want to study how the side effects experienced by the users of such contraceptives are linked to genetics. This information provides a good input into personal medicine and will make it possible to choose the most suitable preparation for each woman, depending on their genetics," Dr Laisk explained.

In her research, Junior Research Fellow in Microbiomics at the Institute of Genomics of the University of Tartu and member of the microbiome research group at the Estonian Biobank **Kertu Liis Krigul** focuses on how the use of antidepressants may affect gut microbiomes and their resistance. The research support will allow her to expand her current area of research, adding the analysis of antimicrobial resistance genes.

"Antimicrobial resistance means that antibiotics are no longer effective against bacterial diseases. This is one of the ten greatest health risks in the world; therefore, it is important to determine the factors that affect resistance,

Triin Laisk.

Photo: Kaupo Kikkas

Kertu Liis Krigul.

Photo: Kaupo Kikkas

Photo: Karolin Köster

For the first time, the recognition event was held in Estonia, in the house of the Academy of Sciences on Toompea.[67]

67 https://www.youtube.com/watch?v=PoI8mlN2Ld4

in order to find ways to resolve the problem. My aim is to study how the use of antidepressants affects the spread of antimicrobial resistance genes in the gut and to determine whether the changes caused might be permanent. I would like that we should use as much medicine as is necessary, but at the same time as little as possible in order to prevent their long-term effects both on health and the surrounding living environment," said Krigul.

The L'Oréal-UNESCO Young Talents programme 'For Women in Science' is the only programme in the Baltic region that supports the professional development of female scientists and the achievement of goals that are important for them. The programme is implemented in cooperation with the Estonian Academy of Sciences and the UNESCO Estonian national committee. The Baltic programme has evolved from the global 'For Women in Science' programme, which was created in cooperation between UNESCO and L'Oréal in 1998 with the aim of increasing the number of female scientists and promoting gender equality in the world of science.

THE LINDAU MEETING 2023

From Estonia, 5th course student of the Faculty of Medicine of the University of Tartu Brita Laht and Research Fellow in Human Physiology at the Institute of Biomedicine and Translational Medicine of the University of Tartu Kattri-Liis Eskla attended the Lindau Nobel Laureate Meeting held from 25 to 30 June 2023.

The 72nd Lindau Meeting was dedicated to medical science and physiology. Thirty-nine Nobel laureates and computer scientist Shwetak N. Patel, who received the 2018 ACM Prize in Computing, participated at the event. More than 600 young scientists from across the world came to meet the laureates, in order to exchange knowledge, ideas and experience.

Photo: private collection

The impressions of Brita Laht and Kattri-Liis Eskla from the meeting are available on the Academy's website.[68]

68 https://www.akadeemia.ee/lindau-kohtumisel-nobelistidega-osalesid-brita-laht-ja-kattri-liis-eskla (in Estonian).

Photo: private collection

Eskla Brita Laht (on left) and Kattri-Liis Eskla on Mainau Island.

A dinner with Nobel laureate William Kaelin Jr., who received the Nobel Prize for the discovery of how cells respond to changes in oxygen levels in the environment at a molecular level. Kattri-Liis Eskla got to hold his Nobel Prize medal.

Photo: private collection

Brita Laht (on right) and Kattri-Liis Eskla at the Bavarian dinner.

The Lindau Meetings have been held since 1951, with the theme alternating between the three Nobel Prize scientific disciplines – physics, chemistry or physiology/medicine. The Estonian Academy of Sciences supports the attendance of the young Estonian scientists invited to Lindau. The lectures, panel discussions and young scientists' presentations are available for viewing on the website of the Lindau Meetings.[69]

Photo: private collection

A walk with Michael Young who received the Nobel Prize for the discovery of molecular mechanisms that regulate circadian rhythm.

69 https://www.mediatheque.lindau-nobel.org/meetings/2023

THE ππ-PRIZES – SPECIAL PRIZES OF THE PRESIDENT OF THE ACADEMY OF SCIENCES AT THE NATIONAL SCIENCE CONTESTS FOR HIGH SCHOOL AND UNIVERSITY STUDENTS

National science contest for highschool students

Since 2015, the Estonian Academy of Sciences has granted the Academy President's special prizes, or π-prizes, for a promising start of the scientific path at the national science contest of high school students. The winning research projects were selected by Academy members Jaak Järv, Kalle Kirsimäe, Agu Laisk, Valter Lang, Peeter Saari and Elmo Tempel.

In 2023, the Academy prizes went to three 12th grade students.

The 1st prize of π × 200 euros (628.32 euros) was awarded to 12th grade student of Hugo Treffner Upper Secondary School **Leene Pärtel** for 'The biodiversity of plants in 20th century Estonian paintings' (supervisor Ott Maidre). Academy members pointed out that a taxonomic analysis of the plant species depicted in the paintings of Estonian artists allowed the author to make interesting generalisations both about changes in biodiversity and changes in the views and ideologies prevalent in society over the 20th century. It was a unique paper which combined different aspects of the humanities with social and environmental sciences.

The 2nd prize of π × 150 euros (471.24 euros) went to 12th grade student of Hugo Treffner Upper Secondary School **Kristiine Kaldmaa** for 'The link between language use and the results of mathematical problems on the basis of the state examinations of 2014–2021' (supervisors Julia Polikarpus and Kati Ain). The paper showed that the level of success in solving mathematical problems also depends on how the problems have been formulated. As research into the use of language in the texts of learning tasks has been scarce to date, these research results deserve serious attention from examination organisers.

The 3rd prize of π × 100 euros (314.16 euros) went to 12th grade students of Nõo Upper Secondary School of Sciences **Annette Bogdanov** for 'Looking for historical supernovas on digitised photographic plates' (supervisors Taavi Tuvikene and Peet-Märt Irdt). The author was looking for previously undiscovered supernovas on the digitised photographic plates of hundred-year-old photos of the starry sky. She discovered five previously undescribed supernova candidates in the galaxies of the Virgo Cluster. Photographic plates from other databases need to be checked for ultimate identification and mapping of these candidates.

Photo: Johanna Adojaan

The prizes were handed over by the Academy's Secretary General Jaak Järv at the awards gala of the contest. From left: one of the supervisors of Annette Bogdanov's research, Research Fellow at the Tartu Observatory of the University of Tartu Taavi Tuvikene, Annette Bogdanov, Leene Pärtel, the supervisor of Leene Pärtel's research Ott Maidre, and Jaak Järv.

National science contest for university students

From 1994 to 2015, the Estonian Academy of Sciences held a science contest for university students. This was discontinued in 2016 when the Academy President's special prizes – the π-prizes – were transferred to the portfolio of the national science contest for university students. In 2019, the Academy's Constitutional Law Foundation prizes were also added to the national contest portfolio.

The committee of the national science contest for university students comprises Academy members Marco Kirm and Lauri Mälksoo, who are supported by various colleagues in selecting the best research papers. In 2023, the Academy President's special prizes were awarded to three university students and the Constitutional Law Foundation prizes to two university students.

The special prize for the most elegant student paper, π × 1,500 euros (4,712.39 euros): **Mihkel Kree** (Aix-Marseille University) for the doctoral thesis 'The Principles of Mixing: Emergence of Correlations'.

The study of the problems of liquids mixing in turbulent flows exceeds the criteria of an ordinary doctoral thesis by both content and volume and is worthy of a high-level scholarly monograph. The comprehensive experimental and theoretical approach to the topic adds elegance to the paper. The author applies general methods to a number of phenomena, such as the emergence of raindrops in clouds. With elegant experimentation, Kree has studied mixing in liquid flows in a porous environment formed of spherical particles, matching the refractive indices of the liquid and the particles. As a result, the author has for the first time achieved a visualisation of the dynamics of mixing in such an environment, which was published in renowned journal Physical Review Fluids. Liquids move turbulently in many natural and technological processes, but theoretically describing this is difficult. Although the thesis is mainly a summary of fundamental research, various practical applications can be foreseen for the results – also outside the problems of turbulent flows. The author himself has demonstrated the usability of the results in describing the spread of optical fields. Describing the role of turbulence in the formation and subsequent growth of droplets in clouds – which may lead to the occurrence of rain – is an excellent result and might be of interest in environmental and atmospheric sciences, particularly at a time when attention to environmental processes has notably increased.

The special prize for an unconventional student paper, π × 1,000 euros (3,141.59 euros): **Lisabeth Hint** (Viljandi Culture Academy of the University of Tartu) for her master's thesis 'Educational material integrating mathematics and music for the 1st grade'.

Photo: Edmond Mäll

At the awards ceremony on 12 December, the President's special prizes were presented by Academy member Jüri Engelbrecht, who is in the photo with Mihkel Kree.

Photo: private collection

Lisabeth Hint.

The study has a clear and theoretically reasoned practical educational objective which the author has superbly achieved, creating functional educational material for integrating mathematics and music in the 1st grade of a general education school. These two subjects have never before been integrated in such an unconventional symbiosis in Estonia. The fact that Lisabeth Hint is both the author and the arranger of the lyrics and melodies adds an aspect of extra creativity to the paper.

The author has managed to achieve a balance between age-appropriateness and preserving her own musical style. The high-quality music has been recorded with professional musicians and the songs are performed by children. The songs have great animations and are relevant considering the target group of the educational material. Thanks to the multi-faceted nature of the material, the results of the master's thesis can easily be used by primary school teachers in their work. Those who can read sheet music can learn and teach the songs by note. Those who do not read sheet music can use the audio files and the animations for singing along and watching. The theoretical part of the paper is in good proportion to the needs of the practical part.

The special prize for a student paper of auspicious scintillating sparks, π × 500 euros (1,570.80 euros): **Sergei Poljatšihhin** (University of Tartu) for the bachelor's thesis 'Analysis of the production '100% Narva' from the viewpoint of political theatre'.

In this paper, which is remarkable from the viewpoint of Estonian society and theatre science, the author has analysed a production staged in cooperation between the German theatre troupe Rimini Protokoll and the Estonian theatre and performance arts centre Vaba Lava in 2022. This involved about 100 citizens of Narva who represented a statistical cross-section of the population of the city. On stage, the performers/actors spoke about their life and fleetingly also touched upon their political views.

The paper discusses important topics, such as the integrated nature of art and politics, the possibility of communicating politics through art, the matter of community-specific art and the role of the Russian community in Estonia. The author has taken into account the political theatre context (Narva city and community) and the format of the production, i.e. the tools with which theatre can be political. The analysis is multi-faceted and not limited to just one or two attributes of political theatre. In the performance, participants have been presented as a politically-engaged protesting community. Such thorough student papers on sensitive topics will ideally contribute to social dialogue: how to understand the Russian community in Estonia and on what bases is communication possible? These topics have been addressed in a balanced and in-depth manner, avoiding hasty conclusions – as is apt for sound science.

Sergei Poljatšihhin and Jüri Engelbrecht.

Photo: Edmond Mäll × 2

The Constitutional Law Foundation prizes were handed over by the Executive Officer of the Foundation Kerdi Raud who is in the photo with Daniil Bardõbahhin.

The special prize of the Constitutional Law Foundation of the Academy of Sciences was awarded to two student papers.

Daniil Bardõbahhin (University of Tartu) received a 1,500-euro prize for the bachelor's thesis 'The relevance of a regulatory act in constitutional review matters initiated by a court of first or second instance'.

The objective of the research paper was to determine the boundaries of the relevance of a regulatory act in constitutional review matters initiated by a court of first or second instance. The author analysed all the constitutional review judgments of the Supreme Court in which the constitutionality of a regulatory act was checked. The paper addresses a topical matter which has not been sufficiently studied in Estonian legal literature, and creates a good starting point for further researching constitutional law in his master's studies.

The second special prize of the Foundation in the amount of 2,200 euros was awarded to **Katariina Kuum** (University of Tartu) for her master's thesis 'Constitutional review of legal provisions related to European Union law'.

The contest paper addresses a disputable matter in the applicable constitutional law, which has until now not been thoroughly covered: to what extent is it possible to perform a constitutional review of Estonian national legal provisions that are related to European Union law. As the author shows in her paper, the practice of the Supreme Court as the court of highest instance in Estonia, and thereby the practice of the court of constitutional review, has been inconsistent. This has allowed several different interpretations. Full clarity – as the author reasons – is also not provided by a judgment of the Supreme Court *en banc* of 15 March 2022, prior to which the Constitutional Review Chamber of the Supreme Court applied for a preliminary judgment from the European Court of Justice in 2019. The paper is written well and provides a good overview, including the author's clearly formulated and well justified criticism of the Supreme Court.

Photo: Edmond Mäll

Kerdi Raud and Katariina Kuum.

TT-PRIZES

The monetary amount of the President's special prize is not a mere round figure. In our indicator-based world, figures often tend to dominate over substance – be it an impact factor of a magazine, a university's place in a ranking list or the number of citations. Although such figures also have their place, the Academy considers it important to preserve the ability to see beyond the figures, to notice something that is currently unmeasurable but may be a part of our future. It is as important to be able to think outside of the box, to do something that pokes the boundaries of our present existence. That is where the criteria come from which the Academy intends to keep alive with the science contest for university students: elegance and unconventionality as aspects which unmeasurably add value even to very good science.

As a combination of these concepts, two special prizes are awarded at doctoral and master's degree level: one for the most elegant student paper and the other for an unconventional student paper. When speaking of obtaining new knowledge, we often use the metaphor of bringing something to light. This is why a special prize for auspicious scintillating sparks is awarded at the applied higher education and bachelor's degree level.

At the science contest for school students, the Academy highlights school students whose works shine with a promising beginning for a future path as a scientist. The figure π (Pi), which is the basis of the prize amount, reflects a lot more than its basic definition or any near value. This kind of figure simultaneously expresses both the immense wealth of knowledge of the academic world and the unmeasurable amount of things we do not know.

Photo: private collection

Ülo Reimaa.

Photo: private collection

Angela Peeb.

ESTONIAN ACADEMY OF SCIENCES FOUNDATION

The aim of the Estonian Academy of Sciences Foundation, established at the Estonian National Culture Foundation in 2006, is to support the research work of young Estonian researchers with doctoral degrees. Since 2009, the Tiit Talpsep[70] scholarship has supported the research of master's and doctoral students in the field of molecular microbiology and virology. The new sub-foundation of the Estonian National Culture Foundation was established with the Academy's donation of 400,000 Estonian kroons which came from the sale of the Academy's summer house on the island of Vormsi. Academy member Mart Ustav also contributed a notable amount. The Academy also invites other organisations, companies, institutions and individuals to cooperate, in order to contribute to Estonia's economic, social and cultural development now and into the future by supporting top-level knowledge, research and young scientists. The scholarships are awarded by the Administrative Board, comprised of Academy members Mart Ustav, Leo Mõtus, Jaan Ross and Peeter Saari.

In 2023, scholarships were awarded to two young scientists.

Research Fellow in Algebra at the Institute of Mathematics and Statistics of the University of Tartu **Ülo Reimaa** received a 3,000-euro Young Scientist Scholarship to support his research. Ülo Reimaa is a young Estonian mathematician with one of the broadest and most creative views, whose interests and research in algebra and category theory are closely intertwined with computer science. Ülo Reimaa's scientific interests and perspective are closest to applied category theory, which is currently topical in several sub-areas of computer science.

Doctoral student of molecular and cell biology at the University of Tartu **Angela Peeb** received a 1,500-euro Tiit Talpsep Doctoral Student Scholarship to support her studies. Angela Peeb has participated in the research projects of the Institute of Molecular and Cell Biology of the University of Tartu since 2015. Since 2017, she has made a contribution to the workgroup of environmental microbiology and biotechnology, where she has mainly focused on studying the biodegradation of compounds released to the sea as a consequence of oil pollution and the related microbe communities in the Arctic and the Baltic Sea.

70 Tiit Talpsep (22.01.1954–26.02.2008) was an Estonian biologist, a specialist in applied molecular biology. The Tiit Talpsep memorial scholarship fund was founded thanks to a monetary donation by Academy member Mart Ustav.

RESEARCH PROFESSORS OF ACADEMY

The positions of research professors at the Academy of Sciences were established in 2002 for scientists who are internationally recognised in their chosen field, to give them time to focus on research and the supervision of young researchers. The new statutes of research professors from spring 2022 have established the option of selecting thematic research professors for the Academy.[71]

Below, four thematic research professors elected in 2023 talk about the content of their research.

STUDIES OF CLIMATIC FACTORS AND BIOAEROSOL IN THE ARCTIC

Heikki Junninen, Research Professor in Arctic studies

Climate change has already extensively affected ecosystems. In the Arctic in particular, we are seeing major changes, such as shrinking sea ice cover and record high annual temperatures.

The effect of increased CO_2 in the atmosphere clearly dominates over other climate warming factors. On the other hand, aerosol particles suspended in the atmosphere cool the climate. Unfortunately, however, recent studies have shown that their cooling effect is smaller than originally thought. Aerosols are still the biggest puzzle in the assessment of climate change factors. We know that aerosols are released into the atmosphere as direct or indirect emissions. We also know that the formation of new aerosol particles is the main natural source of water vapour condensation nuclei and cloud formation. At present, we cannot yet reliably predict the role of aerosols in this process, so the formation and growth of particles suspended in the atmosphere is an exciting and important area of research.

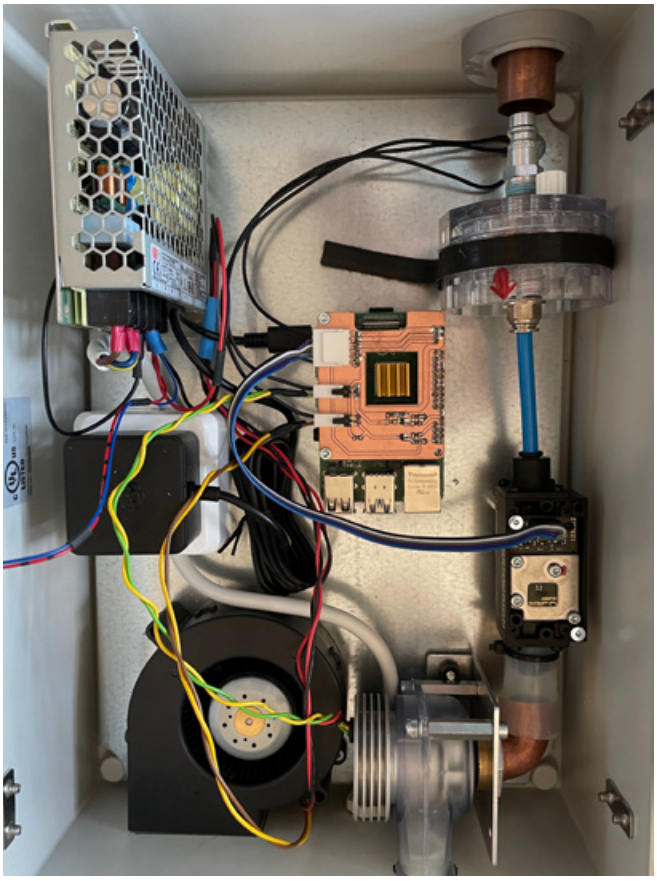
The atmosphere in the Arctic contains far fewer biogenic organic compounds than in our latitudes. Sulphur and iodine compounds are the main drivers of particle formation. The main challenge lies in the detailed *in situ* determination of the physicochemical properties of newly formed aerosol particles. In the 'Studies of climatic factors and bioaerosol in the Arctic' project, we use data collected from several measuring stations in the Arctic and compare them with data from Estonian and Finnish stations. In addition, we are complementing the dataset with bioaerosol measurements. Bioaerosol refers to aerosol particles released directly into the air from biological processes and used by living organisms to extend their distribution area – for example, pollen and fungal spores. A sample of bioaerosol collected from the atmosphere can be used to determine the species present. The study of airborne spores is also important in determining the blind spots in fungal ecology. In particular, very little is so far known about fungal dispersal ecology, in particular about long-range dispersal efficiency and its dependence on air currents.

The project can only envisage the development of a methodology and the short-term collection of aerosol

71 Read more in the Estonian Academy of Sciences Yearbook 2022. Annales Academiae Scientiarum Estonicae XXVIII(55). Tallinn, 2023, https://www.akadeemia.ee/en/publication/estonian-academy-of-scieences-yearbook-2022-xxviii-55, p 59.

Photo: Krista Tamm

Heikki Junninen speaking at the Academy of Sciences' Research Professors Conference on 12 December 2023.[72]



Bioaerosol collection device developed for the project.

Photo: Heikki Junnine × 2

Bioaerosol collector testing at the SMEAR station in Järvselja.

samples at a measuring station in the Arctic to test the method. The corresponding equipment is currently being tested at the SMEAR (Station for Measuring Ecosystem-Atmosphere Relations) Estonia station in Järvselja.

The main aim of this relatively small project is to increase the share of Arctic research in Estonia and use the research as a platform for participation in upcoming European Union projects. A successful example of this is the recent approval to join the Horizon Europe project GreenFeedBack[73] as a new partner. GreenFeedBack focuses on assessing greenhouse gas fluxes and their impacts in the Arctic, using data from the Integrated Carbon Observation System (ICOS) and SMEAR station networks.

72 https://www.youtube.com/watch?v=137Vat_Dr3Y&list=PL-JE7FT-nu-UDFKcE--46yv2NALhJZ0XaNI&index=7 (in Estonian).

73 https://eu-greenfeedback.com/

Photo: Lauri Laanisto

The sval.no test site of the NutNet meta-experiment in Spitsbergen. Piia Jaksi and Petr Macek conducting their annual vegetation coverage analysis.

LONG-TERM STUDIES OF ARCTIC VEGETATION IN SPITSBERGEN

Lauri Laanisto, Research Professor in Arctic studies

The project, for which I was awarded a thematic research professorship from the Academy of Sciences in the summer of 2022, is titled 'A long-term fertilisation experiment in Spitsbergen: taxonomic and functional changes in vascular plants and cryptogams, comparing local and global factors'. As the title suggests, this is a long-term experiment. The site was selected and measured in 2016 and the experiment will hopefully continue there for many years to come.

This experiment, which is taking place on the shores of Petuniabukta Bay in Spitsbergen, about 5 km northeast of the town of Pyramiden, is actually just one part of a global meta-experiment (experiment using the same methodology around the world) called the Nutrient Network (NutNet).[74] It currently consists of around 160 experimental sites in grasslands and it investigates the relationship between vegetation productivity, or biomass growth, and biodiversity. Each site consists of thirty 10 × 10 m test quadrants with a total of eight different fertilisation treatments. Every summer, a vegetation analysis is carried out in the quadrants: plant species and their coverage are recorded in each permanent quadrant, and biomass samples are collected and divided into sub-samples according to functional groups of plants. In addition, each year there are a few additional experiments aimed at studying the above-ground or below-ground functional traits of plants, soil micro- and macro-biota, etc., which provide further information on how the ecosystem functions. This project has no deadline.

Very few long-term experiments have been carried out to investigate taxonomic and functional changes in polar plant communities. Practically no experiments have been carried out to compare the processes described above in ecosystems in other climate zones in polar areas. On the one hand, such comparisons provide an insight into how these processes are different in the polar regions compared to the rest of the world. On the other hand, it allows us to explain more convincingly why the Arctic is becoming green and to predict possible future developments.

With the support of the Ministry of Foreing Affairs channelled through the Estonian Academy of Sciences, I visited Spitsbergen with a team of four people (besides myself, Kristiina Mark, Piia Jaksi and Petr Macek, all from the Estonian University of Life Sciences) for fieldwork in two summers, in July 2022 and 2023. In addition to the NutNet experiment, we conducted fieldwork as part of several other similar global meta-experiments.

Photo: Marcin Winowski (AMU.edu.pl)

Two polar stations in Petuniabukta. On the left is the Nostoc polar station of the University of South Bohemia in České Budějovice and on the right the Petuniabukta polar station of the Adam Mickiewicz University in Poland.

74 http://nutnet.org

Photo: Krista Tamm × 2

Lauri Laanisto[75] and Andrey Makarychev[76] presenting their research at the Research Professors Conference on 12 December 2023.

NEW ANALYTICAL FRAMEWORK FOR RESEARCH ON RUSSIA

Andrey Makarychev, Research Professor in Russian studies

My focus is on how the war in Ukraine makes the research community reconsider previous assumptions of Russia's security policies, and think of novel approaches to study the insecurities produced by Russia. I am critically reviewing the academic legacy that has prevented most opinion leaders and researchers from both predicting and considering as a serious possibility the full-scale war that Russia unleashed against Ukraine, despite previous Russian interventions in Chechnya, Georgia and Syria.

Russia's full-fledged military invasion in Ukraine took both politicians in many countries and experts by surprise who, for many years after the end of the Cold War, grew confident in the growing mutual dependence between Russian and European economies, and in the changing function of borders – from dividing to connecting. Most scholars overlooked the aggressive potential inherent in the seemingly innocent calls of the Russian leadership for accepting multipolarity in the world. The ability of Ukrainian society and the Ukrainian Armed Forces to effectively resist the aggression was also a surprise to many. All of this means that there are significant gaps in current research perceptions, which need substantial rethinking.

Against this backdrop, a research professorship has two goals. First, I would like to decipher the 'mental maps' that guide the instigators of the war in the Kremlin. Within this framework, understanding that the Russian leadership has never acted within the logic of a nation state in the established sense of the word is of huge importance. Knowing this, we need to better understand the security implications of the concept of Russian sovereign power: from a stabiliser of the political system in the early days of Putin's rule, sovereignty has become a tool through which the Kremlin coerces and controls to a far greater extent than it administers, manages and governs.

Second, I would like to rethink some of the previous presumptions that were central for Western research on Russia. One of them relates to ever increasing academic efforts to decolonise our knowledge of the former Soviet Union. We have to avoid the trap set for us by Russia's position and the viewpoints of Russian experts about countries in Central Asia or Southern Caucasus.

Such adjustments of meaning can be used as the basis for new approaches to the study of Russia in a broader security context. We cannot give an exact answer as to why Russia chose first to imitate Europe, and then to distance itself from it instead of partnership and integration. But we can show and describe how Russia went through this trajectory, which many preferred to ignore and which the war against Ukraine highlighted with perfect clarity.

75 https://www.youtube.com/watch?v=GBQjlvc-ATU (in Estonian).
76 https://www.youtube.com/watch?v=n-W_1w7Tj8o

LANGUAGE ATTITUDES OF RUSSIAN-SPEAKING PARENTS IN THE TRANSITION PROCESS TO ESTONIAN LANGUAGE BASED STUDIES

Birute Klaas-Lang, Research Professor of the Estonian language and its teaching

My research professorship at the Academy of Sciences examines the transition to Estonian language based studies from the perspective of Russian-speaking parents. Parents and the family as a whole are an important source of support and motivation for learners in the process of learning Estonian. The behaviour of parents coupled with their example and supportive attitudes towards the necessity of the language being learnt and their child's success in language learning and language attitudes are therefore directly related.

Photo: Ruudu Rahumaru

Birute Klaas-Lang.

Photo: Irene Käosaar

Birute Klaas-Lang and Kristiina Praakli at a meeting with parents at the Narva State Upper Secondary School on 30 August 2023.

Previous studies of the attitudes of Russian-speaking parents show that only 17 per cent of the population of another nationality support their child's education in a school with only Estonian as the medium of instruction.[77] While the results show that a large proportion of Russian parents have a negative attitude towards the transition to Estonian-based studies, they do not answer the question of what is behind this attitude. The results do not reveal the underlying causes of the parents' fears and concerns, and it is therefore not possible to offer solutions to these fears and concerns.

Together with my colleagues Kristiina Praakli, Associate Professor at the University of Tartu, Junior Research Fellow Diana Vender and master's degree student Alina Schmidt, I have met with parents at discussion evenings at Russian and Estonian-Russian bilingual kindergartens and schools in Tartu and Ida-Viru County to examine the fears and problems related to the transition from the parents' point of view, and also to find solutions to the problems raised by the parents. In this way, we are also testing the possibilities of inclusive language policies and trying to ensure a supportive foundation for the transition process among Russian parents. The sample includes three schools and two kindergartens in Ida-Viru County and two schools and three kindergartens in Tartu. In total, more than 200 parents in Tartu and the same number in Ida-Viru County participated in these discussions during 2023.

Based on the data collected in 2023, we can say that the attitudes of parents towards the value of the Estonian language differ significantly in Tartu and Ida-Viru County. While Russian-speaking parents in Tartu acknowledge the necessity of Estonian language skills, in Ida-Viru County, due to the lack of an Estonian language environment, the necessity and motivation to learn the national language is questionable. Parents in Tartu are worried about the loss of their child's Russian identity, native language skills and a sense of their own culture when it comes to Estonian language based studies. For parents in Ida-Viru County, these concerns do not exist. In both regions, the parents' main concerns are related to the objectives and time schedule of the transition to Estonian-based language studies, the quality of general education, and a significant increase in the child's study load and the parents' workload. The latter concern is based on the parents' perception that a child's success at school is largely the responsibility of the family.

Birute Klaas-Lang's presentation at the Research Professors Conference on 12 December 2023 can be watched on Youtube.[78]

77 Integration Monitoring 2020, 19–21, https://www.kul.ee/eesti-integratsiooni-monitooring-2020 (in Estonian).

78 https://www.youtube.com/watch?v=U-9tcdeTg3U&list=PL-JE7FT-nu-UDFKcE--46yv2NALhJZ0XaNI&index=8 (in Estonian).

INTERNATIONAL COOPERATION

SCIENCE DIPLOMACY IS MUCH MORE THAN SCIENCE IN DIPLOMACY

Based on the remarks of Tarmo Soomere to the 1st European Science Diplomacy Conference[79]
Madrid, 18–19 December 2023

The meaning and perspectives of science diplomacy are radically different for different players and players of different sizes. In this regard, Estonia is in a perplexing position, being small in size and population but strong in science and having a challenging and inspiring location at the crossroads of history. It is a feature of our times that more and more of the major challenges are international in nature and that science and its applications are part of the curse as well as the cure.[80] This situation makes it imperative to contribute to the shaping of what science diplomacy is today and how the role of scientists in science diplomacy and the perspective of the entire endeavour can be framed from the viewpoint of a small country.

There is also a delicate (im)balance between the demand and supply sides in science diplomacy. These aspects were nicely linked at this conference by Mr Stephen Quest.[81] Estonia and the Estonian Academy of Sciences mostly represent the supply side. In essence, filling this side with ideas and people is one of the ways in which science can serve society.

Photo: https://eu-science-diplomacy.service-facility.eu

The panel discussion of the Conference 'Making European diplomacy more strategic, effective and resilient through scientific evidence and foresight', with the participation of Tarmo Soomere.

On the one hand, the conference has demonstrated a brilliant set of examples of how science diplomacy could work. On the other hand, a couple of paradoxes were also depicted. This situation probably requires the attention of mathematicians, who, like me, cannot resist the temptation to reduce problems to first principles. In social sciences, doing so is often called deconstruction. At least in essence these approaches are very similar.

79 https://eu-science-diplomacy.service-facility.eu/en/streamingdecember-firstday, https://eu-science-diplomacy.service-facility.eu/en/streaming-decembersecondday

80 Turekian, V. 2018. The evolution of science diplomacy. Global Policy, 9(S3), 5–7, doi: 10.1111/1758-5899.12622

81 Director-General of the Joint Research Centre (JRC) at the time of conference, Director-General of the Directorate-General for Human Resources and Security (HR) of the European Commission from 1 April 2024.

The supply side of science diplomacy is the community of researchers; more generally, the worldwide academic ecosystem. There are roughly 9 million scientists worldwide, plus supporting staff. This is the second largest highly connected group of people, after global religious congregations. The connectivity in the academic ecosystem is created first of all from scientists sharing the same basic principles all over the world. The basic principle of this connectivity is that facts and logic have priority over, for example, friendship or political interests. Moreover, the same values of research integrity and ethics are maintained in the scientific community all over the world.

On the one hand, it is important to stress that the scientific community is not necessarily more rational than other communities, as research has shown. On the other hand, and equally importantly, extensive ways of communication have made this community much stronger and much faster connected than any other similarly sized community. Sharing these values and functioning as a whole is happening all the time just by engaging in science either together or in parallel in the world. The presence of common values is an inevitable feature of science. This implies that science is a massive channel of soft power that is not only able to but is actually changing the world. This potential of science is totally underexploited. Moreover, it is likely that this underexploitation is one of the reasons why misinformation or fake news are spreading so extensively.

Estonia is not simply a small country. It is a very small country. You need a microscope to locate it on a globe. Estonia has an even smaller Academy of Sciences. It may even become the second smallest Academy in the European Union (EU) in the future. This may happen quite soon in fact, if Montenegro joins the EU.

A small country has little financial power to affect the world, any global economic power or any global military power. But those who are small in mass can be great in spirit. This is a kind of two-way street. We learn from and contribute to global science. In this sense, the participation of small countries in science and in (science) diplomacy follows the main principle of the EU: one country, one vote, even though size sometimes does matter in the EU.

The Estonia Academy of Sciences is extremely active in all European and international global academy networks. We massively contribute also to science advice, from EASAC (European Academies' Science Advisory Council) to SAPEA (Science Advice for Policy by European Academies). This way, our Academy's competences are very much used in science advice for policy systems.

However, one channel is really underused. This is channelling crucial information across some boundaries. By this I mean knowledge and messages that cannot be communicated between diplomats of different countries.

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There are some messages that need a significant amount of knowledge and experience to understand. I refer here to Bertrand Russell, who has said, indelicately and undiplomatically: A stupid man's report of what a clever man says can never be accurate because he unconsciously translates what he hears into something he can understand.

Many scientific messages are far too complicated to communicate outside of the scientific community. Such messages, however, can be communicated to scientists in another country in a much more complete form than to society. Since each country tries to cover the entire spectrum of science, we have a recipient in almost every country.

The problem starts when complicated facts need to be communicated. As you all know, facts have three basic properties. They are negative, they are pessimistic and they are unpatriotic. We know that. Our fellow scientists in other countries also know that. We have to communicate such facts to our government and to the European Commission. Scientists in fellow countries inevitably do the same. It is much easier to reach a mutual understanding between fellow scientists compared to more sophisticated diplomatic channels.

This sort of communication depends also on the geographical position. The belt of countries from Nordkapp (North Cape) down to the Black Sea has for a long time been considered at the periphery of Europe. In the changed world since 24 February 2022, these countries are now on the front line.

Moreover, they are at the fore in the battle of values. This is a challenge to which we cannot offer a full solution, but at least some arguments. Many scientists in these countries and many members of their Academies of Sciences were actually trained in Russia (even though it's very undiplomatic to say it today). They lived in Soviet conditions under Soviet rule for decades. They understand the message between the printed lines. Remember Peter Drucker, who said that the most important things are those which have been unsaid.

Madrid Conference participants.

These countries and their scientific communities and Academies are now embedded into the European research landscape. Some of them most successfully. This knowledge is concealed in those research communities and is almost completely untapped. The value of their carriers as brokers or expert knowledge providers, or even ambassadors, you name it, is sometimes vaguely recognised, but never really harnessed.

In this context we do have a plan in small Academies in Estonia, Latvia and Lithuania and in some other Academies. Almost like guerrillas, we try to organise at least local cooperation between the most experienced people in this context in the area. We try to organise annual meetings of various European-wide and global Academy networks in the so-called former Eastern European countries. In this way, we try to build bridges to their academic communities. The decolonisation of science is not only a process that should happen between the global North and global South of science. We have a similar gradient in Europe – but it's just in the East-West direction. The goal is simple and transparent: the integration of the research community and smart and experienced people in the Academies in this belt is one of the major challenges that could boost science diplomacy within the meaning that is being pursued by European Commission now.

EUROPEAN SCIENCE ADVICE FORUM (ESAF)[82]

President of the Estonian Academy of Sciences Tarmo Soomere handed his position as Chair of ESAF over at the forum's 9th annual meeting, which was held in Timişoara, Romania, on 11–12 September 2023 and organised by the Estonian Academy of Sciences in cooperation with the West University of Timişoara. At the meeting, the participants were given an overview of the Romanian science system and its funding and challenges, as well as the system of giving the scientific advice in Romania. Several members of the Forum provided an overview of the system of science advice in their countries along with any changes that have taken place and the related challenges. The representatives of the European Commission presented the Commission's vision with regard to scientific advice and its expectations for the ESAF. The most important discussions involved the future of the forum and the amendment of the basic documents, which were drafted in 2016 and have since become somewhat obsolete. At the end of the annual meeting, President of the Research Council of Italy Professor Maria Chiara Carrozza was elected as the new Chair of ESAF.

82 http://esaforum.eu

Photo: Dragoș Irimia x 4

Tarmo Soomere.

Host of the meeting, Professor Mădălin Bunoiu from the West University of Timişoara, Romania.

New Chair of the ESAF, President of the Research Council of Italy Professor Maria Chiara Carrozza.

Annual Meeting participants.

SECOND WORKING YEAR OF THE ESTONIAN ACADEMY OF SCIENCES AS THE CHAIR OF THE EUROPEAN ISC MEMBERS

Erle Rikmann, Secretary of the European ISC network

At the end of 2021, the Estonian Academy of Sciences was elected chair of the European members of the global science organisation International Science Council (ISC). Estonia will direct the work of the European ISC Members until the end of 2024.

2023 was a busy year for the ISC on several fronts. Reorganisations continued to include a broader circle of scientists in the activities of the Council, which paid particular attention to empowering scientists from developing countries and crisis regions. At the intersection of science and politics, the ISC aims to act as a catalyst for change, concentrating expert scientific knowledge, formulating policy recommendations and speaking in matters that are important for both science and society.

In May 2023, a science symposium was held as a mid-term meeting of the ISC in Paris, France, and this focused on possible synergies between scientists of different regions, their organisations and various scientific disciplines. As the Chair of the European ISC Members, Tarmo Soomere presented the interests and common challenges of European scientists.

During Estonia's presidency, the main activities of the European ISC Members have been focused around three umbrella topics. First, the representation of the interests of European research institutions and scientists in the global ISC organisation. In recent years, the activities of the ISC have significantly expanded and the management of the organisation has changed. Although the European ISC Members comprise nearly a quarter of the member organisations of the global ISC, they are not proportionally represented in the new management of the Council. Therefore, one of the tasks of the European ISC Members and its Secretariat in Estonia is to draw attention to the viewpoints and needs of European scientists in the global ISC organisation.

The second important umbrella topic is the promotion of scientific advice and knowledge-based policy-making in Europe, primarily by way of developing and shaping the structures necessary to achieve this. The network of science organisations concentrates the best knowledge and helps find the best new practices for solving scientific advice challenges by sharing experience, holding public discussions and engaging in research cooperation. The need for more permanent scientific advice structures with rapid response capabilities and interdisciplinary competences is also growing at EU level.

Photo: Balša Radunović

Science Day with the Montenegrin hosts. From left: Vladimir Crnojević, Director of the BioSense Institute; Biljana Šćepanović, Minister of Science and Technological Development of Montenegro; Mila Popovich, Director General in the Government of Montenegro; Ljubiša Stanković, Vice-President of the Montenegrin Academy of Sciences and Arts.

Photo: Balša Radunović

A moment from the meeting of the Presidents of the academies of sciences at the Annual Meeting.

The third area of activity in the work of the European ISC Members is the development of science diplomacy and international research cooperation. This includes the improvement of overall knowledge as well as practical activities where the aim of research cooperation is to support relations between countries or regions or, conversely, to facilitate the growth of science and innovation via diplomacy.

The event of the year for the European ISC Members is the Annual Meeting and a science day aimed at the broader public, which are both held in autumn. In 2023, both events were held in Podgorica, Montenegro, in the middle of September (14–15 September) in cooperation with the Montenegrin Academy of Sciences and Arts. The participants were given an overview of developments in the region's research and science policy, and the major

Photo: Balša Radunović

Participants in the Annual Meeting.

challenges to science in Europe were addressed. Discussions also focused on matters related to the position and influence of science in society, relations between science and politics, developments in science diplomacy and the changing role of European science in the globalising world.

In 2024, the European ISC Members are facing new organisational (elections of a new steering group, possible change of location of the Secretariat) and substantive tasks, such as the more efficient inclusion of European scientists in solving global scientific issues.

Photo: Balša Radunović

Tarmo Soomere's opening words at the Annual Meeting.

RELATIONS BETWEEN THE ESTONIAN ACADEMY OF SCIENCES AND THE HEIDELBERG ACADEMY OF SCIENCES AND HUMANITIES

Academy member Jaan Undusk

Germany, the largest country in Europe by population, has a total of nine academies of sciences, one of which is federal (German National Academy of Sciences Leopoldina), while the other eight are regional. The academy of sciences of the state of Baden-Württemberg is located in Germany's oldest university town, Heidelberg.

The key person in the establishment of relations between the Estonian Academy of Sciences and the Heidelberg Academy of Sciences and Humanities is Ulrich Kronauer (born 1944) who was a member of the German law dictionary (*Deutsches Rechtswörterbuch*) workgroup at the Heidelberg Academy of Sciences and Humanities from 1974 to 2009. It was Kronauer who, while working on the reference book founded in 1897 and by now comprising 14 volumes, highlighted its importance in studying the history of the public use of language in the Baltic countries. Kronauer discovered Estonia thanks to linguistics philosopher Carl Gustav Jochmann from Pärnu (1789–1830), who studied law at Heidelberg University and in the 1820s anonymously published his later renowned works at the university publishing house. In 2009, Kronauer established the Jochmann Society (Jochmann-Gesellschaft e.V.) which has essentially evolved into an academic German-Estonian friendship society.

As the first and in the current perspective also the only Baltic Commissioner (*Baltikumsbeauftragter*) of the Heidelberg Academy, Kronauer brought distinguished members of the Heidelberg Academy, the world-famous historian Reinhart Koselleck[83] (2003) and the former rector of Heidelberg University, Volker Sellin[84] (2009), to speak in the hall of the Estonian Academy of Sciences in Toompea. Thereafter, relations between the academies mainly developed in the framework of conferences dedicated to the history of the Baltic countries held both in Estonia and Heidelberg, where the Estonian Academy of Sciences was represented by the Under and Tuglas Literature Centre.

Communication reached a new level in autumn 2022, when the presidents of the academies, Bernd Schneidmüller and Tarmo Soomere, met in Heidelberg. The meeting was also attended by the Vice-President of the Heidelberg Academy of Sciences and Humanities, Matthias Kind, the Director of the Under and Tuglas Literature Centre, Jaan Undusk, and Ulrich Kronauer, and goals were established for broader cooperation.

83 Reinhart Koselleck's presentation 'About the History of Concepts and the Concepts of History' in the Academy hall in September 2003.

84 Volker Sellin's public lecture 'Monarchy and Nationalism' held in the Academy hall on 16 September 2009.

The first step in that cooperation was a joint seminar held in Tallinn on 13 April 2023 where, in addition to the above, presentations were made by historians Anti Selart and Academy member Marek Tamm. At the roundtable of the seminar, scientists who had conducted research in Germany – Tiina Kala, Jüri Kivimäe, Aldur Vunk and Academy member Jüri Engelbrecht – shared their experience.

In the first half of 2024, the mutual cooperation opportunities between the Estonian and Heidelberg young academies will be discussed. In 2025, a joint conference of the two academies will be held in Heidelberg, entitled 'Law and Tradition in the Baltic Countries'.

Photo: Tobias Schwerdt

From left: Bernd Schneidmüller, Jaan Undusk, Tarmo Soomere and Matthias Kind at the Heidelberg Academy of Sciences and Humanities on 10 October 2022

Photo: Krista Tamm

Roundtable of the joint seminar at the Estonian Academy of Sciences on 13 April 2023. From left: Jüri Engelbrecht, Tiina Kala, Aldur Vunk, Jüri Kivimäe and Jaan Undusk.

ANTARCTICA NEEDS ESTONIA

Kati Lindström

Estonia joined the Antarctic Treaty[85] in 2001. In pre-economic crisis optimism, we hoped to continue our long-standing Antarctic exploration tradition, establish a polar station and eagerly contribute to activities on the southern continent. The economic depression brought a halt to these plans and after a decade of active participation our presence at the Antarctic Treaty Consultative Meetings gradually faded, as did our hope to find sufficient resources for a polar infrastructure, which requires extensive funding. Ultimately, we never ratified the Protocol on Environmental Protection to the Antarctic Treaty, or the so-called Madrid Protocol.[86] Antarctica, however, is still there and needs Estonia's contribution more than ever.

The Antarctic Treaty, which was signed in Washington in 1959 and entered into force in 1961, covers the entire Antarctic continent and ice shelves. The Antarctic Treaty System, which includes other international treaties, also covers the majority of the ocean to the south of the Antarctic Circumpolar Current – 10 percent of the world's oceans in total. The Madrid Protocol, which was signed in 1991 and entered into force in 1998, stipulates that the main objective of the activities of the Antarctic Treaty System is nature conservation, research and ensuring peace on the continent, and it established strict environmental requirements. It also prohibits any activities related to mineral resources, which in 1970–1989 was perceived as the greatest threat to both the southern continent and the Antarctic Treaty System.

Today, Antarctica is facing new, serious problems related to climate changes that are being acutely felt in polar regions, as well as the issue of global political polarisation.

Although there are great variations in Antarctic climate change projections due to the insufficiency of scientific data, it is entirely clear that climate change has a palpable effect on Antarctica. Planet Earth is losing its ice cover at an ever-increasing pace and in 2023 the winter and summer ice cover in Antarctica was at a record low. In total, it lacked 1.75 million km² of ice at its winter maximum compared to the average maximum coverage in 1980–2010, and a million square kilometres compared to the previous record low level. Every new summer is bringing record high air and ocean surface temperatures. The acidity of the ocean is increasing, while the rising water temperature and the abundance of added fresh meltwater are causing the Antarctic Circumpolar Current to slow down. The decreasing ice cover is having a negative effect on many endemic species, including the emblematic emperor penguins, and is increasing coastal erosion.

What happens in Antarctica does not stay in Antarctica. The Antarctic climate models are currently not precise enough for us to know where the breaking points are and how the accumulating negative processes amplify each other. It is clear, however, that the impact of climate change is becoming increasingly irreversible. Projections show that one of our planet's two largest ice sheets, the West Antarctic ice sheet, may be completely melted by 2300. This would increase the total sea level by up to three metres. Should all the negative circumstances coincide, the total sea level may rise by as much as 30 metres by 2300, or between 70 cm and one metre by 2100. Were the Antarctic Circumpolar Current no longer to function, this would also mean the destruction of the world ocean, as the current would no longer pump cold Antarctic water, which is rich in oxygen and nutrients, into it. The Southern Ocean is currently capturing as much as 50 percent of CO_2 and 75 percent of the heat captured by the world ocean. If the ice cover decreases and the temperature rises, it will no longer be able to do so, while the melting permafrost will

Photo: Stephanie Wiegner

Kati Lindström is a Researcher at Tallinn University and Associate Professor at the Royal Institute of Technology (KTH) in Sweden, a member of the Estonian Polar Research Committee of the Academy of Sciences and Estonia's liaison officer to the Antarctic Treaty System, the ICOMOS (International Council of Monuments and Sites) International Polar Heritage Committee's Antarctic Treaty System Liaison Officer and expert member, and a member of the SCAR (Scientific Committee on Antarctic Research) Standing Committee on Antarctic Humanities and Social Sciences.

85 https://www.ats.aq/index_e.html
86 https://www.ats.aq/e/protocol.html

Photo: private collection

Kati Lindström at the Esperanza Base.

release ever-increasing quantities of greenhouse gases into the atmosphere.

Solving complex environmental problems requires political will, which not everyone has. The Antarctic Treaty currently has 56 parties, of whom 29 are consultative voting parties and 27 non-consultative parties, such as Estonia. The initial objective of the Antarctic Treaty was to mitigate tensions between the great powers of the Cold War and the countries that had overlapping territorial claims on the Antarctic continent. A consensus requirement was therefore established: unlike UN negotiations, all the decisions under the Antarctic Treaty must be adopted unanimously. This also applies today when there are 2.5 times as many voting parties. The consensus principle holds the Antarctic Treaty together, but also causes difficulties in a polarised world. Russia and China's joint front against a rules-based world order is manifested in the systematic undermining of the Antarctic environmental protection policy.

In recent decades, significant changes have taken place in Antarctic research. The negative impact of humans on the Antarctic environment is increasingly highlighted, and greater emphasis is therefore placed on remote monitoring methods and shared infrastructure. Countries no longer have to establish a station or build an icebreaker to become a serious Antarctic research country, which also makes things easier for Estonian scientists. Engaging in science to cover data gaps is the least we can do to contribute to the future of Antarctica.

Estonia's continued presence at the Antarctic Treaty meetings and the ratification of the Madrid Protocol are equally important. Estonia does not have its own infrastructure in Antarctica. Joining the Protocol will therefore not create significant financial obligations for us besides a salary for the few hours it takes the ministry to compile the required reports, but the political benefits would be considerable. Non-consultative members that have joined the Protocol can take part in the work of the Committee for Environmental Protection of the Antarctic Treaty. As a non-consultative member, we would thereby gain a real opportunity to participate in the environmental protection related decision-making processes in Antarctica. As the Committee decisions do not have to be unanimous, the participation of allies such as Estonia is important, as it boosts the rows of countries standing for environmental protection. Joining the Madrid Protocol would also allow us to show that we are a responsible party who cares about the rules-based international world order and the future of our planet, and indirectly also increase the security of the entire country.

The seminar 'Polar Research in Estonia'[87] held at the Academy of Sciences on 20 September 2023 discussed matters related to Arctic and Antarctic research and environmental protection. The seminar was organised by the Academy in cooperation with the Embassy of the United States in Tallinn. One of the aims was to present the most important results of research conducted by Estonian scientists, and the related problems. Another aim was to convince decision-makers that after joining the Antarctic Treaty as early as in 2001, Estonia must also join the Madrid Protocol.

87 https://www.youtube.com/watch?v=m4sMaDoDbjI

Photo: U.S. Embassy in Estonia

Nicole Aunapu Mann at the US Embassy reception held at the Academy of Sciences on 28 September. From left: Academy President Tarmo Soomere, Ambassador of the United States to Estonia George P. Kent and Nicole Aunapu Mann.

VISIT OF NICOLE AUNAPU MANN, AN ASTRONAUT WITH ESTONIAN ROOTS

Astronaut Nicole Aunapu Mann of the US National Aeronautics and Space Administration (NASA) visited Estonia from 25 September to 2 October.

She is the first female NASA astronaut of indigenous American origin as well as the first person with Estonian roots to have been in space. Astronaut Mann launched on her first spaceflight on board SpaceX Crew Dragon Endurance as the Commander of the NASA SpaceX Crew-5 on 5 October 2022. The international team of four spent 157 days in orbit. Nicole Mann went on two spacewalks during the mission, for a total of 14 hours and 2 minutes.

The astronaut's visit to Estonia was sparked by an invitation by the students participating in the Global Learning and Observations to Benefit the Environment (GLOBE) education programme. During her visit, she met with local students at Kärdla Upper Secondary School and the Windtower Experience Centre in Hiiumaa, the heads of the city of Tartu and the GLOBE students at the Ahaa Centre in Tartu. In Tallinn, she met with President Alar Karis, Prime Minister Kaja Kallas and the members of the Space Support Group of the *Riigikogu*, as well as with students at the Mektory House of Tallinn University and the Energy Discovery Centre. The tight schedule also included an official reception at the Academy of Sciences and meetings with representatives of the Estonian Space Office of Enterprise Estonia and companies that cooperate with the Incubation Centre of the European Space Agency.

> *With our last name, 'Aunapu,' there were many questions as a child about where this name came from. I was always excited to explain that I was Estonian. (Nicole Aunapu Mann in the interview to Estonian Public Broadcasting)*[88]

Astronaut Mann's visit emphasised the strong relations between the United States and Estonia and their joint dedication to the areas of natural and exact sciences and technology.

88 https://news.err.ee/1609114931/astronaut-nicole-aunapu-mann-makes-first-trip-to-ancestors-home-in-estonia

INTERNATIONAL PROFESSIONAL ASSOCIATIONS

The Academy supports the participation of Estonian scientists in international professional science associations (prioritising the professional associations that have joined the ISC) and international science organisations. Estonian scientists are represented in these by area-specific national committees and learned and science societies. Participation of Estonian scientists in the following international organisations is supported:

International organisation	Estonian body of contact
Consortium of European Taxonomic Facilities (CETAF)	Committee on Phylogeny and Taxonomy of the Estonian Academy of Sciences Contact: Urmas Kõljalg, urmas.koljalg@ut.ee
European Chemical Society (EuChem)	Estonian Chemical Society Contact: Margus Lopp, Jaak Järv, info@keemiaselts.ee
European Marine Board	Committee on Marine Sciences of the Estonian Academy of Sciences Contact: Tarmo Soomere, tarmo.soomere@taltech.ee
European Physical Society (EPS)	Estonian Physical Society Contact: Kaido Reivelt, kaido.reivelt@ut.ee
European Polar Board (EPB)	Estonian Polar Research Committee Contact: Rein Vaikmäe, rein.vaikmae@taltech.ee
European Sociological Association (ESA) International Sociological Association (ISA)	Estonian Association of Sociologists Contact: sotsioloogideliit@gmail.com
The European Association for the Study of Religions (EASR) International Association for the History of Religions (IAHR)	Estonian Society for The Study of Religions Contact: Madis Arukask, madis.arukask@ut.ee
International Astronomical Union (IAU)	Estonian National Committee on Astronomy Contact: Laurits Leedjärv, leed@aai.ee
International Association of Geomorphologists (IAG)	Estonian National Committee of IAG Contact: Tiit Hang, tiit.hang@ut.ee
International Federation of Automatic Control (IFAC)	Estonian Association of Engineers / Estonian Society of System Engineers Contact: Sven Nõmm, sven.nomm@taltech.ee
International Geographical Union (IGU)	Estonian Geographical Society Contact: Hannes Palang, geograafiaselts@gmail.com
International Mathematical Union (IMU)	Estonian National Committee for Mathematics Contact: Mati Abel, mati.abel@ut.ee
International Union of Geodesy and Geophysics (IUGG)	Estonian Geophysical Committee Contact: Piia Post, piia.post@ut.ee
International Union of Geological Sciences (IUGS)	Estonian National Committee for Geology Contact: Kalle Kirsimäe, kalle.kirsimae@ut.ee
International Union of History and Philosophy of Science, Division of Logic, Methodology and Philosophy of Science (IUHPS/DLMPS)	Division of Methodology and Philosophy of Science of the Estonian Association for the History and Philosophy of Science Contact: Peeter Müürsepp, peeter.muursepp@taltech.ee

International organisation	Estonian body of contact
International Union of Pure and Applied Physics (IUPAP)	Estonian National Committee for IUPAP Contact: Marco Kirm, marco.kirm@ut.ee
International Union for Quaternary Research (INQUA)	Estonian National Committee for INQUA (ESTQUA) Contact: Tiit Hang, tiit.hang@ut.ee
International Union of Theoretical and Applied Mechanics (iutam)	Estonian National Committee on Mechanics Contact: Andrus Salupere, andrus.salupere@taltech.ee
Thesaurus Linguae Latinae (TLL)	Estonian Academy of Sciences Contact: Janika Päll, janika.pall@ut.ee
World Energy Council (WEC)	World Energy Council Estonia Contact: Andres Siirde, andres.siirde@taltech.ee

BILATERAL RESEARCH COOPERATION

In collaboration with partner academies, the Estonian Academy of Sciences supports international cooperation between researchers

The Estonian Academy of Sciences began supporting bilateral research cooperation even before Estonia became an independent country: the first cooperation agreement was signed with the Polish Academy of Sciences in 1987. Over the years, cooperation has taken the form of both individual research visits and joint research projects. In 2023, for example, 43 foreign researchers from seven countries spent a total of 290 days in Estonia under inter-academy agreements, while 30 Estonian researchers spent a total of 260 days on research visits in nine countries.

In 2023, 13 cooperation projects came to an end. Seven of them had an Estonian partner from Tallinn University of Technology. The other projects involved researchers from the University of Tartu, the Estonian University of Life Sciences, the Under and Tuglas Literature Centre of the Estonian Academy of Sciences and the Estonian Literary Museum. The foreign partners were from Poland, Bulgaria and Czechia.

New contacts and deeper cooperation relationships were a key result of the cooperation projects. The feedback from the ten researchers who participated in the project is, as follows.

- As a result of the cooperation, new knowledge and technologies were acquired, fieldwork was carried out etc., and the partner country provided input for our research. Sharing expertise and analysis methods with colleagues were important, as were expanding the possibilities for data collection and analysis and the mutual use of research infrastructures and databases.
- Involving young researchers, and in particular doctoral students, to the extent that publications resulting from collaborative work are part of the young researchers' doctoral theses, was considered very important. The collaboration also led to the joint supervision of doctoral students.
- Together, conferences and seminars were held, presentations were delivered at science conferences and conference proceedings were published.
- The ten projects produced more than 35 high-level publications. Most of them have already been published, some are still in the process of publication.
- New ideas for further research cooperation emerged, and there are cooperation projects already underway or soon to be launched, as well as jointly written applications.
- The fact that the cooperation was supported by academies of sciences added substance and prestige to the joint activities.

Considering that the Estonian Academy of Sciences has a foreign exchange programme budget of only 20,000 euros per year, the results are quite impressive. One could even say that the activities have been cost-effective. With these funds, the Estonian Academy of Sciences covers the costs of hosting visiting scientists in Estonia. The same costs for our researchers abroad are financed by the partner academy. The work of the programme is guided by the Academy's Council for International Exchanges.

At the beginning of 2024, 12 new projects were initiated in cooperation with researchers from Slovakia, Czechia, Poland and Bulgaria. Five cooperation projects with Hungary will continue. The research topics of the new projects range from solar panels and methods for assessing ecosystem services to fungi, migration and humour. Researchers from the University of Tartu, Tallinn University, Tallinn University of Technology, Estonian University of Life Sciences and the Estonian Literary Museum are involved. The programme also supports individual research visits.

A list of both completed and ongoing projects can be found on the Academy's website.[89]

89 https://www.akadeemia.ee/en/cooperation/joint-research-projects/

CONSTITUTIONAL LAW FOUNDATION

FIVE YEARS OF THE ACTIVITIES OF THE CONSTITUTIONAL LAW FOUNDATION

Executive Officer of the Foundation, Kerdi Raud, and the Chairman of the Council, Heiki Loot

The Constitutional Law Foundation was founded in 2018, the year the Republic of Estonia turned 100. On 20 December 2018, the Minister of Justice, Urmas Reinsalu, and the President of the Academy of Sciences, Tarmo Soomere, signed the cooperation agreement that founded the Constitutional Law Foundation (then called Endowment) at the Estonian Academy of Sciences. On the one hand, constitutional law science needed the state's support, for strong constitutional law science is as important in strengthening the independence and developing the sovereignty of Estonia as other national sciences. On the other hand, teaching constitutional law was in a difficult situation, as Estonian universities for some time had no regular professor of constitutional law, and students were largely taught by practitioners who were doing so in addition to their main job. It became the Foundation's mission to develop constitutional law and promote the teaching and scientific research of constitutional law in Estonia. The activity support prescribed for the first four years was 300,000 euros a year.

In order to direct the activities of the Foundation, a council was formed, with outstanding legal scholars and practitioners invited as members: former Chief Justice of the Supreme Court and judge of the European Court of Human Rights, Rait Maruste; member of the European Court of Justice and former Chief Justice of the Supreme Court, Priit Pikamäe; judge of the European Court of Justice, Küllike Jürimäe; justice of the Supreme Court and former Secretary of State, Heiki Loot; professor at the University of

Photo: Kristin Rammus

From the left: The former Minister of Justice Urmas Reinsalu, Tarmo Soomere and the first Head of the Council of the Foundation, Uno Lõhmus, on 20 December 2018.

Tartu, Academy member Lauri Mälksoo; professor at the University of Tartu, Marju Luts-Sootak; and circuit court judge and lecturer of constitutional law at the University of Tartu, Madis Ernits. By their position, the Chancellor of the Ministry of Justice, currently Tõnis Saar, and the President of the Estonian Academy of Sciences, currently Academy member Tarmo Soomere, are members of the Council. The work of the Council was led by Uno Lõhmus for the first three years, with Heiki Loot fulfilling the role of chairman of the Council since 2022.

Special constitutional law prizes and recognitions

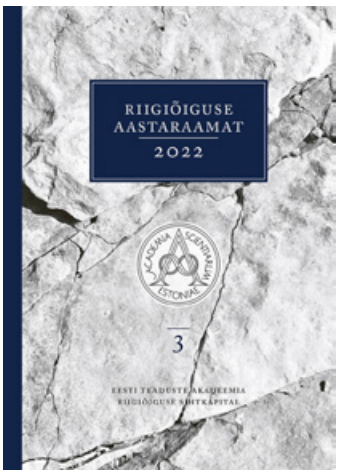
One of the first actions of the Foundation was aimed at the future, with the objective of attracting more law students into the area of constitutional law research. The special constitutional law prizes were awarded for the first time within the framework of a national student research contest in 2019. Since then, the Foundation has announced special prizes for research carried out in the area of constitutional law every year. In 2019–2023, eight students were awarded the special constitutional law prize. Besides talented young people, the Foundation has also sought to recognise the achievements of experienced researchers. In 2020, the Council of the Foundation bestowed the first Constitutional Law Deed of the Year Award to Anneli Albi, Professor of European Law at the University of Kent, who was co-editor of an extensive two-volume compendium of articles analysing the essence and functioning of the constitutions of European countries.

Constitutional Law Yearbook

The decision to begin to publish the Constitutional Law Yearbook grew out of the aim to expand the possibilities of writing and publishing articles on constitutional law. The first yearbook was published in 2020, when the 100th anniversary of Estonia's first Constitution was celebrated. To date, three yearbooks have been published (2020, 2021 and 2022), the fourth is nearly complied (2023) and preparation for the fifth one (2024) has begun. The yearbook is a peer-reviewed publication in Estonian. In addition to original works, it also publishes translated articles that are important for Estonian readers and necessary in teaching constitutional law, as well as historical texts, conference discussions and book reviews. The original articles are published together with a summary in English. Uno Lõhmus was Editor-in-Chief of the first yearbook, Heiki Loot of the second and Marju Luts-Sootak of the third. Madis Ernits is Editor-in-Chief of the fourth yearbook and Lauri Mälksoo the fifth. In 2022, a 12-member international council was formed at the yearbook, with renowned legal scholars from Latvia, Lithuania, Finland, Sweden, Poland, Austria, Germany and Belgium as members. In addition to the printed publication, the electronic versions of the yearbook texts are freely accessible in the web publication of the journal Juridica.[90]

Constitutional and administrative law textbooks

In order to support the teaching of constitutional law, the Foundation announced a public competition for the preparation of a constitutional law textbook in 2019. As a result of the competition, contracts were concluded for the preparation of as many as three textbooks. The draft constitutional law textbook by a group of authors led by Paloma Krõõt Tupay, Associate Professor in Constitutional Law at the University of Tartu, is expected to be completed in 2024 and the draft textbook by Hent Kalmo, Research Fellow at the University of Tartu, and the draft textbook by authors led by Madis Ernits are expected to be completed in 2025. In 2023, a public competition was held for the preparation of an administrative law textbook and, as a result, a contract was concluded with lecturers of administrative law at the University of Tartu, Andra Laurand, Monika Mikiver and Janar Jäätma. The term of delivery of their draft textbook is also in 2025.



90 https://juridica.ee/archive.php (in Estonian).

Principal documents of Estonia's statehood

In 2020, the Foundation published a compendium of the core texts of Estonia's statehood, 'Principal Documents of Estonian Statehood', for the purposes of public education. The book was compiled and equipped with brief commentaries by Rait Maruste. The book was sent to all the Estonian upper secondary schools and basic schools for use as a tool in teaching civic studies. The compendium contains the most important pre-constitutional acts that determined the organisation of Estonia's statehood, as well as the texts of all the Constitutions that have been valid at some time. The book was translated into Russian in 2021 and a translation into English is currently being prepared. In addition to the paper copy, the compendium is accessible on the Academy's website both in Estonian and Russian.[91]

Commentaries of the Constitution

One of the biggest and weightiest tasks of the Foundation is the preparation of new Commentaries on the Constitution. The publication of the Commentaries started under the leadership of Editor-in-Chief Uno Lõhmus in 2022 on the 30th anniversary of the adoption of the currently applicable Constitution. A large number of renowned lawyers as well as new names in constitutional law are engaged in drawing up the Commentaries. The new Commentaries aim to enrich the scientific discussion and strengthen the development power of Estonian constitutional law thought.

The preparation of the Commentaries is a time-consuming and extensive job, most of which is done in the free time of the contributors and, to a significant degree, on a voluntary basis. The Commentaries are published in parts on a designated website,[92] which has been made as informative as possible, so that readers would also promptly reach other sources. To date, readers have full access to commentaries on the Preamble and nine chapters of the Constitution as well as on the Constitution of the Republic of Estonia Amendment Act, along with partial access to commentaries on two chapters. The Commentaries are being constantly updated. The publication of the Commentaries is followed by presentations and discussions which have been held at the Academy of Sciences, the Riigikogu, the Supreme Court, the Audit Office and, most recently, the Prosecutor's Office. All such presentations are streamed live online and are available on the Academy's YouTube channel.[93]

Editor-in-Chief of the new Commentaries on the Constitution, Uno Lõhmus, gave an introductory overview of the Commentaries at the first presentation event on 7 November 2022.

Photo: Krista Tamm × 2

At the second presentation of the Commentaries on 12 December 2022, (from left) Rait Maruste, one of the authors of the Commentaries, Paloma Krõõt Tupay, lecturer of constitutional law at the University of Tartu and Peet Kask, former member of the Constitutional Law Assembly, discussed the chapter 'President of the Republic'.

91 https://www.akadeemia.ee/riigioiguse-sihtkapital/valjaanded (in Estonian).

92 https://pohiseadus.riigioigus.ee (in Estonian).

93 https://www.youtube.com/watch?v=DQQw8lw9xDo&list=PLJE7F-Tnu-UDFj7GyJECKGE3B0OVqKBB80 (in Estonian).

Conferences and seminars

The organisation of discussions, seminars and conferences aimed at legal scholars and the public forms an important part of the Foundation's work. The events started in 2020, when a web seminar dedicated to the 100th anniversary of the first Constitution of the Republic of Estonia was held in tandem with a web conference on the same topic in cooperation with the Learned Estonian Society and the University of Tartu. Since that year, the Foundation has taken part in organising the bi-annual Estonian Lawyers' Days. The Foundation's role has been to provide content to the opening and closing sessions of the grand forum of the Estonian law scene and to organise constitutional law panels. In 2021, the inclusion of Estonia in the League of Nations a century ago was recalled at a conference held in cooperation with the University of Tartu School of Law, and in March 2022, a Science Afternoon was organised concerning Russia's military aggression against Ukraine. In June 2022, the 'Crisis and Constitution' conference was held to celebrate the 30th anniversary of the Constitution of the Republic of Estonia. In 2023, the constitutional law conference was for the first time held as an international event that also included the members of the international council of the Constitutional Law Yearbook. The recordings of the events are available for viewing; information can be found on the Foundation's website.[94]

Panel discussion 'People's participation in state governance – public survey, public initiative and public voting' at the 'People's role in exercising state powers and judicial supervision of constitutionality' constitutional law conference on 2 June 2023. From left: Peter Bussjäger, Professor at the University of Innsbruck, member of the Constitutional Court of the Principality of Liechtenstein and member of the Venice Commission of the Council of Europe; Oliver Kask, judge at Tallinn Circuit Court, Chairman of the National Electoral Committee and substitute member of the Venice Commission of the Council of Europe; Tõnis Saarts, Associate Professor of Comparative Politics at the Tallinn University Institute of Governance, Law and Society; Katarzyna Szwed, Professor at the University of Rzeszów; and Jānis Neimanis, judge at the Constitutional Court of Latvia.

Photo: Aavo Kaine × 2

At the 'Crisis and Constitution' conference on 10 June 2022, (from left) Heiki Loot; Erki Kodar, Undersecretary for Legal and Consular Affairs at the Ministry of Foreign Affairs; Margit Gross, Undersecretary for Legal and Administrative Affairs at the Ministry of Defence; Kristi Purtsak, Head of the Legal Department at the Government Office; and Olavi Jänes, lecturer at the Baltic Defence College, discussed topics related to the security crisis and the Constitution.

94 https://www.akadeemia.ee/riigioiguse-sihtkapital/avalikud-uritused (in Estonian).

Sources of constitutional law

In order to promote research in constitutional law, the Foundation places significant importance on the digitisation of the sources of Estonian constitutional law as well as making these more easily accessible. The first step towards this was making the archival sources and records related to the preparation of the 1920 Constitution available via a single web gate.[95] Next, the transcripts, draft acts and other materials of the Constitutional Assembly will be published on a separate website. A project focused on studying and recording the activities of the Constitutional Assembly has also been launched, and the interviews with Assembly members and experts that have been conducted in the course of the project will be published electronically along with the Assembly's other materials. In 2023, cooperation started with the National Library to create a constitutional law bibliography database and the doctoral thesis of Nikolai Maim, the first Estonian professor of constitutional law at the University of Tartu, entitled 'Parliamentarianism and a sovereign state' (published in 1927), was translated into Estonian.

Research grants and scholarships

In 2021, the Foundation decided to support the research project of Merike Ristikivi, Associate Professor at the University of Tartu, to study the restoration of the rule of law in Estonia, particularly the reformation of the constitutional and administrative law and court system when Estonia regained its independence. The project included the publication of research articles and delivering presentations at international conferences. The Academy of Sciences announced a call for applications for research grants at the end of 2023 and a call for applications for scholarships for doctoral and post-doctoral studies in constitutional law at the beginning of 2024.

Expert opinions and analyses

Since 2021, the Foundation, at the request of the Ministry of Justice, commissions expert opinions on the implementation of the foundations of the legal policy approved by the *Riigikogu*, which the Government submits to the *Riigikogu* as an appendix to its report. The expert opinion was prepared by Priit Pikamäe in 2021, Allar Jõks and Carri Ginter in 2022, and Rait Maruste, Raul Narits and Norman Aas in 2023. An analysis commissioned by the Foundation concerning the proposal to change the legal bases of the service relationships of officials was completed in 2023 (authors: Monika Mikiver, Lecturer of Constitutional and Administrative Law at the University of Tartu, Aaro Mõttus, Andra Laurand). The expert opinions and the analysis have been published on the Academy's website.[96]

The organisation of the work of the Foundation

The Council of the Foundation holds about ten meetings a year. Apart from the summer months, a meeting is held every month. In addition, decisions are sometimes made by e-mail. The Council members work *pro bono* in their own free time. The Foundation's capability to carry out projects increased notably in 2022, when full-time Executive Officer Kerdi Raud was employed. While in 2019 only 25,483 euros of support was used, in 2023 the amount was 382,513 euros. At the end of the first support period, a new support agreement was concluded at the proposal of the Ministry of Justice, under which 200,000 euros were allocated to the Foundation in 2022 and 300,000 euros in 2023. In 2023, the Estonian Academy of Sciences awarded its medal to Uno Lõhmus and a letter of appreciation to Küllike Jürimäe and Priit Pikamäe.

From the very beginning, trying to promote the diversity needed for the development of science has been the principle of activity of the Foundation. Like every science, constitutional law science evolves in discussions. A discussion required a multitude of parties and viewpoints. No one holds the monopoly of truth or pronouncement of truth. It is the objective of the Foundation to have several constitutional law textbooks in Estonia, as well as various options for publishing constitutional law articles, several commentaries on the Constitution, several constitutional law conferences, etc. The Foundation strives to cast doubt on the opinion that Estonia is so small that we lack this potential. Opportunities must be created for the possibility to manifest and develop. This is why the Constitutional Law Foundation has been founded.

95 https://www.akadeemia.ee/riigioiguse-sihtkapital/riigioiguse-allikad (in Estonian).

96 https://www.akadeemia.ee/riigioiguse-sihtkapital/analuusid-uuringud-ja-ekspertarvamused (in Estonian).

BRIGHT MOMENTS

FROM DECADENCE TO SKI TRACKS, STILL FOLLOWING IN THE STEPS OF FRIEDEBERT TUGLAS

Marin Jänes, Academic Secretary of the Under and Tuglas Literature Centre of the Estonian Academy of Sciences

In 2023, the Under and Tuglas Literature Centre of the Estonian Academy of Sciences led two research projects funded by the Estonian Research Council and participated in one research project under the European Union Horizon 2020 framework programme.

In the project 'Emergence of A Civilised Nation: Decadence and Transitionality in 1905–1940' (PRG1667), the group of scholars scrutinises decadent literature, art, philosophy and music at the beginning of the 20th century in the Baltics and the Nordic countries in comparison to Western European decadent culture.[97]

The design of the project led by Mirjam Hinrikus uses Friedebert Tuglas's 1907 ink drawing 'Fairy Tale' from the Literary Centre's art collection. Designed by Tiiu Pirsko.

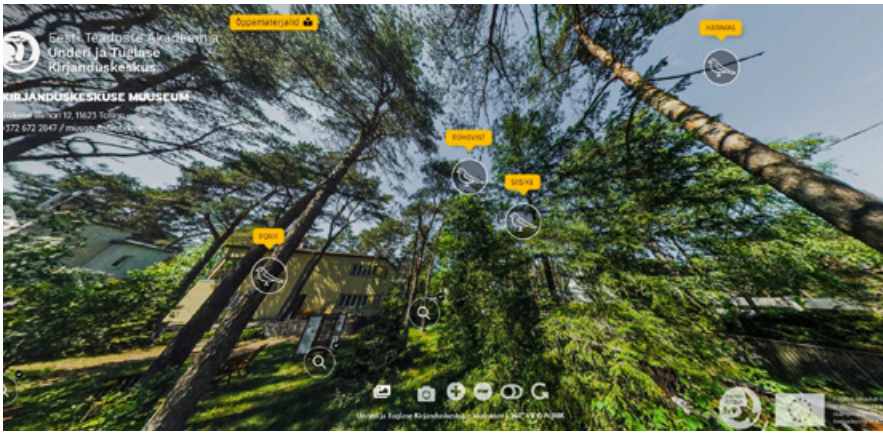
97 https://dekadents.utkk.ee/en

The project 'ConnectMons, transition, change: *nobilitas haereditaria ac litteraria* in the emergence of Early Modern literature in Polish and Swedish Livonia' (PRG1926) shed new light on the former treatment of Baltic German literature, based on the hypothesis that the emergence of the writing nobility in Estonia and Livonia was not caused by a rapid improvement in the economic, political and legal situation at the end of the 18th century, but rather by sociocultural and educational changes that had already occurred in the Early Modern period.[98]

The design of the project led by Kristi Viiding uses the griffin which, depicted holding a sword, a pen and a book, symbolises the ideal of an educated nobleman in Livonia, in that only those who have mastered the art of war and cultivated literary culture are worthy of the palm of victory. The griffin is taken from a print published at the Academy of Tartu in 1633. Designed by Tiiu Pirsko.

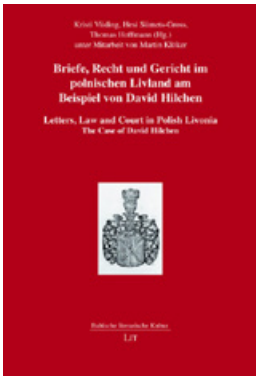
98 https://nobilitas.utkk.ee/en

In the Horizon 2020 project ‘Citizen Science for Environmental Citizenship: Backyard Birding and the Potential for Cultivating Green Engagement’ (EnviroCitizen, grant No. 872557), the Literature Centre was one of the six partners of the University of Stavanger. In seeking solutions to environmental problems, the project partners combined theories and methods from different areas and disciplines of science and examined how participating in hobby science influences people’s environmental awareness. The research results were used for making learning materials of various formats for different stakeholder groups.[99]



One of the outputs of the EnviroCitizen project led by Elle-Mari Talivee was a virtual tour of the Literature Centre’s Museum, where viewers can discover exhibitions, video clips and individual exhibits, read about the inhabitants of the museum and take a look at the inhabitants of the museum garden. The website also provides learning materials for basic school students in Estonian and Ukrainian.

In the 2023 publications, the main topics were studies of earlier German and Latin culture in the Baltic region – two article compilations were published in the Literature Centre’s series ‘Baltische literarische Kultur’ (Baltic Literary Culture) – as well as discussions of 20th century Estonian culture and an analysis of the mutual relationships between humans and the environment. These topics were also reflected in the Literature Centre’s events.



In the German and English article compilation ‘Letters, Law and Court in Polish Livonia – the Case of David Hilchen’, Estonian, German and Polish legal and literary historians for the first time sketch a picture of the role and content of the voluminous Latin correspondence held by Livonian lawyer and humanist David Hilchen in 1577–1610, and of the links of the letters to court trials and files and the legal sources of the era (compiled by Kristi Viiding, Hesi Siimets-Gross, Thomas Hoffmann in cooperation with Martin Klöker. Literature Centre, 2023).

Nine contributions to the German article compilation ‘Literarischer Wandel in der Geschichte der baltischen Literaturen’ (Literary Changes in the History of Baltic Literature) provide a selective overview of the closely intertwined processes of Estonian, Latvian, German and Latin literary history in our region (compiled by Martin Klöker. Literature Centre, 2023).

99 https://www.utkk.ee/en/environmentalism

Photo: Marin Jänes

A parallel section of the conference, held in the attic of the Estonian Academy of Sciences from 4 to 6 May.

Photo: Merlin Kirikal

All the conference days ended with a cultural programme. Photo: a discussion group of Nietzsche translators at Tallinn University. From left: Andres Luure, Märt Põder, Jaanus Sooväli, Leo Luks, Jaan Undusk, Henri Otsing, Egle Erik and Ahto Lobjakas.

In May, we held the exemplary three-day conference 'Decadence in Estonian Culture: Translation and Interpretation', which was organised in cooperation with the Estonian Academy of Arts and Tallinn University. The event brought together fifty presenters from different areas, and four times as many listeners, who together contemplated the changing and sometimes contradictory meanings of decadence in different art forms and eras.

In June, we held the Garden Seminar 'The more-than-human world. Literature and art in a multi-species world' organised together with the Department of Semiotics of the University of Tartu, which focused on encounters and relationships between humans and other species, their mutual impact and perception, and a study of human and other perspectives.

Photo: Timo Maran

Garden Seminar at the Literature Centre's Museum on 15 June 2023.

In September, we held the joint conference of the Literature Centre and the Institute of Philosophy of the Czech Academy of Sciences, 'Representing Crisis in Early Modern Literatures', where we took a comparative look at the symbols of crisis in different regions of Europe and mainly focused on the role of regions located in the sphere of influence of the German Protestant tradition.

Photo: Marcela Slavíková

The conference held from 21 to 22 September 2023 in Tallinn brought together researchers of the Early Modern period and literature from ten countries. From left: Mirella Saulini Martina Kramarić and Jakub Wolak.

The year was not just serious. As is tradition, the Literature Centre's Museum took part in Museum Night, the topic of which this time round was 'Movement in the Night'. We told visitors about writers and sports, did a workout and offered visitors a one-off opportunity to have their picture taken with the father of Estonian hobby skiing – Friedebert Tuglas. The knowledge that we now slide along on Sunday ski tracks in the path of Tuglas is based on his memoirs: "In the end, something that has even a remote link to my then hobbies in Finland. At that time, skis were only known of in southern Estonia through literature and could not actually be bought anywhere. Then I heard that the Tartu Prison workshop makes skis for a northern army unit, but general sale was not allowed. I somehow still managed to buy a pair and learnt to use them after a while. A weird thing is that horses are frightened of skiers, even when the skier just stands immobile by the road, resting on his ski sticks. Villagers cursed me for spooking their horses and some young townies said I was doing the 'work of the devil'. I didn't come across any other enthusiasts of this sport back then. However, when I happened to visit Tartu again in winter about ten years later, I found that there were ski tracks all around the city. So, you could say I gave a boost to at least one thing in my life!"[100]

Photo: Elle-Mari Talivee

Merlin Kirikal's presentation 'Writers and muscles: sports in Estonian literature in the first half of the 20th century' at the Literature Centre's Museum on Museum Night.

Photo: Hegely Klaus

On Museum Night, sports journalist and long jumper Mihkel Talivee taught in the garden of the Literature Centre's Museum how desk workers, writers and school kids can keep in shape.

Photo: Elle-Mari Talivee

In cooperation with the Estonian Ski Association, we offered Museum Night visitors a one-off opportunity to have their photo taken with the father of Estonian hobby skiing, Academy member Friedebert Tuglas.

Photo: Reenika Virks

Estonian Literature Day was celebrated for the first time on 30 January 2023, on the birthday of A. H. Tammsaare. The photo depicts the employees of the Literature Centre and Juhan Liiv Museum, with the best Estonian Tammsaare researchers at the front.

100 Tuglas, F. 1990. Tartu, 1903–1904. Noorusmälestusi. Kogutud teosed, 6. Tallinn, p 73 (in Estonian).

Photo: Elle-Mari Talivee × 2

The Estonian Literature Day programme at the Literature Centre's Museum also included a mini-lecture by Mirjam Hinrikus, which focused on one of the key texts of the Estonian 20th century classics – Friedebert Tuglas's novel *Felix Ormusson*. We certainly cannot complain about a lack of interest in literature, as the Museum was barely big enough to fit everyone in.

The oldest consecutively awarded literary prize in Estonia, the Friedebert Tuglas Short Story Award, was presented on Meelis Friedenthal for his short story 'Abracadabra' and Katrin Tegova for her short story 'The Steel Bird'. The photo depicts the award winners and the Chairman of the Estonian Writers' Union Tiit Aleksejev at the announcement of the winners at the Literature Centre's Museum on 2 March 2023.

Photo: Kris Moor × 3

Of the ten winners of the Annual Literature Award of the Cultural Endowment of Estonia, three were from the Literature Centre: (from left) Mirjam Hinrikus (article), Kristi Viiding (translation of literature into Estonian) and Jaan Undusk (dramaturgy).

Photo: Marin Jänes

On 9 November 2023, Jonathan Schilling held a seminar about the nobility and the bourgeoisie in Baltic German literature in 1870–1914. The Literature Centre organised 15 conferences and public seminars in 2023.

Eduard Rüga. From Soil to Sun, 1968. Literature Centre's collection. Of the approximately one hundred paintings exhibited at the exhibition 'Joy and Sorrow Those Twin Brothers. Eduard Rüga in Exile' at Tartu City Museum (compiled by Enn Lillemets and Inga Heamägi), nearly a quarter were from the Literature Centre's collection. In total, the Literature Centre's collections were exhibited at ten exhibitions at various Estonian museums.

A SELECTION OF ACTIVITIES OF SCIENTIFIC SOCIETIES AND INSTITUTIONS ASSOCIATED WITH THE ACADEMY[101]

Institute of the Estonian Language

20th Conference of applied Linguistics focused on language and its users

On 27–28 April, the Estonian Association for Applied Linguistics and the Institute of the Estonian Language held the 20th Spring Conference of Applied Linguistics, which has been the foremost event of the year for Estonian linguistic discussion since 2002. The discussion focused on how language is born in use and how language users acquire, use, create and apply language.

The conference included a total of 56 presentations on the topics of applied linguistics, lexicology, academic writing, language maintenance and variation. The invited speakers delivered three plenary presentations: 'Digital Dictionary Database for Slovenian: unstructured, semi-structured and structured data in modern lexicography' by Simon Krek (Jožef Stefan Institute, Slovenia); 'A language technologist theorising about the corpus' by Heiki-Jaan Kaalep (University of Tartu); 'Linking second language acquisition research and digital language learning' by Detmar Meurers (Tübingen University, Germany).

Photo: Margit Langemets

One of the main speakers of the conference Simon Krek and the main organiser Kristina Koppel.

101 Contacts of the institutions and organisations associated with the Academy on pp 118–121.

Estonian Literary Museum

Conference 'Dialogues with Estonia. A new beginning' held by the Centre of Excellence in Estonian Studies

On 15–16 February, the Estonian Literary Museum hosted the conference 'Dialogues with Estonia. A new beginning' organised by the Centre of Excellence in Estonian Studies (CEES, 2016–2023) in Tartu.[102] Participants drew conclusions on the seven years of operation of the Centre, presented the most outstanding results and worked on formulating visions for further research.

The Centre operated under the Estonian Literary Museum as a scientific institution that focused on interdisciplinary research in the linguistic and cultural phenomena of Estonian ethnic groups, and it brought together over one hundred researchers and doctoral students from the Institute of the Estonian Language, the Estonian Literary Museum, the Estonian Academy of Music and Theatre, Tallinn University, TalTech and the University of Tartu. As the only interdisciplinary centre of excellence in the humanities, it connected humanities experts of different profiles – linguists, music and theatre scientists, philosophers, folklorists, literary scientists, culture scientists and nature scientists. The work of the Centre focused on Estonia, but the areas of research were internationally innovative.

The main emphasis was on 12 interdisciplinary research areas: historical expression and cultural practices; life writing; digital humanities and linguistic technologies; the ethics and philosophy of mind and language; literary studies and textual culture; corpus-based linguistic, literary and folklore studies; speech and music studies; migration and diaspora studies; narrative studies; studies of contemporary culture (including the media); gender studies; and religiosity and myth studies.

There were five overlapping areas at the core of the Centre's research activities: (1) basic research of the Estonian language and culture, (2) studies of diasporas and Estonian ethnic groups, (3) studies of adoption of global cultural phenomena, (4) documentation of contemporary cultural phenomena, including transmediality, and finding models for it, and (5) development of new digital-based methodological models and solutions. The outstanding results expressed at the conference were related to health

102 https://www.folklore.ee/CEES/2023/finaal (in Estonian).

Photo: Alar Madisson

Participants in the CEES conference 'Dialogues with Estonia. A New Beginning' held on 15–16 February 2023.

and environmental problems (including the development of solutions for crisis situations, e.g. clinical ethics guidelines for hospitals); artificial intelligence and language technologies (including speech recognition, transcription and automatic translation technologies in which the relative error rate decreased 35–63% during the work period of the Centre of Excellence); the expression of the global and the local in culture (including modelling the processes of changes in cultural phenomena, e.g. in the development of the story of national thought, web communication, etc.). The created digital solutions are useful in the humanities, e.g. in linguistics and literary, folk poetry and music science, and in the analysis of mythology and folk tales, runic songs and humour phenomena, where typologies have to be created, motifs and variability have to be mapped, or extensive generalisations have to be made on the basis of large quantities of data.

More than 1,300 high-level scientific publications were published, as well as 111 issues of peer-reviewed journals with an international board of editors, and 143 compilations and monographies were edited.

The Centre contributed to the development of society through developing the conceptual ideas of the humanities and the related areas, and finding and applying new approaches to processes. At the conference, a future vision was presented – to more thoroughly study the ecology of language and culture on the basis of Estonian and other nations, use the combined skills to observe nature culture and vernacular ecology, including the transitions and breaking points of culture, fulfil an important role in global basic and applied research, create new resources and typologies, map cultural models, and find solutions to both present and future challenges, all together to present a comprehensive view of Estonian culture.

The event website contains the conference programme, summaries of presentations and video recordings.

Art Museum of Estonia

The 2023 science events of the research and exhibition project 'Michel Sittow in the North? Altarpieces in Dialogue

The research project of the Estonian Art Museum, 'Michel Sittow in the North? Altarpieces in Dialogue' (2021–2024, project coordinator Merike Kurisoo) culminated in a high-level exhibition including internationally loaned pieces, which was open at the Niguliste Museum from May to November, and a series of research events entailed in the project. The very broad grasp of events aimed at different target groups included scientific and science communication events, such as the international science conference 'Michel Sittow in the North? Artistic contacts in the late medieval Balti Sea region'[103] in November and the science

103 https://kunstimuuseum.ekm.ee/en/syndmus/conference-michel-sittow-in-the-north-artistic-contacts-in-the-late-medieval-baltic-sea-region/; https://www.youtube.com/playlist?list=PLCO0LMBPJtfKBhcTSks-pYxOhAIhHiRH1V

seminar of Swedish art historians, 'Art contacts in late medieval Sweden'[104] in October.

The science conference took a first ever look at Tallinn's meaning in the Baltic Sea art scene and its impact on neighbouring countries. Linking the creations of the local masters with the major Western European art centres, the conference brought together renowned art historians, curators and conservators from the north to the south. The related science communication events aimed at the wider public addressed the late medieval Estonian and Livonian culture, art and history, and the cultural and artistic relationships between Estonia and the Nordic countries on a broader scale. The Estonian Art Museum was the initiator and organiser of all those events held in international cooperation.

Photo: Matthias Weniger

The curator tour of the project 'Michel Sittow in the North', conducted by Merike Kurisoo and Greta Koppel.

104 https://kunstimuuseum.ekm.ee/en/syndmus/seminar-art-contacts-in-late-medieval-sweden/; https://www.youtube.com/playlist?list=PLCO0LMBPJtfIvd_YsLOfGpOH5OKJnw2dT

Estonian National Museum

In 2023, the Estonian National Museum opened the exhibition 'Right Body, Wrong Body?'[105], which developed as an interdisciplinary humanities project focused on the cultural meanings of bodies throughout time. A compilation and conference of the same title summarised the academic research, and the framework programme brought the sub-topics closer to the audience over the year. Great audience interest was proof of the importance of a heritage-based and scientific approach in addressing the topic.

Photo: Berta Jänes, Estonian National Museum

Visitors to the exhibition 'Right Body, Wrong Body?'

Centre of Estonian Rural Research and Knowledge

At the beginning of the year, the result of the lengthy work of Researcher at the Centre of Estonian Rural Research and Knowledge Ingrid Bender and the vegetable workgroup – orange-fruited tomato varieties *Pille* and *Siive* – made it to the catalogue of plant varieties.

Pille is an indeterminant mid-to-early variety with flat, large pleasant-tasting fruits and with the average tomato mass of 125–130 g. *Siive* is a determinant early variety with average-sized round fruits and an average tomato mass of 70–80 g. Thanks to their remarkably abundant early crop and low growth the plants of the *Siive* variety can also be successfully grown in low tunnels in addition to greenhouses. The fruits of both varieties have over six locules and are therefore rather fleshy. The fruits of the *Pille* variety have a thick fleshy pericarp, while in the *Siive* variety the pericarp is of medium thickness.

According to Ingrid Bender, both varieties have a good resistance to pathogens present in unheated greenhouses in the local weather conditions. These varieties are resistant

105 https://www.erm.ee/et/oige-keha-vale-keha (in Estonian).

Photo: Ingrid Bender

Photo: Centre of Estonian Rural Research and Knowledge

New tomato varieties *Pille* (on left) and *Siive*.

to tomato leaf mould (*Fulvia fulva* (Cooke) Cif.). The *Siive* variety is resistant to races 0 and 1 of *Fusarium oxysporum* f. sp. *lycopersici* that cause vascular wilt, and Pille is resistant to race 1 of the same *Fusarium* species.

Academic Theological Society

The event of the year for the Academic Theological Society was the presentation day 'Theology – a science of the modern times?' held at the Academy of Sciences on 31 March.[106] The members of the Society talked about the current status of theology. Urmas Nõmmik talked about the today's challenges in Bible studies, while Tarmo Toom described what is happening in patristics. Anne Kull gave an overview of the contemporary problems of systematic theology and Roland Karo introduced the dialogue between science and religion as an independent area of research in theology. In addition to the speakers, the panel discussion 'How is theology science?' also included Meelis Friedenthal, Toomas Jürgenstein and Indrek Peedu, with Ain Riistan as the moderator. The presentation day was followed by the Society's annual meeting.

Photo: Ain Riistan

Academy President Tarmo Soomere (on right) showing his office to members of the Society. In the photo from left: Toomas Jürgenstein, Meelis Friendenthal, Anu Põldsam and Urmas Nõmmik.

Estonian Academic Oriental Society

The event of the year for the Estonian Academic Oriental Society was the 35th Orientalist Day conference organised in cooperation with the Asian Studies area of Tallinn University School of Humanities held on 15–16 September.[107] This conference has been held since the 1980s and was for the first time held outside Tartu, in Tallinn. The venues were representative: The building of the Estonian Academy of

Photo: Mart Tšernjuk

The 35th Orientalist Day conference in the building of the Estonian Academy of Sciences, with the Honorary President of the Estonian Academic Oriental Society Tarmo Kulmar delivering his presentation.

106 https://www.akadeemia.ee/sundmused/akadeemilise-teoloogia-seltsi-ettekandepaev (in Estonian).

107 https://www.eao.ee/xxxv-orientalistikapaevad-eesti-teaduste-akadeemias-ja-tallinna-ulikoolis-15-16-september-2023 (in Estonian).

Sciences and the Astra House of Tallinn University. During the two days, the audience was able to listen to 17 academic presentations on various topics related to the Orient. The opening day of the conference ended with a festive dinner and an oriental culture programme.

Estonian Society for the Study of Religions

On 15 December, the conference 'Death, dying and life after death' was held at the Estonian Naturalists' Society in Tartu with nearly 40 participants.[108] Eight presentations focused on the treatment of death in Middle Eastern religions (Andreas Johandi), the antiquity (Elo-Mall Toomet) and Buddhism (Märt Läänemets), and death from the aspect of Christian pastoral care (Kaido Soom) and from the internal viewpoint of the Orthodox community (Irina Paert). Three presentations were dedicated to the study of near-death experiences as a separate area (Madis Arukask, Karl Käsnapuu, Roland Karo). All the speakers took part in a discussion group moderated by Ain Riistan, and the participants were also given an opportunity to speak. It was concluded that discussing death and the other side in different contexts and in an interdisciplinary manner will be also necessary in the future. The day ended with the Society's information briefing and a pre-Christmas gathering.

Photo: Ain Riistan

Elo-Mall Toomet (on right) delivering a presentation, with Merili Metsvahi moderating the discussion.

Estonian Naturalists' Society

40th Naturalists' Day

The 40th Naturalists' Day was held at the Räpina School of Horticulture on 7–9 July. The long-standing event has been held in different regions of Estonia since 1931 and was last held in Räpina in 1976. The event included presentations about local nature, as well as workshops presenting various species groups and study trips into nature. The participants mainly included the members of the Naturalists' Society – both prestigious natural scientists and hobby naturalists – as well as employees of the School of Horticulture and members of the Räpina section of the Naturalists' Society.

The first workshop took place on Friday evening when Ain Piir led the participants to look for moths in a flower garden. Jaan Kivistik introduced the well-known and lesser-known plants of a manor park, including the clones and mutants of ordinary species, such as the Norway maple Paldiski. The enjoyable hike lasted well into the night.

On Saturday, the participants listened to presentations and, among others, ecologist Anneli Palo from Räpina spoke about local nature. In the workshops, Henn Timm and Helle Mäemets led the participants to study the biota at the water's edge, mainly plants and invertebrates. Annelie Ehlvest from Tartu Nature House had set up an exciting workshop about snails. Ain Piir and Villu Soon spoke about butterflies and bumblebees. The workshops were followed by study trips to Krõnstali forest and Meelva bog. The day ended with a festive celebration for the Society's 170th anniversary at Sillapää castle.

Photo: Ain Piir

Participants in the 40th Naturalists' Day in front of Sillapää castle.

Estonian Economic Association

The Annual Conference[109] of the Estonian Economic Association was held in Rakvere on 26–27 January 2023. The main academic presentation was delivered by the Head of and Senior Research Associate at the Cambridge Institute for Sustainability Leadership (CISL) Dr Annela

108 https://eaus.ee/et/eaus-aastalopukonverents-surm-suremine-ja-elu-parast-surma (in Estonian)

109 https://majandus.ut.ee/et/sisu/eesti-majandusteaduse-seltsi-aastakonverents (in Estonian).

Anger-Kraavi, whose main area of research is climate change economics.

Photo: Andres Vaher

Two honorary members of the Economic Association, Professor Jüri Sepp (left) and Professor Enn Listra (right) with the Association's President Professor Kadri Ukrainski.

Estonian Musicology Society

The 2023 Tartu Day of the Estonian Musicology Society was held in the Eller Hall of the Heino Eller Music School on 15 April and was dedicated to the 150th anniversary of Rudolf Tobias. Presentations were delivered by Aare Tool, Janika Oras and Taive Särg, Toomas Siitan, Anu Kõlar and Mart Humal. The evening was ended via Zoom by Mimi S. Daitz who spoke about her recently published book *Ancient Song Recovered: The Life and Music of Veljo Tormis*.

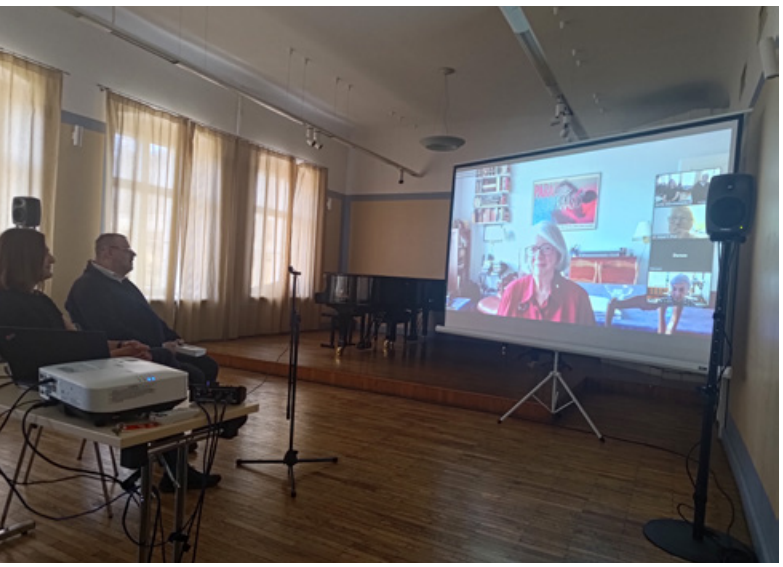


Photo: Kerri Kotta

Professor Emeritus of the Estonian Academy of Music and Theatre, Acacdemy member Jaan Ross and Pärtel Lippus speaking with Mimi S. Daitz on the Tartu Day of the Musicology Society on 15 April 2023.

Estonian Semiotics Association

The 12th Autumn School of Semiotics, titled 'Utopia. Dystopia'[110] was held at the Old Observatory in Tartu on 4–5 November. Jaak Tomberg talked about the use of terminology in literature through years and movements. Jaana Davidjants spoke about social media activism, and also touched upon compassion fatigue. Helena Tulve demonstrated how music is a shaper and creator of spacetime, and its possibilities in expressing different utopias and dystopias. Jarmo Reha talked about his projects, linking the role of a director, dramaturg and actor with dystopias. Kalevi Kull took the participants on an autumn walk to discuss (urban) landscapes, climate and darkness. Sanna Kartau held a writing workshop. Andreas Ventsel presented conspiracy theories as a form of dystopian/utopian thinking. Timo Maran highlighted the anti-utopian attitude which strives towards strengthening the links between humans and nature. Hasso Krull entwined thoughts about history, Prometheus and regression as a possible solution. A dystopia and utopia quiz was held in the evening. The participants in the Autumn School mainly included semiotics students and lecturers, members of the Estonian Semiotics Association and enthusiasts from other fields.

Photo: Kadri-Ann Väärsi

Hasso Krull at the Autumn School.

110 https://semiootika.ee/semiootikasugiskool (in Estonian).

A poster inviting interested parties to discuss the EHDR, designed by Mari-Liis Tikerperi.

Estonian Association of Sociologists

Public lecture and discussion 'Ant's scramble and mental health' on the topic of the Estonian Human Development Report 2023"[111]

In April, the Estonian Association of Sociologists invited its members and all other interested people to discuss mental health and wellbeing, inspired by the Estonian Human Development Report 2023 (EHDR). A total of 12 members of the Association took part in the compilation of the EHDR. At the public lecture and subsequent discussion, Editor-in-Chief of the EHDR Merike Sisask, co-authors Dagmar Kutsar, Mare Ainsaar and Veronika Kalmus and reviewer Marju Lauristin spoke about the mental health of Estonian people. The discussion was moderated by Mai Beilmann. The discussion participants talked about things included in the report as well as matters that did not fit into the report, e.g. the importance of culture in maintaining mental health. 77 people attended the event live in Tartu and via the internet.

Estonian Learned Society in Sweden

The event of the year for the Estonian Learned Society in Sweden was the presentation of the Society's 16th yearbook. This marked years of research, writing and editing. All the articles were written in Estonian in 2015–2022 and cover topics from both the humanities and sciences. The authors of the compilation: Evelin Tamm, Ivar Paljak, Ants Anderson, Raimo Raag, Virve Raag, Katrin Uba, Koidu Norén, Ivi-Mai Schöön, Helena Faust, Astrid Wendel-Hansen, Ruth Rajamaa and Hain Rebas. At the presentation, Editor-in-Chief Helena Faust and the authors discussed what inspired them to study and write on the topics addressed in the yearbook and what the writing process was like. The authors presented a short summary of their articles. The previous issues can be accessed in the DIGAR database of the Estonian National Library. To read the latest yearbook, please contact the Society.[112]

Photo: Kristina Viira

(From left) Piret Villo, Hain Rebas, Raimo Raag, Evelin Tamm, Virve Raag, Ants Anderson, Koidu Norén, Helena Faust, Ruth Rajamaa, Ivi-Mai Schöön and Anu Mai Kõll at the presentation at the Embassy.

111 https://sotsioloogia.ee/rubriigid/publikatsioonid (in Estonian).

112 teadusliikselts@gmail.com

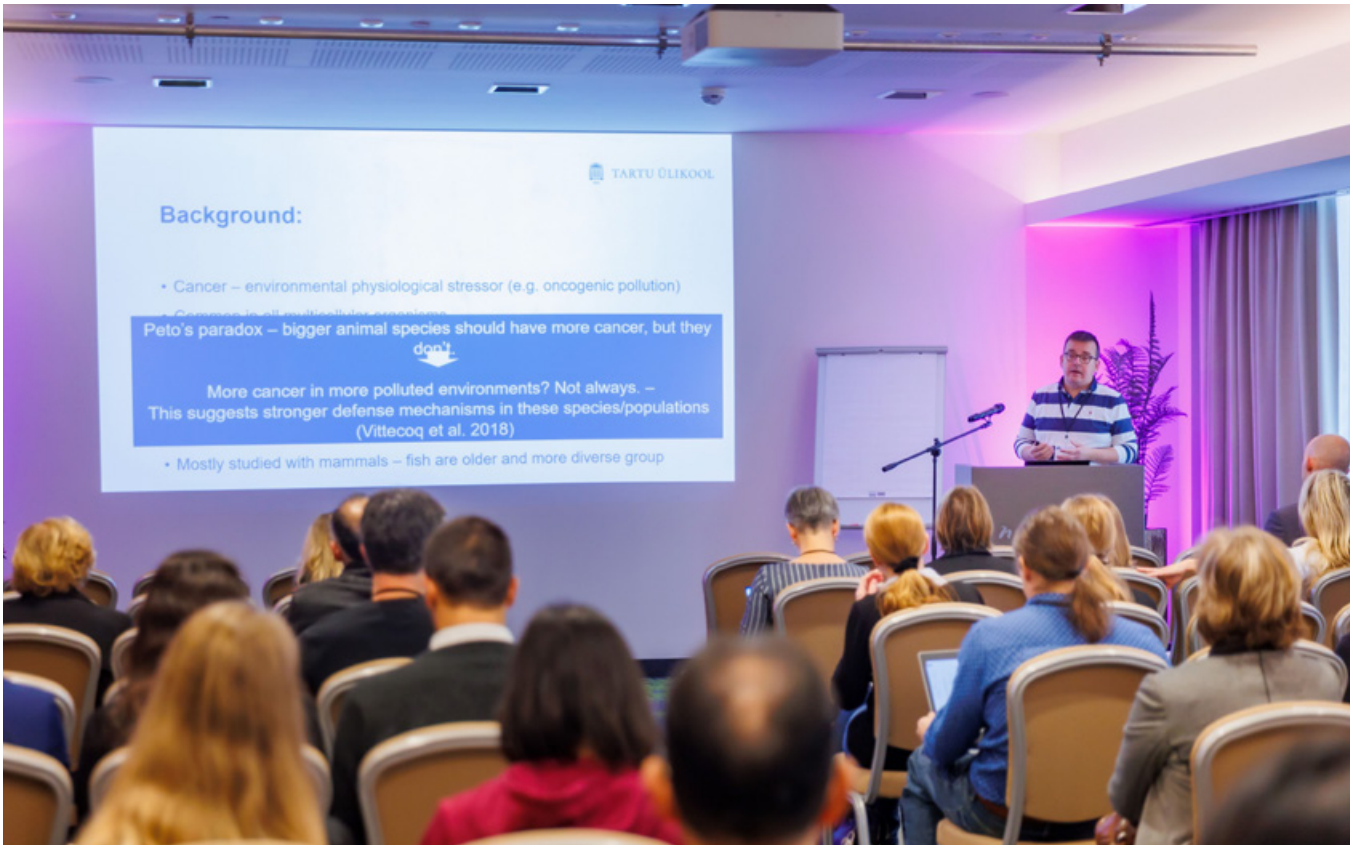


Photo: Arno Mikkor

The session of the Estonian Society of Toxicology at the EcoBalt 2023 conference. Randel Kreitsberg is speaking.

Estonian Society of Toxicology

The session 'The Effects of Legacy and Emerging Chemicals on Ecosystems and Humans' of the Estonian Society of Toxicology at the EcoBalt 2023 conference

The Estonian Society of Toxicology was the co-organiser of a session about toxic substances at the EcoBalt 2023 conference,[113] which was held on 9–11 October and attracted nearly 200 participants from Europe and Asia. The session 'The Effects of Legacy and Emerging Chemicals on Ecosystems and Humans' was led by the Society's Chairman of the Board Angela Ivask. Speakers included Dr Randel Kreitsberg (University of Tart), Professor Anita Jemec Kokalj (University of Ljubljana, Slovenia), Professor Cristina Miceli (University of Camerino, Italy), Dr Margit Heinlaan (Institute of Chemical and Biological Physics), Dr Simona Bartkova (TalTech) and Professor Ivana Vinković Vrček (Insitute of Medical Research and Occupational Health, Croatia). Five of the six presentations were related to microplastics or additives to plastics (e.g. plasticisers), indicating the importance of the topic in today's toxicological research. The summaries of the presentations were published in the MDPI special issue about the conference.[114]

Estonian Mother Tongue Society

The 56th Johannes Voldemar Veski Day 'Regarding the Estonian language and the family of Baltic-Finnic languages'

The 56th J. V. Veski Day, titled 'Regarding the Estonian language and the family of Baltic-Finnic languages' and dedicated to the 150th anniversary of Johannes Voldemar Veski and the UNESCO Decade of Indigenous Languages, was held in Tartu on 27 June.[115] After the opening words of the Society's Chairman Helle Metslang, Vice Chairman Karl Pajusalu was congratulated on his recent 60th birthday. The University of Tartu Foundation announced the 2023 recipient of the J. V. Veski scholarship: second-year bachelor's student of the Estonian language at the University of Tartu Maria Merilo. Presentations included 'Johannes Voldemar Veski as the developer of professional terminology in 1920–1940' by Reet Kasik, 'The Livonian language in the Decade of Indigenous Languages' by Valts Ernštreits, 'Regarding the importance of a language island for Baltic-Finnic linguistics' by Petar Kehayov and 'More than forty years with Votians' by Heinike Heinsoo. The recently published yearbook (68th issue) was presented

113 https://ecobalt2023.kbfi.ee
114 https://www.mdpi.com/2504-3900/92/1/26
115 www.emakeeleselts.ee/koik-teated/27-juunil-toimus-juba-56-korda-j-v-veski-paev (in Estonian).

Photo: Tiina Laansalu

In celebration of the linguist's 150th birthday, the participants in the J. V. Veski Day on 27 June 2023 visit the monument established in his birthplace in Vaidavere.

by Editor-in-Chief Reili Argus. As is the tradition, the participants then went to the Raadi Cemetery where Külli Habicht gave a speech, flowers were placed on the grave of J. V. Veski and a song was sung together.

Led by J. V. Veski's relatives, participants visited important places related to J. V. Veski in Maarja-Magdalena Parish on the occasion of his 150th birthday.

Estonian Young Academy of Sciences (EYAS)

The event of the year for the Estonian Young Academy of Sciences was the unanimous election of the previous Vice President and now supportive member of the EYAS Helen Eenmaa as President of the European Young Academies Science Advice Structure (YASAS) in September 2023. She was also elected as a board member of the Science Advice for Policy by European Academies (SAPEA).

The EYAS joined the YASAS in 2021. In 2022, YASAS was invited to the SAPEA consortium. The role of SAPEA in the European Commission's Science Advice Mechanism[116] (SAM) is to provide independent science-based input for shaping political decisions together with the Group of Chief Scientific Advisors of the European Commission. The SAPEA consortium previously consisted of five European networks of academies of sciences (Academia Europaea, ALLEA, Euro-CASE, FEAM, EASAC). The addition of YASAS allows the consortium to better cater for scientists who are at the beginning of their scientific career in shaping scientific advice.

YASAS leads the 6th SAPEA work package, which is focused on the development of a strategy for increasing the inclusion of young scientists. The EYAS has been additionally represented in the Council of YASAS by observer Ester Oras (2021–2023) and Miina Norvik since 2023. Thanks to its inclusion in the Board of YASAS, the EYAS has also been included in cooperation with the Chief Scientific Advisors of the European Commission.

Photo: Rene Riisalu

Helen Eenmaa.

116 https://scientificadvice.eu

Photo: Mana Kaasik

Participants in the ICOHTEC conference at the Estonian National Museum.

Estonian Association of History and Philosophy of Science

The most important event directly related to the Estonian Association of History and Philosophy of Science in 2023 was doubtlessly the 50th annual conference of the International Committee for the History of Technology (ICOHTEC) held in cooperation with TalTech, the University of Tartu and the Academy of Science. The TalTech Conference Centre, led by Mariann Lugus, bore the main weight of organisation. The first two days of the event took place in Tallinn. The final meeting of the opening day was held in the mirror hall of the Academy of Sciences. On the third day, we travelled through Ida-Viru County to Tartu. In the course of the trip, the conference participants got to see the history of the Estonian oil shale industry. The last two days of the conference were held at the University of Tartu. Led by expert guides, the participants visited the Estonian National Museum, the University of Tartu Museum and the Old Observatory.

CONTACTS OF THE INSTITUTIONS AND ORGANISATIONS ASSOCIATED WITH THE ACADEMY

As specified in the Estonian Academy of Sciences (EAS) Act, passed in 1997, research and development institutions and cultural establishments which are not part of the structure of the Academy, and academic societies or other organisations whose activities and objectives are consistent with the activities and objectives of the Academy may associate with the Academy. The association is effected under bilateral agreements that state the aims of association and the tasks and commitments of the parties.

Institutions associated with the Academy (in alphabetical order):

	Institution	Information and contacts
1.	Academic Library of Tallinn University Associated with EAS since 17 June 1998	Founded in 1946 Personnel: 46 Registered users: 34,639 Items in the circulating collection: 2,687,947 More information: https://www.tlulib.ee/en
2.	Art Museum of Estonia Associated with EAS since 9 June 2015	Founded in 1919 Personnel: 154 More information: kunstimuuseum.ekm.ee/en
3.	Centre of Estonian Rural Research and Knowledge (until 1 January 2023 Estonian Crop Research Institute) Associated with EAS since 23 September 2008	Founded in 1920 Personnel: 323, including 50 researchers More information: https://metk.agri.ee/en
4.	Estonian Literary Museum Associated with EAS since 11 May 1999	Founded in 1909 as the Archival Library of the Estonian National Museum Personnel: 108, including 40 academic staff and 52 other specialists More information: www.kirmus.ee/en
5.	Estonian National Museum Associated with EAS since 21 December 2006	Founded in 1909 Personnel: 144, including 17 researchers More information: www.erm.ee/en
6.	Institute of the Estonian Language Associated with EAS since 11 May 1999	Founded in 1947 Personnel: 94, including 50 academic staff More information: www.eki.ee/EN/
7.	Tartu Observatory of the University of Tartu Associated with EAS since 8 May 1998	Founded in 1808, an institute of the University of Tartu since 1 January 2018 Personnel: 102, including 58 academic staff More information: kosmos.ut.ee/en

Learned societies and other organisations associated with the Estonian Academy of Sciences (listed in an alphabetical order)

	Organisation	Information
1.	Estonian Academic Agricultural Society Associated with EAS since 6 March 2018	Founded in 1920 205 active members, 31 honorary members, (incl. 3 honorary presidents) More information: aps.emu.ee/en/
2..	Estonian Academic Oriental Society Associated with EAS since 12 June 2018	Founded in 1935, re-established in 1988 75 active members, 10 honorary members, 26 corresponding members More information: eao@eao.ee www.eao.ee
3.	Estonian Academic Theological Society Associated with EAS since 15 October 2019	Founded in 1921 as an academic society of theologists, re-established in 1999 as an academic society of theology 65 members, 2 honorary members More information: https://usuteadus.ee/?page_id=1312&lang=en
4.	Estonian Association of Engineers Associated with EAS since 23 September 2008	Founded in 1921 as the Estonian Society of Engineers Re-established on 10 December 1988 as the Estonian Association of Engineers Membership: 18 legal entities More information: igor.krupenski@insener.ee www.insener.ee/
5.	Estonian Association of Sociologists Associated with EAS since 18 June 2019	Founded in 1990 as the Academic Association of Estonian Sociologists, restructured in 1999 68 members More information: sotsioloogia.ee/in-english-2/
6.	Estonian Biochemical Society Associated with EAS since 13 November 2009	Founded in 1959 103 members, incl. 81 active and 22 student members More information: biokeemiaselts.ee/en/
7.	Estonian Chemical Society Associated with EAS since 5 April 2011	Founded in 1919 74 active members More information: www.keemiaselts.ee/english
8.	Estonian Economic Association Associated with EAS since 16 June 2011	Founded in 1930, re-established in 2002 Membership: 121 private persons and 4 legal entities More information: kadri.ukrainski@ut.ee https://majandus.ut.ee/et/sisu/eesti-majandusteaduse-selts-ems

	Organisation	Information
9.	Estonian Geographical Society Associated with EAS since 27 January 1998	Founded in 1955 180 members, 17 honorary members, 5 foreign members More information: egs@egs.ee www.egs.ee
10.	Estonian Learned Society in Sweden Associated with EAS since 19 March 1999	Founded in 1945 Membership: 40 members, incl. 3 honorary members More information: teadusselts@gmail.com www.etsr.se
11.	Estonian Literary Society Associated with EAS since 23 January 2001	Founded in 1907 248 members (incl. 42 life-time members, 3 honorary members and 17 trusted members) More information: https://tartu.kirjandus.ee/
12.	Estonian Mathematical Society Associated with EAS since 26 February 2019	Founded in 1926 as the Academic Mathematical Society, re-established on 17 September 1987 as the Estonian Mathematical Society 362 members More information: https://matemaatika.eu/eng/
13.	Estonian Mother Tongue Society Associated with EAS since 4 February 1998	Founded in 1920 377 active members and 17 honorary members More information: es@emakeeleselts.ee www.emakeeleselts.ee
14.	Estonian Musicological Society Associated with EAS since 21 June 2004	Founded in 1992 95 active members (4 from abroad), 1 honorary member More information: kerri.kotta@eamt.ee www.muusikateadus.ee
15.	Estonian Naturalists' Society Associated with EAS since 23 January 1998	Founded in 1853 659 active members, 9 honorary members, 57 trustees Divisions: 23 More information: www.elus.ee/index.php/en/
16.	Estonian Physical Society Associated with EAS since 14 June 2005	Founded in 1989 163 active members More information: efs@fyysika.ee www.fyysika.ee/efs
17.	Estonian Semiotics Association Associated with EAS since 15 December 2009	Founded in 1998 78 members More information: https://semiootika.ee/english

	Organisation	Information
18.	Estonian Society for The Study of Religions Associated with EAS since 16 June 2011	Founded in 2006 57 active members, 2 honorary members More information: eaus.ee/en/welcome/
19.	Estonian Society of Human Genetics Associated with EAS since 5 April 2011	Founded in 2000 160 members More information: estshg@ebc.ee https://estshg.ut.ee/
20.	Estonian Society of Toxicology Associated with EAS since 31 May 2017	Founded in 1997 71 active members More information: ets@kbfi.ee https://ets.kbfi.ee/
21.	Estonian Association of History and Philosophy of Science Associated with EAS since 4 February 1998	Founded in 1967 57 active members, 12 honorary members, 6 collective members More information: kaija.koovit@gmail.com et.wikipedia.org/wiki/Teadusajaloo_ja_Teadusfilosoofia_Eesti_%C3%9Chendus
22.	Estonian Young Academy of Sciences Associated with EAS since 14 December 2021	Founded in 2017 31 active members, 2 supporting members More information: www.akadeemia.ee/en/eyas
23.	Learned Estonian Society Associated with EAS since 23 January 2001	Founded in 1838 111 active members and 14 honorary members More information: oes.ut.ee/english
24.	Society of Estonian Areal Studies Associated with EAS since 27 January 1998	Founded in 1939 163 members More information: www.ekus.ee/en

ACADEMY MEMBERS

The names are highlighted to distinguish heads of divisions, female scientists, prominent creative individuals and the deceased. More information at www.akadeemia.ee/en/membership

Division of Astronomy and Physics

Jaan Aarik, Exact Sciences, 2013*
Jaak Aaviksoo, Exact Sciences, 1994
Jaan Einasto, Astrophysics, 1981
Ene Ergma, Exact Sciences, 1997
Krista Fischer, Mathematics and Mathematical Statistics, 2020
Arvi Freiberg, Exact Sciences, 2009
Vladimir Hižnjakov, Physics, 1977
Marco Kirm, Exact Sciences, 2018
Martti Raidal, Exact Sciences, 2011
Toomas Rõõm, Physics, 2022
Enn Saar, Astronomy, 2010
Peeter Saari, Physics, 1986
Mart Saarma, Molecular Biology, 1990
Elmo Tempel, Astronomy and Astrophysics , 2021
Gennadi Vainikko, Mathematics, 1986
Richard Villems, Biophysics, 1987**

* Here and hereafter the year of election as an Academy member.
** President from 2004–2014

Foreign members

Jonathan (John) R. Ellis, Theoretical Physics, 2015
Markku Kulmala, Environmental Physics, 2023
Charles Gabriel Kurland, Biochemistry, 1991
Jaan Laane, Chemical Physics, 1995
Alar Toomre, Applied Mathematics, 2012

Division of Informatics and Engineering

Olav Aarna, Informatics, 1990
Hillar Aben, Mechanics, 1977, † 21.01.2024
Dan Bogdanov, Computer and Engineering Science, 2022
Jüri Engelbrecht, Mechanics, 1990*
Maarja Grossberg-Kuusk, Engineering, 2023
Ülo Jaaksoo, Informatics, 1986
Maarja Kruusmaa, Engineering, 2016
Jarek Kurnitski, Engineering, 2018
Jakob Kübarsepp, Materials Engineering, 2011
Rein Küttner, Engineering, 1997
Enn Lust, Energy Technology, 2010
Leo Mõtus, Informatics, 1993
Tarmo Soomere, Engineering and Informatics, 2007**
Raimund-Johannes Ubar, Computer Technology, 1993
Tarmo Uustalu, Computer Science, 2010
Jaak Vilo, Informatics, 2012
Dmitri Vinnikov, Engineering and Computer Science, 2021

* President from 1994–2004
** President from 2014– 2024

Foreign members

Steven R. Bishop, Nonlinear Dynamics, 2012
Michael Godfrey Rodd, Process Control and Information Technology, 1995
Gábor Stépán, Applied Mechanics, 2017
Esko Ukkonen, Computer Science, 2015
Margus Veanes, Software Science, 2019

Division of Biology, Geology and Chemistry

Toomas Asser, Medical Science, 2011
Jaan Eha, Natural Sciences and Medicine, 2016
Jaak Järv, Natural Sciences, 1997
Ain-Elmar Kaasik, Neurology, 1993
Anne Kahru, Ecotoxicology, 2018
Dimitri Kaljo, Geology, 1983
Mati Karelson, Natural Sciences and Medicine, 2007
Kalle Kirsimäe, Geology, 2018
Urmas Kõljalg, Biosystematics and Ecology, 2011
Maris Laan, Public Health, 2021
Agu Laisk, Natural Sciences, 1994
Margus Lopp, Chemistry, 2011
Jüri Martin, Ecology, 1990
Ülo Mander, Global Change, 2024
Andres Metspalu, Biotechnology, 2010
Ülo Niinemets, Natural Sciences, 2013
Pärt Peterson, Biomedicine, 2023
Valdur Saks, Biochemistry, 1993
Martin Zobel, Ecology, 2010
Raivo Uibo, Medical Science, 2003
Veiko Uri, Forestry, 2020
Mart Ustav, Biomedicine, 2001
Eero Vasar, Medical Science, 2010

Foreign members

Ülo Langel, Neurochemistry, 2015
Pekka T. Männistö, Pharmacology, 2012
Svante Pääbo, Genetics, 2019
Matti Saarnisto, Geology, 2008
Helmut Schwarz, Chemistry, 2002

Division of Humanities and Social Sciences

Jüri Allik, Psychology, 2010
Mart Kalm, Art History, 2010
Mare Kõiva, Ethnology and Folkloristics, 2023
Valter Lang, Historical Science, 2010
Lauri Mälksoo, Law, 2013
Elmo Nüganen, Dramatic Arts, 2020
Karl Pajusalu, Linguistics, 2011
Arvo Pärt, Music, 2011
Tiina Randma-Liiv, Social Sciences and Governance, 2018
Anu Raud, Art, 2016
Anu Realo, Cultural Studies, 2018
Jaan Ross, Humanities, 2003
Hando Runnel, Literature, 2012
Huno Rätsep, Estonian Language, 1981
Ellu Saar, Sociology, 2022, † 02.06.2024
Marek Tamm, Cultural History, 2021
Tiit Tammaru, Human Geography, 2018
Tõnu-Andrus Tannberg, History, 2012
Jaan Undusk, Humanities, 2007
Urmas Varblane, Economics, 2009
Haldur Õim, Humanities and Social Sciences, 1994

Foreign members

Juri E. Berezkin, Ethnography, 2012
Cornelius Theodor Hasselblatt, Literature and Culture, 2015
Raimo Raag, Linguistics, 2019
Endel Tulving, Psychology, 2002 † 11.09.2023
Jaan Valsiner, Psychology, 2017

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Group photo of the Academy members at the General Assembly on 19 April 2023.

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