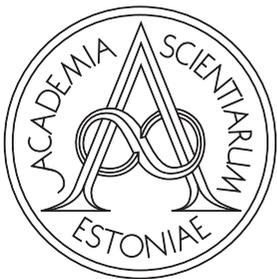


EESTI TEADUSTE AKADEEMIA

IN WORDS  
AND  
IMAGES

2017



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# Introduction

Life in the Academy has many faces. Some of these facets can be inscrutable for the outsider. The way researchers verify, over and over again, whether things are actually the way they seem or investigate issues down to the minutest detail, such as splitting nanotubes thousands of times thinner than a human hair, can look like a hopeless pedantic and labyrinthine routine to some. But since more or less every experienced researcher can recall times when microscopic differences have massively changed outcomes, there is really no way around this process.

However, the majority of life in the Academy is fascinating: generally multilayered, commonly informative, but also sometimes startling, occasionally capable of shocking the experts - even those of us with the broadest and deepest knowledge. The ancient playwright Sophocles once said “look and you will find it, what is unsought will go undetected” and we must learn from this. The human eye is a capable instrument in its own right, but a well-chosen angle, place, or distance for viewing can often result in absolute oodles of extra insight.

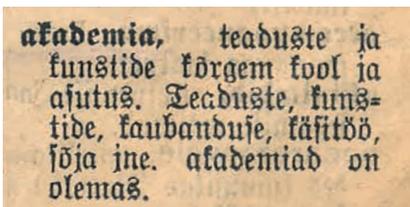
We would like here to show you a kaleidoscopic view of a year in the life of the academy. Some things can be shown with a smile, while others necessarily require a more serious focus. To practice the latter, we’ll jump into the deep end with two longer texts and an interview.

Since the present overview is the first of its kind, we have peppered it with data from previous years. This is simply because this helps provide depth and perspective.

As is the case with every long-standing institution and science in general, the Academy tends to use some words slightly differently from their everyday meaning. Thankfully, these instances are few and far between. To make sure the authors and the readers are ‘on the same page’, we’ve included some historical perspectives, explanations of terminology and insights into more obscure aspects of life at the Academy.

Probably the most significant change in Estonian science in 2017 was the creation of the Estonian Young Academy of Sciences (EYAS). This was the culmination of a long process and, although we are only at the beginning of a journey, this initiative has already begun to prove its worth. To help introduce and promote EYAS, this publication features EYAS and its members relatively heavily. Members of the Estonian Academy of Sciences do, after all, have an entire classic yearbook all of their own.

Tarmo Soomere, 28 March 2018.



*Academy, a higher institution of sciences and arts. Academies exist for sciences, arts, trade, crafts, war, etc.*

(Teadusline tasku sõnaraamat. 2146 teaduslist sõna, kõnekäändu, tarkade meeste ütelsi, lentsõnu jne. Tarvilik käsiraamat igale teadusehimulisele ja edasipüüdjale inimesele. A. Suurkask'i kirjastusel, Viljandis 1908 A. Peet'i trükk, Viljandis.)

# THE ACADEMY IS THE ACADEMY IS THE ACADEMY...

(Umberto Eco / Gertrude Stein)

The modern know-it-all Dr Google and its right hand man Wikipedia are defeated by the task of defining the phrase “academy of sciences”. It is quite amusing to read<sup>1</sup> that “an academy of sciences is a type of learned society or academy (such as a special scientific institution) dedicated to sciences that may or may not be state funded.”

The definition of one of the oldest academies, the French Academy of Sciences, is better. It goes:

“...Ever since it was created in 1666, the Academy [French Académie des Sciences] has been resolutely committed to the advancement of science and has advised government authorities in those matters and issues deemed within its remit. It is a double calling that has been reinforced over time, as and when our knowledge base itself progressed. Today, the Academy’s Members discharge their missions, to the Nation and the Academy’s foundations, in standing committees and working parties set up by the Academy.”

<sup>1</sup> Wikipedia, Academy of Sciences, accessed 31.07.2018

The Estonian Academy of Sciences Act says the same thing, though with some added verbiage: “The Estonian Academy of Sciences was founded in 1938 as an association of top-level scientists and scholars with a commitment and responsibility to advance scientific research and represent Estonian science, to foster adaptation of new knowledge in the interests of the country, and enhance public appreciation of science and scientific methods of thought in Estonia.”

These definitions are missing a crucial component: we are stronger together than we are alone. Jüri Engelbrecht emphasises this in writing about the nature of the academy: “It is not the formal institution that matters; it is the mental strength that binds its members together in the age-old Aristotelian spirit: the whole is more than the sum of its components.”

Jüri Engelbrecht, 2008. Aastatest akadeemias 1994–2004 ja edasi. (The years in the Academy. 1994–2004 and further.) Aastatest akadeemias, Eesti Teaduste Akadeemia, Tallinn 2008, lk 33–55.

Small countries face a perennial question: whether it makes any sense to get mixed up in the problems of the world. While in music, a single genius can rise and stay at the top for a long time (such as Arvo Pärt, a member of the Academy), and a super-talented young person with a small team can achieve the same in sport, neither a lone researcher nor a small team can go far these days. Moreover, in a country as small as Estonia, where the total number of the nation’s scientists approximates a regular research institute in a large country, is there even any point in having an academy of sciences?

The Estonian Academy of Sciences was founded in 1938. It was unique in the world as the first academy of sciences to

be founded in a country with such a small population, and has kept this status to this day. This fact leads us to ask why the Estonian Academy of Sciences and later the Academy of Sciences of the Estonian SSR were created in the first place. Did this need originate from the innate logic of Estonian scientific development or was it a political gamble?

Did the Academy justify itself in such a small country and would its existence and development have been possible without Estonian universities and the close control and funding of different powers? Which direction did research take in the Academy and does it have a continued impact in the modern Estonian science?

## Its Ponderous Birth

The Estonian Academy of Sciences is celebrating its 80th anniversary in the same year the Republic of Estonia turns 100. With people, birthdays are generally easy to determine, but ages not necessarily so. One member of the Academy, Ene Ergma, for example, has been able to celebrate just eighteen<sup>1</sup> birthdays. For states and institutions, birthdays can be complicated. If suitable days occur more often than once every four years, the solution lies in multiple celebrations.

The need for an academy was debated from the time independence was won. Action only followed twenty years later. It took nearly nine months to move from the decision to the actual creation of the Academy. The process started on Friday, 28 January 1938, when President-Regent Konstantin Päts, citing “urgent national need”, signed Decision no. 35 of the Estonian Academy of Sciences Act. The law entered into force upon its publication in the *Riigi Teataja* the following week, on 2 February 1938. That made 31 January 2018, the date of a celebration meeting in the conference hall of the Riigikogu [Parliament of Estonia – ed.], a good date to commemorate the Academy’s founding.

The original composition of the Academy was confirmed, following a proposal by the Minister of Education, by the decision of the President-Regent, two and a half months later, on 13 April. On 20 April 1938, the symbolic first general assembly took place at the Council Hall of the University of Tartu. A celebratory general assembly meeting and a conference was held on 20 April 2018 at the Estonian National Museum.

<sup>1</sup> Food for thought: is member Ergma celebrating a birthday this year?

The central tasks of the Academy are still the same: “fostering science in general and as it pertains to Estonia in particular, driven by questions arising from real-life needs”. Importantly, the task of advising the state has been added.

The substantive work kicked off with a general meeting in Tallinn, at the premises of the Estonian Chamber of Commerce and Industry, on 22 October 1938, with the President attending. We commemorate this date with an international conference, “Advisory role of academies in the information-rich society”, on 22-23 October 2018.

Referenced from Ken Kalling, Erki Tammiksaar. Estonian Academy of Sciences. History, Developments, Conclusions. Tallinn, 2008.

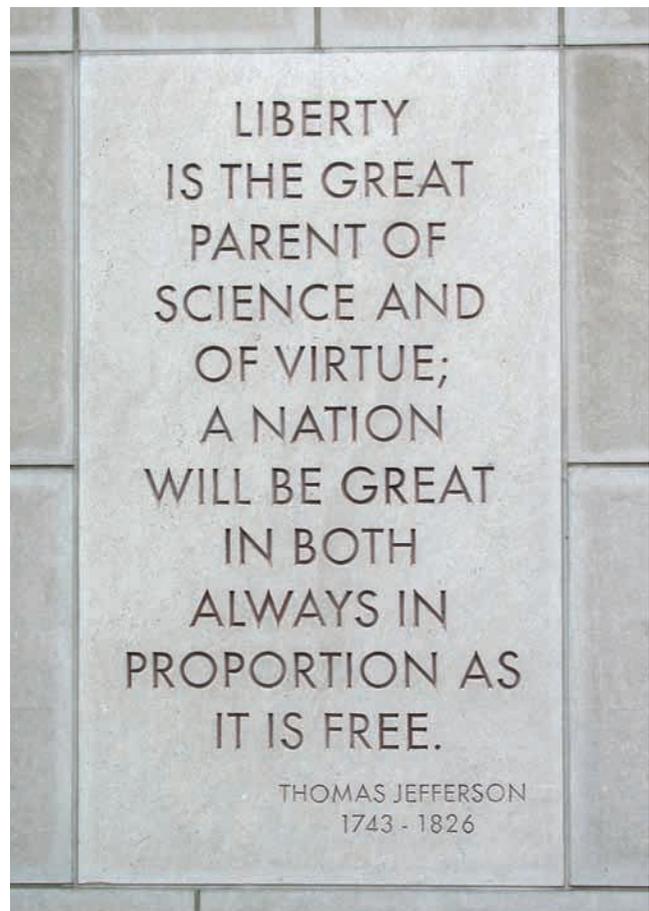


Photo: private collection



Photo: private collection

Plaques next to the doors of the (multiple!) national academies of sciences of the US. Few people have dared to associate research with bravery; even fewer add liberty to the mix.

*Did you know?* The US National Academy of Sciences was created with the express purpose of providing advice to the government, but the state does not contribute a single cent to its budget.

## Its Framework

The beginnings and development of different national academies of sciences are varied. Estonia chose the model in which the academy is relatively closely bound to the state and draws most of its funding from the state budget: hence, the Academy's status and its mandate to work for the state.

The legal form of the Estonian Academy of Sciences is somewhat peculiar compared to its peers. The Academy is a legal entity in public law. This form does not exist everywhere. Such institutions are created through legislation to act in the public interest. In Estonia, legal persons in public law include universities, the Estonian National Opera, Estonian Public Broadcasting, and the Estonian Health Insurance Fund; there are more than 20 institutions altogether.

In other words: the Estonian Academy of Sciences has always been intended to act in the public interest. This is evident from the text of 1938, which states that the Academy was created to address an “urgent national need” (see the phrasing of the President-Regent's decision on p. 7). It is only logical that the legislature has set the Academy a multitude of tasks. The central responsibilities

are the same as those assumed by academies of sciences functioning under other legal forms:

- to bring together top researchers;
- to act independently and with high academic professionalism;
- to develop and represent the science of the country.

Those classic statements are followed by the crux of why the Estonian state needs this academy. Developing and representing high-level research is only part of the Academy's mission.

According to the Academy of Sciences Act, the Academy's main mission is to “help resolve issues relating to the development of Estonian research and the social and economic development of the state”. This means that the Academy is charged with applying high-level research to improve the general quality of life of Estonians and with promoting science and scientific thought in Estonia. The twelve classic ways to do this are enshrined in the Act. Unwritten, but permitted and encouraged, are myriad ways to carry out these tasks creatively and elegantly.



Photo: Reii Kõkk

**Decision No. 35**

of the President-Regent of 28 January 1938: Due to urgent national need I enact and proclaim as a decree the Estonian Academy of Sciences

Act. President-Regent K. Päts

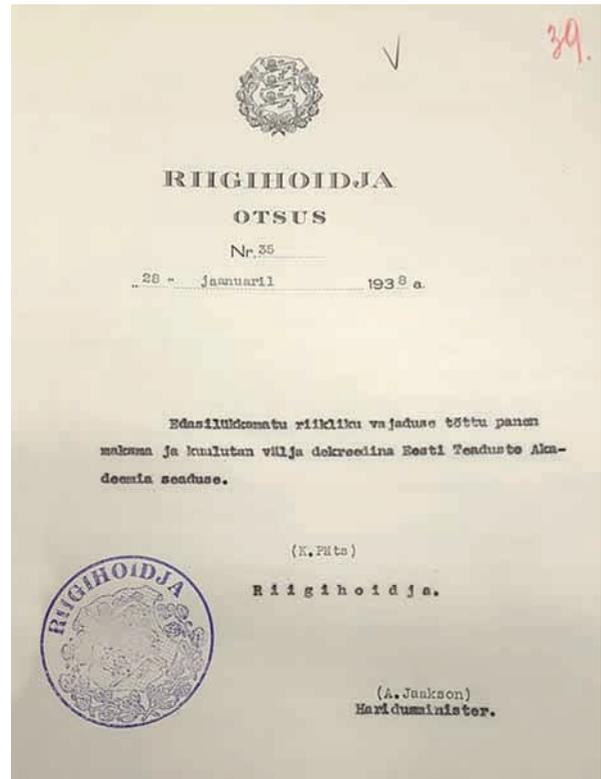


Photo: copy of the original

## Two Pictures from the Past

On 28 January 1938, President-Regent Konstantin Päts enacted and proclaimed as a decree the Estonian Academy of Sciences Act.

On 13 April, the President-Regent appointed the first 12 Members of the Academy, six of them in the humanities division - Edgar Kant, Oskar Loorits, Julius Mark, Hendrik Sepp, Gustav Suits and Jüri Uluots - and six in the natural sciences division - Hugo Kaho, Paul Kogerman, Aleksander Paldrok, Ludvig Puusepp, Karl Schlossmann and Ernst Öpik. Karl Schlossmann was appointed the first president of the Academy.



Photo: TÜ

The photo was taken on 20 April 1938 at the Council Hall of the University of Tartu, at the first general assembly of the Estonian Academy of Sciences. From the left: Members of the Academy Ernst Öpik, Hugo Kaho, Aleksander Paldrok, Edgar Kant, Karl Schlossmann, Oskar Loorits, Paul Kogerman, Julius Mark, Gustav Suits and Ludvig Puusepp. The general assembly elected Julius Mark vice-president and Edgar Kant and Paul Kogerman division heads.

On 31 December 2017, the Estonian Academy of Sciences had 73 full members and 22 foreign members. Enn Mellikov passed away on 23 July 2018.



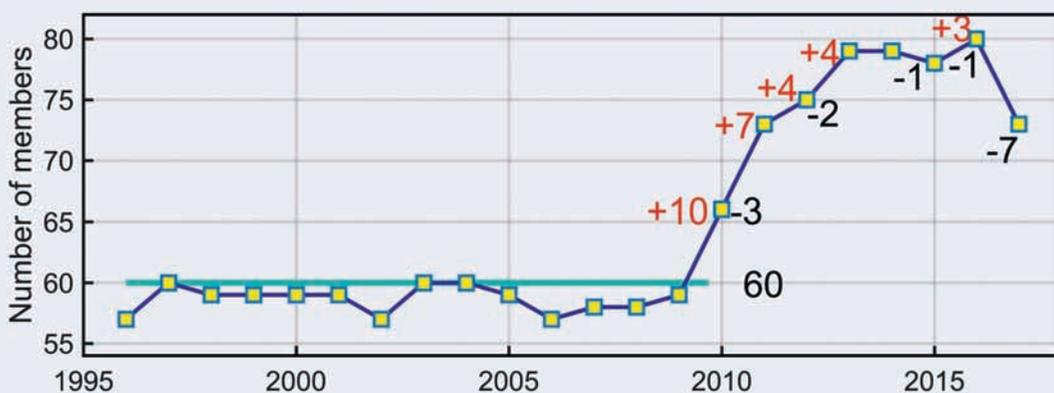
Photo: Maris Krüuveld

This photo was taken at the annual general assembly of 19 April 2017.

The number of members of the Academy has grown steadily. It started out with 12 members. Over time, the number rose to 60 and then stayed stable for some 20 years. The first memberships (the original membership of 1938 and the first restored one of 1946) were appointed; every following new member has been elected.

The membership of the Academy is lifelong. Therefore new members can be elected only when a member passes away. The unfilled places are called vacancies. When a member departs to science Valhalla, a vacancy is said to have opened.

Filling vacancies is not compulsory. However, since the strength of a personal academy lies in its members, vacancies are generally filled relatively quickly with the most meritorious researchers. From 2010 onwards, a vacancy also opens on the 75th birthday of a current member. Older members remain full members of the Academy, but a new seat is created for a new member alongside them. And so the total head count of the Academy numbered 81 in December 2016.



The full members and foreign members of the Academy (name, division and year of election) by division as of 31 July 2018. Heads of divisions are highlighted in green, female researchers in yellow, and outstanding cultural

personalities in blue. More information is available at <http://www.akadeemia.ee/en/>.

## Division of Astronomy and Physics

**Jaan Aarik**, Exact sciences, 2013

**Jaak Aaviksoo**, Exact sciences, 1994

**Jaan Einasto**, Astrophysics, 1981

**Ene Ergma**, Exact sciences, 1997

**Arvi Freiberg**, Exact sciences, 2009

**Vladimir Hiznjakov**, Physics, 1977

**Tšeslav Luštšik**, Solid state physics, 1964

**Ergo Nõmmiste**, Exact sciences, 2012

**Eve Oja**, Mathematics, 2010

**Martti Raidal**, Exact sciences, 2011

**Enn Saar**, Astronomy, 2010

**Peeter Saari**, Physics, 1986

**Mart Saarma**, Molecular biology, 1990

**Arved-Ervin Sapar**, Astrophysics, 1990

**Gennadi Vainikko**, Mathematics, 1986

**Richard Villems**, Biophysics, 1987

### Foreign members

**Jonathan (John) R. Ellis**, Theoretical physics, 2015

**Richard R. Ernst**, Physical chemistry, 2002

**Charles Gabriel Kurland**, Biochemistry, 1991

**Jaan Laane**, Chemical physics, 1995

**Jaak Peetre**, Mathematics, 2008

**Alar Toomre**, Applied mathematics, 2012

## Division of Informatics and Engineering

**Olav Aarna**, Informatics, 1990

**Hillar Aben**, Mechanics, 1977

**Jüri Engelbrecht**, Mechanics, 1990

**Ülo Jaaksoo**, Informatics, 1986

**Maarja Kruusmaa**, Engineering, 2016

**Valdek Kulbach**, Mechanics, 1986

**Rein Küttner**, Engineering, 1997

**Jakob Kübarsepp**, Materials engineering, 2011

**Ülo Lepik**, Mechanics, 1993

**Enn Lust**, Energy technology, 2010

**Leo Mõtus**, Informatics, 1993

**Andres Öpik**, Engineering, 2013

**Arvo Ots**, Power engineering, 1983

**Tarmo Soomere**, Informatics and engineering, 2007

**Enn Tõugu**, Informatics, 1981

**Raimund-Johannes Ubar**,

Computer science, 1993

**Tarmo Uustalu**, Computer science, 2010

**Jaak Vilo**, Informatics, 2012

### Foreign members

**Steven R. Bishop**, Nonlinear dynamics, 2012

**Antero Jahkola**, Power engineering, 1998

**Michael Godfrey Rodd**, Process control and infotechnology, 1995

**Gábor Stépán**, Applied mechanics, 2017

**Esko Ukkonen**, Computer science, 2015

## 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

**Dimitri Kaljo**, Geology, 1983

**Mati Karelson**, Natural sciences and medicine, 2007

**Urmas Kõljalg**, Biosystematics and ecology, 2011

**Ilmar Koppel**, Physical chemistry, 1993

**Hans Kõüts**, Agricultural sciences, 1994

**Agu Laisk**, Natural sciences, 1994

**Ülo Lille**, Biotechnology, 1983

**Margus Lopp**, Chemistry, 2011

**Udo Margna**, Plant physiology, 1987

**Jüri Martin**, Ecology, 1990

**Andres Metspalu**, Biotechnology, 2010

**Ülo Niinemets**, Natural sciences, 2013

**Anto Raukas**, Geology, 1977

**Valdur Saks**, Biochemistry, 1993

**Raivo Uibo**, Medical science, 2003

**Mart Ustav**, Biomedicine, 2001

**Eero Vasar**, Medical science, 2010

**Mihkel Veiderma**, Inorganic chemistry, 1975

**Martin Zobel**, Ecology, 2010

### Foreign members

**Carl-Olof Jacobson**, Zoological morphology, 1995

**Ülo Langel**, Neurochemistry, 2015

**Pekka T. Männistö**, Pharmacology, 2012

**Matti Saarnisto**, Geology, 2008

**Helmut Schwarz**, Chemistry, 2002

**Janis Stradinš**, Physical Chemistry and History of Science, 1998

## Division of the Humanities and Social Sciences

**Jüri Allik**, Psychology, 2010

**Mihhail Bronštein**, Agricultural economics, 1975

**Mart Kalm**, Art History, 2010

**Valter Lang**, Historical sciences, 2010

**Lauri Mälksoo**, Law, 2013

**Karl Pajusalu**, Linguistics, 2011

**Arvo Pärt**, Music, 2011

**Huno Rätsep**, Estonian language, 1981

**Anu Raud**, Art, 2016

**Jaan Ross**, Humanities, 2003

**Hando Runnel**, Literature, 2012

**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**, Cultural anthropology, 2012

**Cornelius Theodor Hasselblatt**,

Literature and Culture, 2015

**Päiviö Tommila**, History, 1991

**Endel Tulving**, Psychology, 2002

**Jaan Valsiner**, Psychology, 2017

Members of the Academy are elected for life; therefore, their departure, while painful, is part and parcel of life in the Academy. In this respect, the Academy did well for six years. In 2011-2016, we had to bid farewell only to the Academy members Parmasto (24.04.2012), Hagelberg (17.07.2012), and Lippmaa (30.07.2015). The year 2017, on the other hand, was among the saddest in the entire history of the Academy. Within 373 days, counting from 13 December 2016, we lost eight colleagues and a foreign member.

Three of them had contributed to the Academy for over 40 years. Arno Kõörna was one of the longest-standing members in the history of the Academy; only Tšeslav Luššik (53 years and counting) and Harald Keres (elected in 1961, Theoretical physics, 15.11.1912-26.06.2010), as well as Ernst Õpik from the original membership of the Academy (appointed in 1938, Natural sciences, 22.11.1893-10.09.1985) served longer.

*The membership of the Academy is lifelong. Therefore, their departure, while painful, is part and parcel of life in the Academy.*

**Lembit KRUMM**, elected in 1987, Power engineering, **20.07.1928–13.12.2016**

**Hans-Voldemar TRASS**, elected in 1975, Botany and ecology, **2.05.1928–14.02.2017**

**Arvo KRIKMANN**, elected in 1997, Humanities, **21.07.1939–27.02.2017**

**Peeter TULVISTE**, elected in 1994, Humanities and social sciences, **28.10.1945–11.03.2017**

**Georg LIIDJA**, elected in 1987, Physics, **4.08.1933–12.06.2017**

**Karl SIILIVASK**, elected in 1977, History, **20.01.1927–18.11.2017**

**Ülo LUMISTE**, elected in 1993, Mathematics, **30.06.1929–20.11.2017**

Välisliige **Antero JAHKOLA**, elected in 1998, Energy research, **5.02.1931–10.12.2017**

**Arno KÕÖRNA**, elected in 1972, Economics, **2.02.1926–21.12.2017**

**Enn MELLIKOV**, elected in 2003, Technology of materials, **01.04.1945–23.07.2018**

Aside from their day jobs, the members of the Estonian Academy of Sciences take on over 400 roles. The vast majority involve voluntary work. The obligations they have undertaken vary from essentially national-level duties in the Research and Development Council and advisory committees of various national institutions to tasks connected to the specifics of science, such as editing science and popular science magazines, reviewing submissions, organising conferences and sorting presentations.

Neither time nor age seems to bother our members much. The oldest member of the Academy, the mechanics researcher Ülo Lepik, recently (on 11 July 2018) turned 97. Just four years ago (2014), Springer published his monograph on wavelets, a topic he first started researching at the age of 70. At the end of 2017, 11 Members were 85 or older. Of course, a few of them are no longer fully active.

Naturally, all active members participate in organisational work at their universities and other research organisations, fulfilling direct administrative duties ranging from laboratory manager to rector, participating in councils of various (sub) units and contributing in countless ways to advancing and promoting science. Six current members of the Academy currently sit on the Council of the University of Tartu and the board of governors of the Tallinn University of Technology.



Ülo Lepik's and Helle Hein's monograph *Haar Wavelets* (Springer 2014) is the first book to present a systematic review of the applications of this type of wavelets for solving calculus and theoretical mechanics problems. Ülo Lepik wrote about the coining and development of the term "wavelet" in *Postimees* (The Postman), 8 April 2017: *Wavelets: a foundation for modern technology and great breakthroughs*, *Postimees* no. 82 (7983), *Arvamus*. *Kultuur* no. 422, p. 11, <http://tehnika.postimees.ee/4067165/tanapeva-tehnoloogia-ja-suurte-avastuste-alustala-lainikud>



Photo: TA

Akadeemik Ülo Lepik



Photo: TÜ

Helle Hein

*Aside from their day jobs, the members of the Estonian Academy of Sciences take on over 400 roles. The vast majority of those include voluntary work.*

*Did you know that:* Two Estonian Presidents - half of our Presidents so far - have been Members of the Academy of Sciences (Konstantin Päts as an honorary member, and Lennart Meri as an active member). Arnold Rüütel holds a PhD in agricultural sciences.

# ABOUT THE FRAGILITY OF TRUTH IN THE DIALOGUE OF SCIENCE AND SOCIETY

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Professor Raimund Ubar, Member

*Postimees AK (The Postman), 4 February 2017, p. 7*

*The public expects science to create miracles, be fun and provide answers to important existential questions. But science is pyramidal, and only the peak is wonderful and attractive. And here lies the chasm between the understandings of science by a scientist and by ordinary people, where big risks are encountered concerning the modern “post-truth” society: blurring of the truth, becoming old-fashioned, replacement with half-truths or lies and succumbing to emotions. What is the meaning of truth, and does truth still have any impact in our “post-truth” society? Anita Makri considers these questions in the 19 January issue of the journal Nature, where she expresses her concern about the role of scientists in discussions of socio-political issues.*

**W**hen assessing the expectations of society more generally, the question is: What kind of truth really matters to society? And is this the same truth that science is looking for?

In recent decades, the meaning of science has radically changed and become obscure. There are even discussions of “the end of science” as the practical revenue from science lags further and further behind compared to the spending on R&D, and society is not at all happy about this.

There are numerous fields of science and each of them has its own character. It is prestigious to be a scientist. But what is science, after all? For example, is a study pursuing a specific goal and focusing on a particular application science?

Engineers deal with applications in the field of technology. The divide between engineers and scientists lies in the vague criteria of the delimitation of the boundary between single and general. Engineers who are devoted to applications do not claim the fancy title “science”, although, for example, the project of a complex electronic system always includes both research and development.

The truth of applied research is specific and indisputable: it is an application. But what is the truth of basic science? It is new knowledge. Basic research does not have a specific goal: it is not a project, but a journey into the unknown, driven by curiosity. The expectations of society regarding basic science are not explicit and have been built on trust over long periods of time. But in today’s

expanding market economy, everything is expressed in terms of money.

So, now every scientist has to choose whether to take a risk and follow his/her curiosity, or go along a safer route with results guaranteed, along with a good number of publications, a high h-index and a great salary. The ever-intensifying competition no longer allows anybody to take a risk, and so little by little basic science is acquiring a new face: theme-based becomes project-based.

The public expects science to create miracles, be fun and provide answers to important existential questions. Science, however, is pyramidal, and only the peak is wonderful and attractive. The rest of the pyramid is quite tedious, ordinary, lacking in scandals and difficult to understand for ordinary people.

And here lies the chasm between the understandings of science of a scientist and of ordinary people, where there are big risks in the modern “post-truth” society: blurring of truth, becoming old-fashioned, being taken over by half-truths or lies and succumbing to emotions. Reaching fact-based conclusions is turned upside down: merely padding arguments with facts. The more information noise the Internet produces, the more silent become the voices of the knowledgeable.

For science, two truths hang in the balance: the practical value of science (improvements in welfare, health and environmental protection), and answers to the questions asked by society.

The truth is sometimes ambiguous; it may constantly change and develop. There are questions which do not have any certain answers. In these cases, science cannot provide any specific recipes, and it is possible to give only general guidance. In that case, the seed has to at least fall on fertile soil. Fertility here means that the person consulting scientists is sufficiently educated and is able

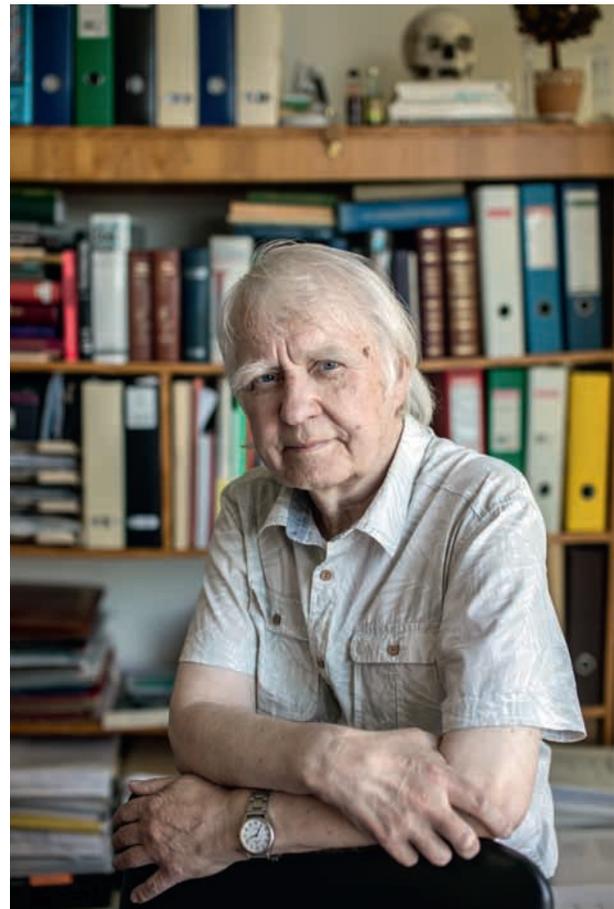


Photo: Reti Kokk

to make their own decisions based on their own common sense and by using received instructions. In the short term, the cooperation between scientists and society means life-long continuing education for the older generation and higher education for the younger generation focussed on the long-term perspective.

Life-long learning should also involve the leading strata of society (politicians) so that the discourse with

scientists takes place with some balance between the two sides. University education should be relevant so that graduates are able to enter the labour market without any problems related to the needs of society.

See also: Anita Makri. “Give the public the tools to trust scientists”. *Nature* 541 (7636), 19 January 2017. doi:10.1038/541261a. <http://www.nature.com/news/give-the-public-the-tools-to-trust-scientists-1.21307>



Photo: Reti Kokk

# THE ROUTINE

The management structure of the Estonian Academy of Sciences is slightly clunky, as is all too often the case with academies. The reason is simple enough: the leading principle is that every opinion counts and, therefore, every member of the Academy is included in strategic decision-making.

The highest decision-making body of the Academy is the general assembly, which includes all members of the Estonian Academy of Sciences, regardless of age. The general assembly traditionally gathers twice, and sometimes three times, annually. The general assembly approves the foundational documents of the Academy, decides on the creation and dismantling of bodies, elects the members and the management and approves the budget of the Academy.

A few of the general assembly's duties have been neglected over the years, such as "evaluating the circumstances of research strands in Estonia and making proposals about their development", and "formulating positions on questions concerning the social and economic development of Estonia and communicating those positions to the Riigikogu and the Government of the Republic".

The spring meeting of the general assembly (often called the annual general assembly) generally takes place in the second half of April and the autumn meeting is scheduled for the first week of December. The spring session discusses, among other things, the developments during the previous year and is generally open to all. The winter session often includes elections and organisational discussions and sometimes takes place behind closed doors.

The main events of the general assembly are always presentations on science or research policy. The winners of the year's "lifetime achievement awards" (see p. 25) traditionally deliver lectures on the history and current hot topics in their field at the spring assembly. The winter session of the general assembly often focuses on scientific policies and, in recent years, considers how the Academy could improve advising the state.

The head of the Academy is its president. The current president, Tarmo Soomere, was elected in 2014, replacing Richard Villems. He is supported by two vice-presidents (Mart Kalm and Ergo Nõmmiste, also elected in 2014).



Photo: Kaarit Leibold

Tarmo Soomere



Photo: Mark Raldapere

Mart Kalm



Photo: TÜ

Jaak Järvi



Photo: TA

Margus Lopp



Photo: TA

Ergo Nõmmiste



Photo: TA

Richard Villems

The management and financial aspects of the Academy are assigned to the secretary-general (Margus Lopp until January 2017 and Jaak Järv from April 2017).

Between the general assemblies, the reins are passed to another collegial group of academics: the board of the Academy. The general assembly determines the size of the board and elects some of its members. Traditionally, it is composed of up to 16 members, including the president, the vice-presidents, the secretary-general and the heads of divisions. The board announces competitions (including elections of full members), decides on research grants and stipends, chooses research professors, forms committees etc.

Every opinion counts at the Academy of Sciences. Every member of the Academy is included in strategic decision-making.

The board of the Academy, 31.07.2018: Tarmo Soomere, Ergo Nõmmiste, Mart Kalm, Jaak Järv, Jaak Aaviksoo, Jakob Kübarsepp, Toomas Asser, Urmas Varblane, Jüri Engelbrecht, Valter Lang, Ülo Niinemets, Karl Pajusalu, Martti Raidal, Peeter Saari, Eero Vasar and Andres Öpik.

## The Annual General Assembly of 19 April 2017

### *The Academy's Image is Changing*

**W**e noticed the Academy's image changing as early as 2015 and the evolution is still going on. The society is ripe for change. It feels like some parts of the society have been waiting for a consolidated message from our scientists.

Last year [2016 - ed.] we continued the emerging tradition of inviting thinkers from outside the Academy to attend the general assembly. It so happened that Siim Kallas's speech at our spring assembly was his first official appearance as a presidential candidate. While this was a coincidence, it was a very welcome one. He spoke about how wisdom takes more than mere information and how transforming information into wise decisions requires deep culture and excellent background knowledge; his message echoed the Academy's aspirations. At our winter general assembly [December 2016 - ed.], Gunnar Okk pointed out areas where we have room for growth and outlined a few goals that we might see as controversial, but that are certainly worth striving for.

- The secretary general of the Ministry of Education and Research Tea Varrak greeted the general assembly.
- An overview was given of the activities undertaken in 2016, three scientific presentations were held, the new statutes were approved and the member of the Academy Jaak Järv was elected the secretary-general.
- It was decided to keep the head count of the board at 15 until December 2017.
- The assembly is traditionally introduced by the president of the Academy, who talks about the main successes and problems of the previous year.
- These opening words therefore give an overview of the state of affairs in early 2017.

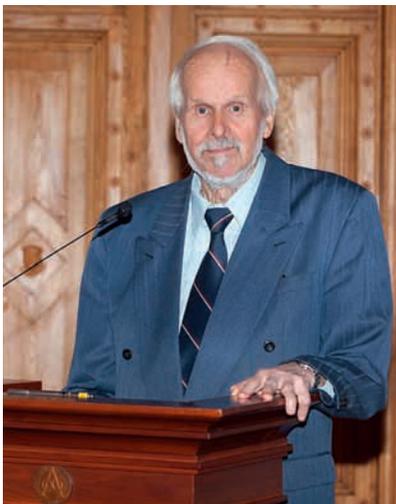


Photo: Maris Krünvald

Gennadi Vainikko



Photo: Maris Krünvald

Enn Tõugu



Photo: Maris Krünvald

Cornelius Hasselblatt

From the Academy's perspective, 2015 seemed like a year when the Estonian society realised the importance of knowledge and evidence. The year 2016 took a bit of a different turn, especially abroad. In several parts of the world, 2016 struck like a cold shower and then crystallised into a recognition that we have crossed over into a post-truth - or even untruth - era. Marju Lepajõe has described this new normality as an era of buying into every rumour, and she is right about that.

In this context, the Academy has been going against the flow throughout the year. One of our tasks is to offer our state independent and professional support. We initiated reflection exercises before meetings of the Research and Development Council in order to support the joint positions of our scientific community. For example, we presented the Research and Development Council with an argument of the high importance of engineering education as given by top researchers. It is qualitatively better than textbook-based education. What's more, it is also the link in the value chain of science that produces the fastest measurable gain. The scientific advisory work aspect was somewhat formalised by the fact that the Ministry of Education and Research appointed the president of the Academy as the Estonian representative to the International Network for Government Science Advice.

As the secretary-general [of the Ministry of Education and Research Mrs Tea Varrak - ed.] emphasised, the Academy is essentially a body of thought leaders. This means we bear a fundamental duty to create open content and trust and an obligation to build bridges between different sides and expand their common ground. Unlike political parties, an academy of sciences neither has nor needs a single, formally codified programme. Therefore it is only logical that the academic - and the Academy's - value system is open to the changes that sweep society. On the other hand, it is equally logical to demand that the Academy's founding values and the specifics of the scientific value system are not only accessible to society, but also clearly explained in speech and writing.

The Estonian auditor general [Alar Karis - ed.] did not hold back when he told us [at the annual general assembly of December 2015 - ed.] that we have a long way to go, and Madame Secretary-General reminded us of this again today. Since September of last year we have been trying to fill this space by new means, in cooperation with Postimees's [the daily newspaper The Postman - ed.] weekend supplement "Arvamus. Kultuur" [Observations. Culture - ed.]. The members of the Academy draw inspiration from the topics treated in top international scientific journals and try to explain them to the Estonian public. Last year ten such opinion pieces were published; this year we're up to eleven and counting. Having a broad-based daily newspaper regularly write about meta-scientific

topics and explain the relevance of science to the society at large is extremely uncommon and possibly even unique.

We took two big steps towards making post-university scientific education meaningful and supporting young people on their way to becoming good scientists. These steps were aimed at helping to consolidate the voices of young scientists and helping them connect better with society.

The first step was taken at the beginning of the year: a conference of young researchers who work and study abroad took place on 6 January 2016. We are hoping that it becomes a tradition. But even more importantly, it is going to be followed by the celebratory founding assembly of the Estonian Young Academy of Sciences at the end of May of this year [31.05.2017 - ed.]

The other step we took was a more glamorous one. The three-minute lecture contest has become a solid part of the Academy's image. It can be described as a gateway to the exciting, alluring world of science. Getting in is anything but easy: it requires hard advance training. The training includes many things, including how to explain complex things briefly and clearly, and how to appear convincing in front of cameras and large audiences.

Compared to 2015, there were two noteworthy moments. The first one was the summary programme the Estonian Television decided to produce about the entire three-minute lecture process. Titled "Three-Minute Challenge", the programme was broadcast during last year's Christmas season. Its 47,000 viewers rated it rather highly. The other one is related to harnessing quality science in the interests of society. Sometimes it seems not unlike quality real estate, which everybody talks about but few have seen. The Academy certainly does not intend to earn money through selling content, but we consider it important to show good ways to monetise content creation. Just last week, the collection Science in three minutes was presented to the public. It's a joint project between Argo Publishers, Estonian Public Broadcasting and the Estonian Academy of Sciences, consisting of 32 short lectures that reached the finals of the three-minute lecture contest over the last two years. This is a vivid example of how it's possible to commercialise good science broadcasting in cooperation with other parties: in this case, the scientific community, private enterprise and a national media channel.

Those were last year's most memorable moments. Meanwhile, a new year has begun and we have a long day ahead of us. As is customary at academic gatherings, we will start with scientific presentations. As is again customary, two of the speakers are the laureates of this year's lifetime achievement awards. But our tradition is enhanced by a detail we added a year and a half ago: having foreign members speak at the assembly. We are firmly convinced that our foreign members are integral parts of the Academy and ambassadors of Estonian science. The stronger their bond with researchers working in Estonia, the stronger the message of the entire Estonian scientific and academic community both at home and away.

Three scientific presentations were held at the 2017 spring general assembly:

- **How I've done and applied science**

Enn Tõugu, a member of the Academy (winner of a lifetime achievement prize, 2017)

(See also: Algorithmic talent and what to do with it. *Sirp*, 17 February 2017, pp. 8-9, <http://www.sirp.ee/s1-artiklid/c21-teadus/algoritmiline-andekus-ja-mida-sellega-peale-hakata/>)

- **Life's work in retrospect**

Gennadi Vainikko, a member of the Academy (winner of a lifetime achievement prize, 2017)

(See also: The cordial mathematics of a passionate mathematician. *Sirp*, 17 February 2017, pp. 10-11, <http://www.sirp.ee/s1-artiklid/c21-teadus/hasartse-matemaatiku-sudamlik-matemaatika/>)

- **The message of Kalevipoeg**

*Cornelius Theodor Hasselblatt, a foreign member of the Academy*

Slightly edited versions of each presentation were published as opinion articles. Two of the presentations were made by the members of the Academy who were awarded the state's lifetime achievement awards in 2017. But a new addition to the old tradition is inviting foreign members to speak at the general assembly. And so the third presentation was made by a foreign member elected in late 2015, Cornelius Hasselblatt, a renowned Estophile.

Many of us were surprised to learn that our national epic *Kalevipoeg* became a major cultural event and even a trailblazer in the European educated classes even before the epic was published in Estonian. According to Cornelius Hasselblatt, the people of 19th century Central Europe “thirsted after everything that was new and refreshing, strange and unknown, and *Kalevipoeg* provided it all”. According to the modern author, the epic was like “a breath of fresh air in our musty and stuffy contemporary atmosphere”. Perhaps it has been an Estonian habit of hundreds of years to understand the worth of our figure-heads only when they're world famous.

## *Cornelius Theodor Hasselblatt: The message of Kalevipoeg*<sup>1</sup>

This year marks exactly two hundred years since *Kalevipoeg* (the son of *Kalev*) was first mentioned. Though also in earlier centuries, for example in the literary works of Mikael Agricola, the Finnish reformer, or Heinrich Stahl, the author of the first Estonian language grammar, an ancient hero of the same name was mentioned, it was the Baltic-German Estophile Arnold Knüpffer who in 1817 in a footnote in the *Beiträge* magazine mentioned *Kalevipoeg* as an evil giant who cultivated certain land areas with a wooden plough, after which no blade of grass ever grew on this land again and it became what was called *möllik* (silty mud).

Perhaps it may seem arbitrary to give such importance to a single footnote, yet in the same year more things happened in the Estonian cultural history: under the leadership of Johann von Luce, the Kuressaare Estonian Society, which was in a way a predecessor of the Learned Estonian Society, was founded. In the above-mentioned Johann Heinrich Rosenplänter's *Beiträge* magazine, the first Estonian fairy tales were published and also there the first public call appeared to collect fairy tales. Otto Reinhold von Holtz published his short story collection “Luggemissed Eestima Tallorahwa Moistusse ja Süddame Juhhatamisseks” (“Readings for guidance of the mind and heart of the Estonian peasantry”), which became very

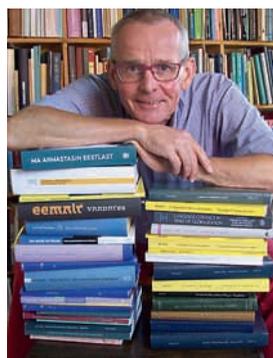


Photo: private collection

**Cornelius Theodor Hasselblatt** was born on 17 August 1960 in Hildesheim. He received his master's degree in Fennougrics in 1986 from University of Hamburg and defended his PhD there in 1990. He lived in Helsinki from 1989 to 1991, then in Göttingen in 1992-1995 and then again in Hamburg. He was Professor of Finno-Ugric languages and cultures at University of Groningen from 1998 to 2014. Cornelius Hasselblatt is a foreign member of the Estonian Academy of Sciences (elected in 2015) and Honorary Doctor at University of Tartu. He is the editor of the monograph “History of Estonian Literature” (published in German in 2006 and in Estonian in 2016). He has translated works by many Estonian authors into German and Dutch.

popular among readers and secured him a place in Estonian literary history. Friedrich Robert Faehlmann began his studies at the University of Tartu and Friedrich Reinhold Kreutzwald was attending the Rakvere Kreisschule (circle or district school). Franz Anton Schiefner, the translator of the Finnish epic *Kalevala* into German and a supporter of Kreutzwald in publishing *Kalevipoeg*, was born.

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<sup>1</sup> This essay is a shortened form of Cornelius Hasselblatt's speech delivered at the General Assembly of the Estonian Academy of Sciences on 19 April 2017.

All this happened in 1817, and although you can find different noteworthy events for each year if you wish, I dare say that precisely two hundred years ago it was a very important moment from the point of view of Estonian literature. Almost all of the above-mentioned events can, in one way or another, be associated with *Kalevipoeg* and Kreutzwald, the creator of its literary form: Knüpfner had baptized Kreutzwald, Holtz had been his teacher, the first edition of *Kalevipoeg* was published in the transactions of the Learned Estonian Society, and Faehlmann was initially supposed to be the author of the epic.

As one footnote has in two hundred years become the symbol of a nation, one of the most important works of national literature, and also an important epic in world literature, it seems only appropriate to point out once again how everything began.

*Kalevipoeg offers West European readers something almost entirely new and sweeps away the mundane and slightly stagnant routine like a fresh and healing gust of wind.*

Although *Kalevipoeg* is primevally and genuinely Estonian in the sense that the word as a sign is firmly associated with Estonia, there is still a need to emphasise the international background, for two reasons. Firstly, the initiative to write the epic undoubtedly came from outside of Estonia and, secondly, in the first decades after it was published, the reception of the epic was much more intense and more significant abroad than in Estonia.

As far as the first point is concerned, it is not an exaggeration to say that without the Finnish “*Kalevala*”, “*Kalevipoeg*” would not have seen the light of day. It is hardly probable that a child of a kreisschule would have read Rosenplänter’s *Beiträge* and reached conclusions of his own, although theoretically it cannot be ruled out. And Kreutzwald, somewhat later, perhaps in 1824, may indeed have made some notes about *Kalevipoeg*, but then lost them, just as Jaan Kross so masterfully described in his novel “*Kahe kaotsi läinud paberi lugu*” (*The Story of Two Lost Papers*) from 1966. But even a German ballad written in 1836, in which Kreutzwald mentions *Kalevipoeg*, does not yet allude to the epic, because the character there is more like a brute than a hero.

The idea of the epic was born in 1839, when two presentations of *Kalevipoeg* were held in the Learned Estonian Society: first Faehlmann drew attention to the *Kalevipoeg* of folk legends and, half a year later, Georg Julius Schultz-Bertram gave a flamboyant speech in support of the idea that ends with a much-quoted call for action: “Let us give people their epic and history,

and everything will be achieved!” The fact that something like creating a national epic was even conceivable or advisable was due to the fact that *Kalevala* had been published in Finland four years earlier. It is well known that the Finnish epic also had a significant effect on the verse form of *Kalevipoeg* because Faehlmann, the initially proposed author of the epic, would probably have written the entire story in German, and not in a form typical of Estonian folklore.

The second point is even more important: in the middle of the 19th century, no real Estonian literary scene even existed. Let us keep in mind that the first book store that primarily sold books in the Estonian language was founded only in 1867. Then the guild system was abolished and Heinrich Laakmann could open his own book store in Tartu. When Kreutzwald’s *Kalevipoeg* was issued in 1857–1861 as a bilingual publication, however, its normal reception in Estonia was almost impossible because among the Baltic Germans there was not enough interest and competence to appreciate the epic. Nobody bought this expensive work, which cost three and a half roubles, which today would equal several hundred euros, according to the calculation of annual income. Although the Estonian language popular edition, published in 1862, was only one-seventh as expensive, at half a rouble, it did not become a bestseller either, and its true reception by Estonian readers began only in the students’ reading circles of the 1870s. At that time, the foreign reception started practically a second round, because it began, as outrageously as it sounds, even before the epic was published.

The key person here was Wilhelm Schott (1802–1889), a scholar of the University of Berlin who is not an unknown figure in Estonia (his letters to Kreutzwald in the period 1866–1875 were published in Estonian in 1961), but is still not sufficiently appreciated in the cultural memory. Beginning in 1838, Schott was a professor of the Chinese, Tatar and East Asian languages, but also dealt with Finno-Ugric languages, which at that time were not represented in universities. Schott was proficient in Hungarian, Finnish and Estonian, and he was a reader of several periodical publications. These were the languages he introduced to German readers in both the scientific and popular science press, and from this standpoint it was important that he reviewed the transactions of the Learned Estonian Society from the beginning. He was elected an Honorary Member of the Learned Estonian Society on 1 September 1843, many years before *Kalevipoeg* was published. His first review was published in 1841 in the journal “*Archiv für wissenschaftliche Kunde von Russland*”, which was published on a quarterly basis in Berlin from 1841 to 1867 with financial support from Russia; its editor-in-chief was Adolf Erman, a professor of physics from Berlin, and Schott himself was its co-editor. In his review, Schott explains the objectives of the Learned Estonian Society and then refers to the

content of the first part, which, in his words, “is utterly appealing because it offers us, Western European readers, something almost entirely new, and penetrates like a fresh, healing gust of wind into the somewhat musty atmosphere of the habitual and dull.”

Thus, in his first article about Estonia in 1841, Schott showed his motivation: he was fascinated by the exotic, he liked non-everydayness, and he wanted to inspire readers with the idea that dealing with such things could be beneficial and invigorating. The reason for that was the content of this first part, namely the first German presentation of *Kalevala*, accompanied by a translation sample and Faehlmann’s folk legend about the “boiling of languages”. It was a subject matter that was indeed entirely new in Western Europe and that also fascinated Jacob Grimm, among others.

In the same spirit, Schott published more than 50 articles about Estonian folklore and literature in the German language in 1841-1880, while in Estonia the reception of *Kalevipoeg* only improved little by little. However, Schott wrote in 1855 that an epic called *Kalevipoeg* would soon be published in Estonia, since the first part of the third volume of the transactions of the Learned Estonian Society had contained an advance notice of this. And once the part with the first tales of *Kalevipoeg* had been published, Schott immediately published a triumphant response in the literary paper “Magazin für die Litteratur des Auslands”, which was issued three times a week. The review was placed on the front page of the paper, so that on 24 September 1857 the first thing the German-speaking intellectuals read was about *Kalevipoeg*. The excitement about the new discovery was the same as sixteen years earlier, when Schott wrote about a fresh gust of wind. This time he wrote: “The folk legends of the Estonian people are a gallery of noble images surrounded by a mourning veil. Their keynote is melancholy [...], but not merely powerless longing for the lost, happy time of independence. [...] After the many centuries that these beautiful fruits of fantasy have struggled along among the poor serfs around Lake Peipus, they now, as if hand-in-hand with the kindred blossoming minds of the neighbouring country Finland, finally step onto the stage of the European world, perhaps bringing with them a breath of fresh air into our musty and stuffy contemporary atmosphere.”

That says it all; this was the message of *Kalevipoeg* to Central Europe in the 19th century. The people there were hungry for something new, refreshing, unknown and strange, and *Kalevipoeg* was able to give it to them. Although *Kalevipoeg* is primevally and genuinely Estonian, its existence is not conceivable without an international context. It did not come into the world alone: Väinämöinen, Ilmarinen, Joukahainen and Kullervo – the characters of *Kalevala* - came along to help.

There is another factor, which could be called the advantage of the disadvantage. In general, the Finns were in a better situation than the Estonians because they had had no serfdom, and in several areas they were more developed.

That resulted in *Kalevala* being published only in Finnish. Those who did not know the Finnish language had to wait until the book was translated. Although translations into Swedish (1841), French (1845) and German (1852) came out relatively quickly, it still took a few years. It is known that Kreutzwald also wanted to publish his epic only in Estonian, but then difficulties with censorship arose, and the solution was to present the text as a bilingual scientific publication. So, from the very beginning there was a German version of the epic, which facilitated its immediate reception in Europe.

Wilhelm Schott was not the only one to deal with *Kalevipoeg*, but he used the clearest and the most convincing formulation. Moreover, he dealt more intensely with *Kalevipoeg* than the others did and he published a monograph about Kreutzwald’s epic as early as 1863. This was followed by paraphrases and adaptations as early as the 1870s, when, as mentioned above, the reception of *Kalevipoeg* was only beginning in Estonia. In 1866, Carl Robert Jakobson still deemed it necessary to urge Estonians to be proud of their *Kalevipoeg*: “No Estonian should put it down disdainfully. Estonians must expect beetles to sing like nightingales!” At that time, the readers abroad did not want to hear the nightingale’s song any more; they had heard it enough already. The words of beetles were something new and interesting.

In the following centuries, the message of *Kalevipoeg* has substantively not changed much. Even now, when Estonia is a member of the European Union and the same money is in use as in Rome and Paris, the need for things that are a bit out of the ordinary remains. And that is why an ancient character who is close to nature and does not act like everyone else but who surprises again and again with his unconventionality is a perfect ambassador of this culture!

Cornelius Hasselblatt once saved my life - from death by boredom, sure, but save me he did. Once upon a time I happened to be participating in a big international congress. Reading the programme, I realised I was one of the few representatives from my field and the entire week was filled with topics to which I had little or no affinity. The solemn introductions left me slightly desperate. Hasselblatt’s plenary speech, where he associated grouse, brown bears and pine trees with the Finno-Ugric mindset and poetry, restored me to good spirits and the week passed pleasantly enough.

Cornelius Hasselblatt, Foreign Member  
Postimees 93 (7994), AK 424, 22 April 2017, p.5  
Liina Saarlo, researcher, the Estonian Folklore Archives of the Estonian Literary Museum and Estonian National Museum. Comment on Cornelius Hasselblatt’s book “Eemalt vaadates”. Posted on 25.04.2016, <https://lugemissoovitus.wordpress.com/2016/04/25/cornelius-hasselblatt-eemalt-vaadates/>

# General Assembly Meeting, 6 December 2017



President Tarmo Soomere

Photos: Ede Pill



Secretary-General Jaak Järvi

## *Fresh Blood at the Academy*

The annual winter session of the general assembly took place on 6 December 2017. A first retrospective to the year was given. Maive Rute (of the European Commission's Joint Research Centre) and Tea Danilov (of the Estonian Foresight Centre) gave presentations on the scientific advisory function and the plans of the Foresight Centre. Eero Vasar was elected a new member of the board. The four statutes of the divisions of the Academy were replaced with a single document.

Although the main ranks of every academy are elected from among the citizens of the country, most of the world's academies also have foreign members. Often, the role of foreign members is as important as that of "full members", although different. They are frequently the ambassadors and well-informed representatives of our science in their home countries. In Estonia, we have been able to harness their potential only partially. Great work has been done, for instance, by Ülo Langel as a member of the national research awards committee and by Steven Bishop as a spokesman for science to the Riigikogu.

The election of foreign members is initiated and the number of vacancies determined by the board of the Academy. Elections for foreign members take place once every three years. Up to five members can be elected at a time. The total number of foreign members cannot surpass 30 per cent of the number of full members.

The board's decision of 16 May opened up two foreign member vacancies: one of them for the Division of Informatics and Engineering and the other for the Division of Humanities and Social Sciences.

The general assembly elected two new foreign members: Gábor Stépán, Professor of Applied Mechanics at Budapest University of Technology and Economics, and Jaan Valsiner, Professor of Psychology at Clark University (Massachusetts) and of Cultural Psychology at Aalborg University.



Photo: János Philipp

**Professor Gábor Stépán, DSc** (b. 13.12.1953), Professor of Applied Mechanics at Budapest University of Technology and Economics (BME), member of the Hungarian Academy of Sciences and of Academia Europaea. His fields of study include nonlinear dynamics, vibration and stability of machine elements, mechanical balancing, and robotics. He is an ERC Advanced Grant holder and

he is in charge of teaching mechanics at the BME and of the engineering section at the Hungarian Academy of Sciences. He has been an evaluator of Estonian engineering and developed cooperation between the Hungarian and Estonian Academies of Sciences. Gábor Stépán's experiences and international reach will contribute to the strength of the Estonian Academy of Sciences.



Photo: Elena Vareiko

**Professor Jaan Valsiner** is a born and bred Estonian. He was born in Tallinn on 29 June 1951 and defended his Candidate of Sciences (now PhD) degree in Psychology at the University of Tartu in 1979. He taught at the University of North Carolina between 1981 and 1997 (Professor from 1993); from 1997, he has worked as a Professor of Psychology at Clark University (Massachusetts, United States) and from

2013 as a Professor of Cultural Psychology at Aalborg University and leader of the Niels Bohr Professorship Centre. Cultural psychology is a fairly new field. Since the mid-1990s, it has focused on researching psychological processes in a social environment.

## *A Year of Accomplishments*

The year 2017 will be remembered for several reasons. Perhaps the most important of them is a small, but tangible shift in mindset. It is likely to take a lot more time and effort before the Academy's advice becomes indispensable. But finally, after a long hiatus, the rhetoric of the Riigikogu started reflecting an important idea: that the Academy's opinions should be taken seriously.

The Academy's actions or statements making national news has become an almost habitual occurrence. Rather unusually, they are heard by a very broad range of parties and discussed in depth on many different media (including media analysis broadcasts, which is a brand new development). We are headed towards a position of prominence in cultural life as well. Our member Jüri Engelbrecht and the recently elected foreign member Jaan Valsiner were among the very few scientists appearing on the "Plekktrum" TV show this year.

The everyday work of the Academy is in step with the rest of the (scientific) community. The entire country put a lot of effort into making the presidency of the European Union successful this year. The academy was a bit further from the epicentre than the public sector, but the European presence had an effect. The highest-level event in the hall of the Academy was the speech of the President of the Federal Republic of Germany Frank-Walter Steinmeier, which was essentially an academic lecture.

Both in Europe and on a global level, the need for scientific advice in political decision-making has grown ever more urgent. This is one of the Academy's core goals. We participate in the work of organisations connecting researchers and academies of sciences, such as Academia Europaea, ALLEA, EASAC, Euro-CASE and FEAM. In May, we hosted a work meeting of the European Academies' Science Advisory Council. In October, the extremely relevant SAPEA (Science Advice for Policy by European Academies) project's conference "New approaches to science for policy in Europe" took place. It was organised as a follow-up event to the previous day's conference on top-level science, research funding and scientific collaboration held within the framework of the Estonian presidency.

The Academy has been gradually opening up to society. It can no longer be ignored or overlooked. If we were to briefly characterise each year, then from the Academy's point of view 2017 would be a year of accomplishments.

The first of those is the creation of the Estonian Young Academy of Sciences (EYAS). EYAS is not meant to

be a clone of the original academy; rather, it is a valued partner. EYAS amplifies the voices of Estonia's top young researchers. The thoughts and attitudes of the Young Academy are strongly evident in the society. For many, including the President of the Republic, EYAS is even more meaningful than the "classic" academy.

The second accomplishment is the increasing influence of academic reflection exercises. In many ways, they form the best and most genuine way for the competences of the Academy to bloom into an output of practical advice for the state. The Academy is morphing into an open forum, and a place for (heated) discussions. It is a place to deal with acute problems and bring together diverse participants to develop together a fact-based overview of our

*The Academy has been gradually opening up to society. It can no longer be ignored or overlooked. From the Academy's point of view, 2017 would be a year of accomplishments.*

current knowledge and the arguments of different parties. Even more importantly, we need to admit the gaps in our knowledge and determine what studies or analyses need to be conducted to inform strategic decisions. A positive example here can be found in the two rounds of the seminar on the perspectives of Estonian wood chemistry and advising the state in this respect.

Thirdly, there are the international acknowledgements and cooperation with the private sector. The harmony of those keywords became evident with the first Endel Lippmaa commemorative lecture and the creation of a commemorative medal at the beginning of the academic year (12 September 2017). The lecture was given by a winner of the Nobel Prize, Kurt Wüthrich. On a smaller scale, the same harmony resurfaced when the first L'Oréal stipend "For Women in Science" was granted to a young Estonian female scientist. The winner was Els Heinsalu (President of EYAS - see p. 48 for an interview). Those honourable acknowledgements have something in common that the public might not necessarily notice: both of them were realised thanks to private capital.

Extended summary of the message of the President of the Academy to the general assembly. For full texts of the speeches, see the XXiii (50) edition of the Year Book of the Estonian Academy of Sciences, 2017. Tallinn 2018, pp. 145-147.

## Enough is never enough

Hiram's Law (see the Complete Edition of Murphy's Laws) states that if you consult enough experts you can confirm any opinion. It is seconded by Lowe's Law: success always occurs in private, and failure in full public view. The Academy is part of both scientific life and society in general. Therefore, it is only logical that our actions are sometimes assessed and criticised from perspectives we cannot quite predict.



Therefore, the Academy is subject to the “worker’s dilemma”: no matter how much you do, you’ll never do enough; and what you don’t do is always more important than what you do.



Photo: private collection

Photo: private collection

Whom to believe? A confused member of the Academy hesitating between two great men.

## National Research Awards

The Estonian state has delegated the national research awards procedure to the Academy. This means helping to draft the rules, announcing the competition, reviewing and registering the applications, then analysing them in depth and making decisions concerning the awarding or non-awarding of prizes. The awards committee is formed by the government.

Traditionally, two national research awards for outstanding lifetime achievements, or lifetime awards, are granted every year. Eight awards - “annual awards” - are given to highlight the best research work completed and published during the previous four years in specific fields of research. Awards for an outstanding scientific discovery - “discovery awards” - can be given for scientific discoveries that changed the paradigm of or world-view in particular areas of research, or that created a new

field of research or led to the creation of an innovative product which has a significant socio-economic impact. In the absence of suitably high-level research efforts, the committee has the right to abstain from awarding any of the above prizes.

The members of the committee also help to explain the committee’s decisions. Concise explanations are published in the web portals of daily newspapers and slightly longer articles are published in the culture weekly Sirp. In 2017, Sirp 7/8 (17 February 2017) dedicated six pages to the laureates of the national research awards. For the last 22 years, the research works, research cycles and outstanding lifetime achievement award laureates have been introduced in a book meant for a wider readership. For the last three years, the book has also included coverage of sport and culture awards, and the J. W. Wiedemann language award.

The 2017 national research awards were granted to four members of the academy and one founding member of the Estonian Young Academy of Sciences. The lifetime achievement award was presented to the computer scientist Enn Tõugu and the mathematician Gennadi Vainikko. The annual award for chemistry and molecular biology went to Richard Villems for his cycle “The nature and development of the genetic variation of mankind” in the framework of the Estonian Biocentre’s working group. The social sciences annual award went to Lauri Mäliksoo, Professor of International Law at the University of Tartu, for the cycle “Russian Notions on International Law and Human Rights”.

Science Magazine ranked the results of the work of the Estonian Biocentre group, from whose ranks the Academy member Richard Villems received the annual award, among the world’s top ten most important scientific achievements of 2016. Such recognition is a first in the history of Estonian research. The breakthrough concerned the substantial specification in time and space of humanity’s - homo sapiens’ - emigration from Africa. A significant part of this is an analysis of the inheritance of paternal lines in the emigration of our direct predecessors from Africa.

Photo: Annikka Haas



### THE PRIME MINISTER’S GREETING

Dear laureates! Dear Members of the Academy! Ladies and Gentlemen!

It is my great honour to welcome and congratulate you today on the 99th anniversary of the Republic of Estonia! There is no better day nor worthier occasion to give out our culture, sport and science awards and the Ferdinand Johann Wiedemann language award. Every single laureate has more than earned an award. We are proud of you!

On the anniversary of our state it is natural to recall the Estonian “Manifesto to the Peoples of Estonia”. I have already quoted it on multiple solemn occasions, but I will permit myself to do so once more: “E s t o n i a ! You stand on the threshold of a hopeful future in which you shall be free and independent in determining and directing your destiny! Begin building a home of your own, ruled by law and order, in order to be a worthy member of the family of civilized nations!”

Ladies and Gentlemen!

I emphasise here that at the very moment of declaring independence, nearly one hundred years ago, Estonia chose

to squarely face the world and it was our wish to be a worthy member of the family of CIVILIZED nations.

We in modern Estonia can say without a shadow of a doubt that the ambition of the people who proclaimed our state has been realised. European-level research bolsters our self-image, because it shows that Estonians are among the leading culture consumers in Europe. We are ahead of several ancient civilized nations. I am sincerely pleased with this.

We should be proud of our culture. The vigour of our culture, language, science and sport is crucially important for the spiritual wealth and dignified future of our country. We should instil these values in our children and promote them in adults. I believe that today’s occasion supports this message. My sincere congratulations again to the day’s laureates!

I wish you a memorable event and a good National Day!

Long live Estonia!

Jüri Ratas

Awards of the Republic of Estonia, 2017. Estonian Academy of Sciences, Tallinn 2017, 9.



Photo: Annika Haas

**Member of the Academy of Sciences Gennadi Vainikko**

is the internationally most acclaimed Estonian mathematician and has authored and co-authored several groundbreaking monographs. His exceptionally fruitful research has focused on specific varieties of integral, differential and operator equations. Equations like this are the main modern tools for describing our

planet and its elements. As a polyvalent mathematician, he has made breakthroughs both in the fundamental qualities of such

equations and in their mathematical solutions. He has constructed effective solution methods for many singular equations, created the “cordial integral equations” theory and applied it in practice. (The core is part of the kernel of the integral operator, which can sometimes be analysed discretely, and “cordial” is a liberty taken here with language.)

As is particular to mathematicians, many of Gennadi Vainikko’s research results are final, i.e. not subject to corrections in principle, and therefore they provide solid foundations for future research.

- 1989** Honored Scientist of the Estonian SSR
- 1998** Republic of Estonia Order of the White Star, Third Class, and Estonian Academy of Sciences Medal
- 2011** National science award in exact sciences for the research cycle “Cordial Volterra Integral Equations”



Photo: Annika Haas

**Member of the Academy of Sciences Enn Tõugu**

is in some ways the godfather of several generations of Estonian computer science. His work decades ago initiated, for example, software development, cyber defence and algorithm theory. Even though many of his groundbreaking works are in Russian and therefore not suitably reflected in current statistics,

he is well known among his international colleagues. The strength of computer science in Estonia during the Soviet era later permitted Estonian scientists to reorientate rapidly. The groundwork he

laid indirectly contributed to the success of Estonian IT startups, because all software engineers and computer scientists educated in Estonia a few decades ago were influenced by his work.

As an experienced sailor, he knows full well that many apparently simple situations (smooth sailing in a pleasant tailwind or idly surfing the Internet) can hide extremely dangerous underwater reefs. Enn Tõugu has successfully shaped this knowledge into science-based messages both to specialists and the general public.

- 1967** National award of the Estonian SSR
- 1987** National award of the Soviet Union
- 1995** Estonian Academy of Sciences Medall
- 2001** Republic of Estonia Order of the White Star, Third Class
- 2010** Member of the Academia Europaea



Photo: Annika Haas

Photo: Juri Park

Luca Pagani, Toomas Kivisild, Mait Metspalu, Monika Karmin, Richard Villems, Lauri Saag.

**An Inseparable Part of the National Day**

The tradition of recognising our best sons and daughters and highlighting their achievements has become an inseparable part of our National Day. Even though this fine tradition is quite new compared to that in many other countries, 2017 marked the 27th time of honouring the scientists of the Estonian Republic in this way.

The categories, sizes, and secondary conditions, such as the maximum number of members in candidate collectives or the minimum period of time between receiving awards have changed somewhat over the last quarter century. For some time now, the national research awards have been presented in three categories: 1) the annual award for works or cycles published within the last four years by single researchers or collectives, 2) the lifetime achievement award for individuals for long-term productive research and development effort, and 3) so-called scientific discovery award for a discovery that changed the paradigm of or world-view in the relevant area of research or created a new field of research or led to the creation of an innovative product which has a significant socio-economic impact.

At the moment of writing [January 2017 - ed.], a total of 232 awards have been granted to 480 laureates over 26 years

across all categories. A clear minority - 73 - are members of the Academy, and many of those were not yet members at the time of receiving the award. Perhaps a simpler comparison would drive home the full significance of these awards. In general, we consider them, as the leading scientists of the world, to be among the 1% most cited authors in their fields. At the moment, the number of personal lifetime achievement award laureates stands at 36. The number of scientists in Estonia has traditionally ranged from 3,000 to 4,500. That means that the laureates of this award are firmly among the one per cent.

Since the famous Pareto 20:80 principle<sup>1</sup> stands in much starker relief in the field of content creation, it is safe to say that most of the current vitality and anomalously good ranking of our science on the global scale is owed to the value created by the laureates of the lifetime achievement award.

Awards of the Republic of Estonia, 2017. Estonian Academy of Sciences, Tallinn 2017, 12.

<sup>1</sup> At the end of the 19th century, Vilfredo Pareto noticed that 20% of the Italian landowners owned 80% of the land. Later, this observation was extrapolated to many other fields. The recognition follows that efforts made in certain crucial directions yield the large majority of productive results. This relationship has only become more extreme over time. In social media, for instance, over 90% of the content is created by less than 5% of the users.

Experts consider the Academy member Mälksoo's cycle of works the last half-century's most detailed and thorough analysis of the development of international law in Russia, from imperial literature up to modern times. It brings together a historical overview, interdisciplinary aspects and the current situation. The works shed light on the relationships, connections with and differences between Russian laws and laws in neighbouring countries from the perspective of comparative law and show how the principles and norms of international law, while in theory universal, are interpreted differently in different countries.

The national exact sciences award went to Elmo Tempel, a founding member of the Estonian Young Academy of

Sciences and a senior researcher at the Tartu Observatory, for the cycle "Galaxy filaments in the cosmic web".

Galaxy filaments are enormous chains consisting of groups and clusters of galaxies. The insight that the positioning of galaxies in the filaments determines the main features of their birth and development has considerably improved our understanding of the architecture of our universe, mass distribution in its different sections and the role of galaxies in the cosmic web. The fact that the filamentary distribution of the universe is closely connected to the speed of the galaxies may prove to be the key to understanding one of the major current secrets of the universe: dark matter and dark energy.



Photo: Annika Haas

Lauri Mälksoo



Photo: Annika Haas

Elmo Tempel

#### Highlights of the statistics of the research awards, 1991-2017

In 1994-1996, the award for long-standing productive Research and development work could be given to research teams as well as to individuals. A team received it in 1995 and the award was split in 1996. From 1997 onwards, this award was redefined as an individual award, or in the modern sense, a lifetime achievement award.

Thirty-nine such awards have been given out in total; there are 46 laureates (including 36 laureates of the personal lifetime achievement award), 24 of whom are members of the Academy.

Only three outstanding scientific discovery awards have been granted. There are 13 laureates, including three members of the Academy.

One hundred and ninety annual awards have been granted to a total of 457 laureates, 61 of whom are members. This

means that members who have not received a national research award of the Republic of Estonia are few and far between, and nearly all of them received an Estonian SSR or USSR award.

Thirty-one people have won awards more than once, 26 of them twice (10 of whom are academician) and the other five - all members of the Academy - three times.

The awards are not automatic. A lack of deserving applications leads to skipping the award. The bar is highest with the discovery award. Only every third year on average do any applications cross the threshold. Annual awards have been withheld seven times (three times in agricultural science, twice in engineering, and once in medical science and in the humanities). Scientists themselves realise that sometimes research stalls. For example, there was a year when no applications were submitted for agricultural sciences.

#### The National Research Awards Selection Board since 2016

**Tarmo Soomere** – Member of the Academy, and President of the Academy of Sciences (chairman)

**Jaan Aarik** – Member of the Academy, and Professor at the University of Tartu

**Toomas Asser** – Member of the Academy, and Professor at the University of Tartu

**Tõnis Kanger** – Professor at the Tallinn University of Technology

**Rainer Kattel** – Research Professor at the Academy of Sciences

**Maarja Kruusmaa** – Professor at the Tallinn University of Technology

**Priit Kulu** – Senior Researcher at the Tallinn University of Technology

**Maris Laan** – Professor at the University of Tartu

**Valter Lang** – Member of the Academy, and Professor at the University of Tartu

**Jüri Martin** – Member of the Academy, and the rector of the EuroAcademy

**Lauri Mälksoo** – Member of the Academy, and Professor at the University of Tartu

**Marika Mänd** – Professor at the Estonian University of Life Sciences

**Ülo Niinemets** – Member of the Academy, and Professor at the Estonian University of Life Sciences

**Karl Pajusalu** – Member of the Academy, and Professor at the University of Tartu

**Ellu Saar** – Professor at Tallinn University

**Eero Vasar** – Member of the Academy, and Professor at the University of Tartu (vice-chair)

## International Relations

Researchers can be likened to ambassadors of their countries to the academic world. The organisations that connect them (including academies of sciences) function as a highway of information, ideas, competencies and good practices. The Estonian Academy of Sciences represents Estonian science and Estonian scientists in the major European and global research organisations.



The **International Council for Science** was founded in 1931. Initially called the International Council of Scientific Unions (ICSU), its name changed in 1998 but the acronym ICSU was kept. The ICSU has two kinds of members: 1) in terms of territory, there is one academy of (natural) sciences or one scientific board representing each member country, and 2) there are leading international scientific societies. The central goal of the ICSU is to identify the key global problems facing science and society through cooperation between scientists from all countries and all fields. The Estonian Academy of Sciences has been a member since 1992. The Academy also participates in the union of the ICSU's European member organisations. <https://icsu.org/>

In 2017, the ICSU merged with the International Social Science Council (ISSC), which was founded in 1952 with the mission of linking academies of social sciences and humanities. The decision to merge was made at the

extraordinary joint general assembly of the two institutions in November 2016 in Oslo; the details were hammered out in October 2017 at a forum in Taipei. The new organisation is called the International Science Council (ISC), although the Estonian translation remains the same. The first general assembly of the new organisation took place 3-5 July in Paris. Naturally, the Estonian Academy of Sciences is one of the founding members of the ISC.

The ICSU was one of the initiators of the sustainable development programme that has since gone global. This programme seeks to organise our lives so as to avoid overexploiting the natural resources that guarantee the sustainability of the economy and society and to avoid excessively damaging the nature that surrounds us (or, in more modern words: so that we do not undercut the ecosystem services that support our way of life). In Estonia, this subject is tasked to the Commission of Sustainable Development, which was founded in 1996 and reorganised in 2017. The Estonian Academy of Sciences takes part in its work.





**The InterAcademy Partnership (IAP)** was founded in 1993 as a global network of academies of sciences. It is currently comprised of over 130 national and regional academies. The goal of this organisation is to advise society at large in cooperation with its member organisations and to provide support to various decision-making bodies regarding the scientific aspects of global problems. <http://www.interacademies.org/>



The European Federation of National Academies of Sciences and Humanities “All European Academies” (ALLEA) was founded in 1994 and brings together both classic natural sciences academies and academies of humanities and social sciences. The Estonian Academy of Sciences is a founding member of ALLEA. The goal of ALLEA is to facilitate the exchange of information and experiences between academies to achieve high standards in research and ethics, as well as to promote independent discussion of scientific strategy and policy at the European level. Jüri Engelbrecht, a member of the board of the Estonian Academy of Sciences (at that time the vice-president) was the president of ALLEA in 2006-2011. <http://www.allea.org/>



Union Académique Internationale (UAI, founded in 1919) is approaching its 100th anniversary. The Union connects academies of humanities and social sciences at a global level. Its goal is to promote joint research (including joint projects) and facilitate the publishing of research results. The Estonian Academy of Sciences joined

the UAI in 1998 and the Estonian representative is our member Jaan Undusk. <http://www.uai-iaa.org/>

The **European Academies' Science Advisory Council (EASAC)**, founded in 2001) is a relatively young organisation whose members are individuals appointed by academies of sciences of EU member countries. Estonia joined this organisation in 2004. The goal of the EASAC is to direct the joint competencies of the academies in the advising of EU governmental bodies and politicians in decisions that require scientific expertise. Or in other words: it takes on the role of an independent academic counsellor to the EU, bringing together the top-level competencies and experiences of European academies.

Expert networks have been formed in the three main programmes (biosciences, energy and environment). They deal with various societally relevant topics, analyse nascent problems and predict development trends and side effects. Through its members, the EASAC also engages in a steady dialogue with national policy-makers, striving to promote evidence-based decision-making in Europe.

The Estonian Academy of Sciences is represented by its member Margus Lopp; the Academy member Tarmo Soomere is on the Environment Steering Panel and the member Enn Lust is on the Energy Steering Panel. <http://www.easac.eu/>

In recent years, Tallinn has become a regular meeting place for EASAC. On 25-26 May 2017, an EASAC Council meeting took place in Tallinn. The topics included the Smart Villages Initiative and the developments in the SAPEA (Science Advice for Policy by European Academies) joint project, as well as elucidating short-term plans.

For more than ten years, the Academy participated in the work of the European Science Foundation (ESF). This organisation, founded in 1974, brought together scientific institutions of European countries (including the Estonian Research Foundation, later the Estonian Research Council), coordinated collaboration in research at the European level and funded interdisciplinary studies and cutting-edge research. Several Europe-wide advisory science policy bodies, such as the European Marine Board and the European Polar Board, were active in the ESF. The Committee on Marine Sciences and the Polar Research Committee of the Estonian Academy of Sciences contributed to their work.

In 2012, ESF was reorganised as a consulting expert body, in which the Academy decided not to participate. The advisory bodies were reformed as independent legal persons (the European Marine Board and the European

Polar Board). The Academy continues to provide scientific counsel to the European Commission through these institutions.

## *Researcher Exchange and Science Diplomacy*

The Estonian Academy of Sciences supports researchers' international mobility. One of the results of the cooperation agreements between the Academy and its partners abroad is academic researcher exchanges. They are open to all Estonian scientists. The grants are modest, but every little bit helps. The budget of the Estonian Academy of Sciences also covers the reception expenses of foreign researchers in Estonia. The expenses of our scientists abroad are borne by the Academy's partners in target countries. The work of the programme is directed by the Academy's Council for International Exchanges (chaired by Academy member Jüri Engelbrecht).



### **Gulf of Finland Co-operation**

#### **Conference “From small scales to large scales”**

“From small scales to large scales”, an international marine environment and environmental policy conference, took place at the Estonian Academy of Sciences on 9-10 October 2017. Its follow-up event, “Gulf of Finland Year 2014”, gathered together Finnish, Estonian and Russian marine science, environmental protection and environmental awareness specialists.

It turns out that the environmental policy for the Gulf of Finland attracts a lot of specialists and researchers: over a hundred people attended. The conference kicked off with a welcome speech by the former Minister of the Environment and the current chairman of the Constitutional Committee of the Riigikogu Marko Pomerants. The concluding speech was given by Minister of Education and Research Mailis Reps.

Together, we had a look at the work done in recent years and discussed new ways to improve the state of

the marine environment, stabilise the marine ecosystem, secure its services, and use our seafood resources wisely. The key to success lies in collaboration between the three countries, extensive data sharing and mutual competence migration.

#### **Research careers in the European Research Area**

Mobility is nowadays an integral part of a successful career in research. However, a long-term move to another country can lead to numerous administrative and practical problems. Those range from complicated visa, residence and work permit procedures and different social security and tax systems to variations in labour legislation and local lifestyles.

To tackle these obstacles, the European Commission created the eURaXeSS Services Network (formerly ERA-MoRE). The Estonian Research Council coordinates the international network. Within the Estonian Academy of Sciences, these aspects are capably handled by Anne Pöitel, Assistant to Secretary-General for Foreign Relations, and Ülle Raud, Foreign Relations Manager.

- On 14 June 2017, a group of European science journalists visited the Academy for an introduction to the Estonian scientific system and our outstanding achievements.
- On 1 September 2017, the Academy hosted Sonia Ortega, the head of the Europe Regional Office of the US National Science Foundation. She was accompanied by Kristian Moore, the head of the US Regional Office for the Environment, Science & Technology (Copenhagen), the U.S. Embassy Tallinn's Economic Officer Nicole Johnson, and the Embassy employee Taimi Alas.
- On 12 September 2017, the Academy received a delegation from the Shanghai Academy of Social Sciences.
- On 26 September, Dr Silke Schumacher, Director of International Relations of the European Molecular Biology Laboratory, visited the Academy.

## *The Journey to the Lindau Nobel Laureate Meetings*

### **EYAS secretary-general Gert Preegel's impressions from Lindau**

*Interviewed by Piret Suurväli*

#### **How did you end up at the Lindau Meeting?**

A feature of my life is that I rarely know where I am going. It's a bit of a constant, really. It was like that with the Lindau meeting, too. Information about this conference was making the rounds and my professor thought it might be useful for me to go. I had never heard of the town or the event before, but the Nobelists made for a persuasive argument. I applied and was selected.

The presentations given by the Nobelists can be accessed on the Internet. All of the main stage presentations are available on video. The small seminars, however, are not. Those are focused events, much more specific and more relevant to us. Lindau hosts about 350 people from all around the world, the absolute top researchers. Talking to people who have achieved a lot in their fields and are building their groups is an eye-opening experience. They laid out the entire discourse of their daily work in 10 minutes. It was good to see something clearly that is so often shrouded in mystery. The myth of the scientist took on a human face.

#### **Were top researchers, Nobel Prize winners, a myth for you before?**

People's positions have never struck me as important. Conversations with Nobel laureates showed that this magic ship that everybody longs for is not all that it's said to be. Essentially, it means that you climb to the top of your system, you are held in high esteem by all researchers in your field and they say that your work deserves recognition.

It turns out that a Nobel Prize is a heavy load to bear. It has happened that Nobel Prize winners apply for their next grant, but are turned down; they find it harder to find postdoctoral students and applications to their group decline. This pattern is the other side of the coin.

Another aspect is that the Nobel Prize is often granted for work done 20 years before. You are no longer working on the same subject; you have moved on. In Lindau, there were 20-30 Nobel Prize winners, presenting on chemistry and on physics. You could find out what they had been doing in the time after receiving the prize.

More recent winners carry on doing what they were doing before. But there are those who received the prize in, say, 1985. What were their following 30 years in science like? You have made it to the top, the absolute top, and find out that it is not all fun and games. The peak turns out to be ... more of a handshake.

It's an interesting pattern. Many people get hung up on it: they develop psychological problems mulling over what to do next. If you have reached the top and made your way back down, what comes next? Do you start over? Do you change fields and try something new? It's an interesting situation. But the Nobel Prize itself has never been the goal of any winner. They all have a passion for science, for research, for finding out how the world is put together.

#### **If the Nobel Prize is like a stamp on the forehead, is that bad?**

I wouldn't say it is bad. Few understand its actual weight. There are seven million people out there who know what it means to be a Nobel Prize winner. So, all right, seven billion people think of you as an educated and very smart person. This brand is hugely renowned. But the way there, the family tragedies on the way or the wife raising the

The beautiful German town of Lindau has hosted dozens of Nobel prize laureates and over 500 talented young researchers from around the world since 1951. In the spirit of its motto, "Educate, Inspire and Connect", the Lindau Meetings invite young researchers to hear lectures by Nobel prize winners and rub elbows with top global scientists.

The meetings, [www.lindau-nobel.org](http://www.lindau-nobel.org), are invitation-only. The students and young scientists are chosen from among the best of their countries. The Estonian nominees are chosen by the Estonian Academy of Sciences under an agreement made with the organisers (the Council for the Lindau Nobel Laureate Meetings and the Foundation Lindau Nobel Laureate

Meetings). The competition has two phases and the organisers have the final say.

Estonia has so far sent 18 young scientists since 2006. Participation fees are covered by the organiser in collaboration with the Academy. The 67<sup>th</sup> Lindau Meeting took place 25-30 June 2017 and brought together chemistry degree students and researchers. The Estonian participant was Gert Preegel, Engineer at the Division of Chemistry of the School of Science of the Tallinn University of Technology, the head of the Laboratory of Industrial Analysis, and a founding member of the Estonian Young Academy of Sciences.

children alone, those are very personal stories. There are the stories of the troubles taken to source chemicals, or of Jews who had to escape the country during the war to carry on their research, and so on. If you add this aspect, this world seems deeper but perhaps more human.

**So what is the hidden agenda of the Lindau Meetings? Is it a warning to young people that a desire for such a stamp should never be the goal?**

A desire for a stamp is never the goal.

## *Across the Globe*

Every year, the Estonian Academy of Sciences has refreshed existing collaboration links and created new ones with academies of sciences near and far. In 2016, new contacts were made with national academies of sciences of the US, Canada and Australia, and ties were renewed with the academies of sciences of Romania, Azerbaijan and Kazakhstan, as well as with the Royal Society of Edinburgh. In 2017, the focus shifted to Central America. Contact was established with some academically exotic countries, such as Nicaragua and Costa Rica, but also a sibling of the US National Academy of Sciences, the Florida Academy of Sciences.

The President of the Academy's first visit abroad in summer 2017 took him to Nicaragua. Estonian researchers may not be a common sight there, but Vaino Väljas marked our country firmly on their map. Making the acquaintance of the Vice-President of the Nicaragua Academy of Sciences and the Vice-Rector of the Central American University (Universidad Centroamericana), Professor Jorge Alberto Huete-Pérez, started with a conversation in Russian. Both were surprised to find out that they had attended the same university (though Professor Huete-Pérez later graduated from the University of Kishinev).

Peace came to Nicaragua only some ten years ago, and the wounds of civil war have still not fully healed. That is why the local Academy of Sciences is less than a decade old. The interest in Estonian science and especially the advances in marine and coastal sciences was extremely high in Managua. Tanker vessels cross the Nicaraguan coastal waters daily; problems with ship waves and possible pollution are critical in designing the new canal connecting the Pacific Ocean to the Atlantic; and wave energy could meet the energy needs of the entire

## **Not even for young researchers?**

I think it varies by age. It starts out with a desire to change the world. This leads to the beginning of the doctorate, and by its end, all you want is to get those three articles finished. The deeper into it you get, the more the understanding sets in that not everything comes easily. What counts is the passion and the curiosity. In my opinion, those are the most important things in doing science.

country. The lecture on harnessing ocean currents for environmental protection, thoughts on the potential applications for the technology developed at the Institute of Cybernetics (since 2017 Department of Cybernetics) of Tallinn University of Technology, and comments on the perspectives of wave energy were broadcast by several leading media channels.

The standard of living in Costa Rica is much the same as in Estonia and science there has had a fair bit of time to advance. Like in Nicaragua, many know of Estonia. Even the very first meeting there was attended by a lady whose sister had visited Estonia barely a month before.

Like our Academy, Costa Rica's Academy of Sciences leans heavily on science communication and encourages interest in science from a very early age. Microphotography offers an interesting way to do this. All it takes to practice it is to add an extra lens to the camera of a regular mobile phone. This simple device opens the way to, for example, the world of insects, which in tropical South America is extremely rich in species and not yet fully explored by science. But even the lecture on the above-mentioned topic of harnessing ocean currents, given in the framework of Costa Rica's Academy of Sciences' traditional science month, was quite well received.

In the US, in addition to the National Academy of Sciences, nearly every state has its own academy of sciences. In our context, these are akin to learned societies. But their standards are by no means lower and the scientific journal published by the Florida Academy of Sciences is in no way inferior to the journals of our academy. After all, their English just might be - quite understandably - a bit smoother and more elegant.

The headquarters of the Florida Academy of Sciences are currently located in Melbourne. The meeting at the Florida Institute of Technology was attended by the

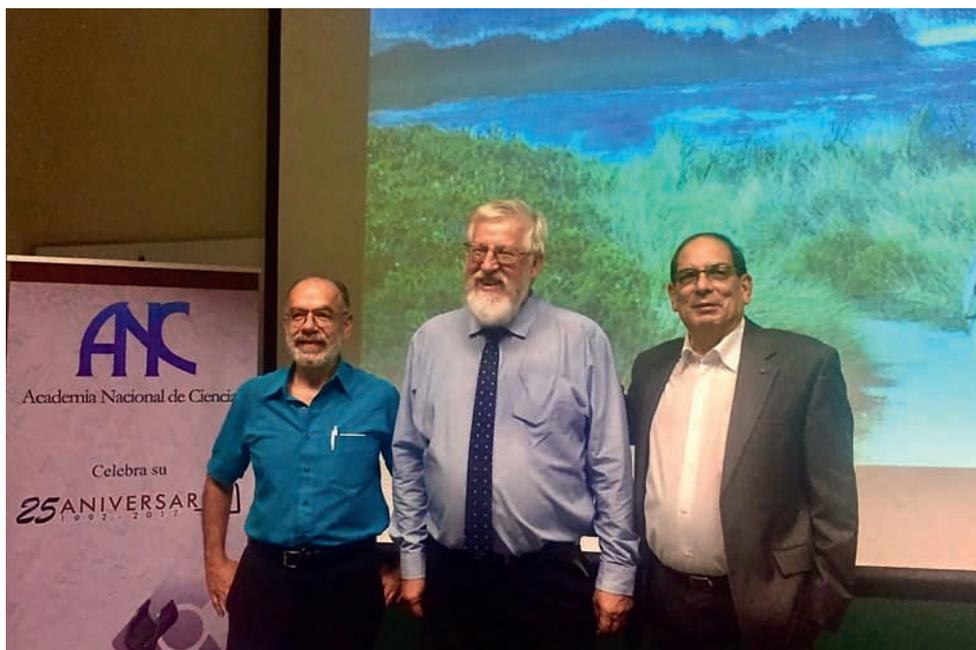


Photo: Dayana Mora Solórzano

After the lecture at the University of Costa Rica. With the President of the Costa Rica Academy of Sciences, Prof. Pedro León Azofofeifa (right) and marine biologist Prof. Jorge Cortés. (NB! The latter name contains a typo in the Estonian version).

Estonian-descended engineer Prof. Paavo Sepri and his bibliographer wife Anne. Thus, a part of the meeting actually had an Estonian majority. Topics discussed included the role and duties of different types of academies, popularising science and communicating science to society, involving young scientists (including young academies), science career models, academies' own publications, science that involves citizens, and, naturally, opportunities for future collaboration.

Wave tanks and future research into ship waves were discussed in meetings at the Embry-Riddle Aeronautical University College of Arts & Sciences at Daytona Beach and at the University of Florida School of Sustainable Infrastructure & Environment. The highlight of the latter was a three-hour lunchtime seminar with the master's and doctoral students of the working group of our long-term partner and colleague Professor Sheremet.

Florida gave us an excellent lesson in science policy and communication. On an entirely mundane radio show

on a completely regular radio station that we had tuned into to make a long drive go faster, we heard a long comment on the impact of a fairly challenging article recently published in an iconic journal on society and economics [Mohammad Ahmadpoor, Benjamin F. Jones. The dual frontier: Patented inventions and prior scientific advance. *Science*, 357(6351), 11.08.2017, 583-587, doi 10.1126/science.aam9527, <http://science.sciencemag.org/content/357/6351/583/tab-pdf>]. The speaker, if I remember correctly, was a journalist, not a scientist. And that moment sparked the idea of writing a piece about that article for Postimees (daily newspaper Postman – ed.) to illustrate how close fundamental science is to awesome applications. See the piece in Postimees, No. 228 /8129), *Arvamus*. Kultuur No. 438, 6. <http://arvamus.postimees.ee/4258099/tarmo-soomere-puhtastmatemaatikast-vingetooteni-on-void-kuus-kukesammu>

# Ethics and Good Practices

On 24 March 2017, the European Federation of National Academies of Sciences and Humanities ALLEA (see p. 30, under International Relations) presented the European Code of Conduct for Research Integrity, prepared by ALLEA's Permanent Working Group on Science and Ethics.

The code is intended to complement the previous 2011 version, which was published in cooperation with the European Science Foundation to account for recent developments in science funding and research regulation.

Apart from the classic principles of research ethics and good practices, the new code discusses open science,

digital databases and repositories, and developments in science communication and citizen research, as well as science on social media. A significant addition concerns the responsibility of research institutions in maintaining good practices.

The European Commissioner for Research, Science and Innovation emphasised upon receiving the Code that the public needs to be able to trust science completely and that is possible only if the highest level of research ethics is guaranteed.

The Estonian Academy of Sciences was represented in the preparation of the Code by its member Raivo Uibo.

.../“The central pain point is the trustworthiness of science. After all, universities and research institutes do not ‘sell’ research results to the public. In general, those are published and accessible to everyone.

What is really ‘sold’ here (if this word is appropriate in the context at all) is the credibility of the results, conclusions and recommendations. And if there is something wrong with this, it is understandable that the ‘client’, i.e. the general public, digs their heels in and demands to know if their money has been used appropriately. I am in complete agreement with, for example, Indrek Reimand, the deputy secretary-general of the Ministry of Education and Research, who stated before the signing of the Estonian Code of Conduct for Research Integrity (at the conference of 1 November 2017) that if society (or a funding body as its representative) cannot trust scientists, science will not be funded. /---/

[Good science] is a field with exceptionally broad grey areas. Fully formalising it is basically impossible, and therefore tying future developments to a single document represents a significant risk. The way our world functions, after all, is that, no matter how detailed a document, there will be a case that does not fall under its precepts. Moreover, for any given set of rules, a situation can be constructed that cannot be deemed right or wrong.

(I personally believe, even though my colleagues may not concur, that drawing up things like ethics codes or good practices in research is an extremely worthwhile exercise. It is a good way to think things through, to separate the proverbial wheat from the chaff and organise it in a sensible and beautiful pattern, and to set goals for the future. But just as the meanings of good upbringing, solid education and refined manners change over time and space, they also change in science. In our times, changes come so quickly that nearly any document is already outdated at the time of its signing.

The Code is available on ALLEA's website: <http://www.allea.org/wp-content/uploads/2017/03/ALLEA-European-Code-of-Conduct-for-Research-Integrity-2017-1.pdf>

Therefore, documents describing good practices are generally not canonised and are instead seen as open documents that reflect constantly developing agreements.)

The Estonian Code of Conduct for Research Integrity differs slightly from its ALLEA analogue. Both discuss institutional responsibility, which is a relatively new aspect of such norms. The difference lies in details. The Estonian code sees institutions as good teachers and mentors, sharp-eyed guardians and just punishers, who follow good practices a priori (generally passively). The academies of sciences additionally see institutions as (pro)active subjects whose policies or decisions can relate to (or contrast with) good practices and research ethics.

Therefore the new version of ALLEA's code expands the concept of misconduct to also cover institutions. Examples of unacceptable conduct include, apart from the fairly elementary ‘Allowing funders/sponsors to jeopardise independence in the research process’, the much more delicate ‘reporting of results so as to introduce or promulgate bias’. /---/.

Problems of this nature keep surfacing due to the fundamentally dualistic nature of academic institutions.

On the one hand, academic freedom is an important precondition for scientific progress. (To quote an aphorism attributed to Feodor Lynen, it is most importantly the freedom to work more than permitted by labour legislation.) Its motivation is clear: guaranteeing academic freedom is generally the best way for society to realise the investments made in training scientists.

On the other hand, academic institutions need to follow the regulations of the modern world and their implications just like any business enterprise would. Their leaders need to walk the razor's edge of balancing these two aspects. There have been times when academia has been relatively closed to the world, lived according to its own internal rules, and expected society to foot the bill. /---/ The swing of the pendulum is now approaching the other extreme. Yet there

is clear hope that neither academia nor society at large will permit either of the extremes.”

Extract from: Tarmo Soomere on the three rectors' agreement: these problems are inevitable. Postimees online, arvamus.postimees.ee, 08.12.2017 at 13.22, <https://arvamus.postimees.ee/4337805/tarmo-soomere-kolme-rektori-kokkuleppesellised-probleemid-tekivad-valimatult>

## Research Professorship

Every three years, The Estonian Academy of Sciences announces a competition for research professors. Research professors (also called Academy professors) are elected for three-year periods.

The position of research professor enables a researcher who leads studies at a research and development institution or at a university and supervises doctoral students to concentrate on research.

Candidates for the position must have an Estonian doctorate or an equivalent foreign academic degree, must have worked as a senior researcher or a professor at a university for at least ten years in total and must

have supervised successfully defended doctoral theses. Applicants for research professorships are expected to carry out international-level research and successfully fulfil research grants.

The research professors elected in 2016 for the 2016-2018 period are Anne Kahru, a senior researcher at the National Institute of Chemical Physics and Biophysics, Kaupo Kukli, a leading researcher at the Institute of Physics at the University of Tartu, and Rainer Kattel, a professor at the Ragnar Nurkse School of Innovation and Governance at the Tallinn University of Technology.



Photo: Eeva Kumberg

**Anne Kahru:** the magic of nanoparticles (size <100 nm) lies in their minuscule size, which is also the reason for the rapid advances nanotechnology is making in our daily lives, energetics, healthcare and other economically important fields. Can the smallness and the associated increased reactivity be dangerous for us and for nature, though? We attempt to answer this question by concentrating on

the environmental safety aspects of nanoparticles. We explore both particles of rare earth metal oxides, of which little is as yet known, and copper- and silver-based nanoparticles, whose biological modes of action are not yet clear. In order to maximise the efficiency of the work, we are developing new methods for assessing the nanoparticles' modes of action and impact on the environment.



Photo: TTU

**Rainer Kattel:** We tend to think innovation is limited to the private sector. As consumers, we see how Apple and other very innovative companies constantly roll out new products and services. At the same time, the weight of the public sector is 30-50% of the GDP of developed countries. Over the last decade, therefore, the question of why public-sector organisations do not behave like Apple and Transferwise

has become increasingly pressing. The importance of public sector innovation becomes even more evident when you consider how important national investments in foundational and applied research have been in e.g. the development of the Internet. But the development of economy has also been influenced by some very varied institutional and regulatory innovations. Estonia is a global trailblazer in this respect. ID card related solutions based on the X-Road software such as e-Tax Board are clearly innovative and pioneering.



Photo: Andres Tennus

**Kaupo Kukli:** The properties of ultra-thin, nanometres-thick layers of various substances are often radically different from the properties of thicker layers and open up unexpected opportunities to create new devices and components. We concentrate on ultra-thin layers based on oxides of certain base metals (such as zirconium) with various additions, such as oxides of erbium, iron, cobalt, titanium and tantalum and their mixes. We create them by depositing the material on a suitable surface by single, essentially one atom thick films. Thus, we build uniform layers, whose thickness can be regulated with a precision of a fraction of a nanometre, on surfaces of any shape. The properties of such structures permit their use as, for instance, exceptionally small logic and storage elements.

### Research Professors 2002-2015

**2013-2015:** Professor of the University of Tartu Rein Ahas (10.12.1966-19.02.2018), Senior Researcher of the University of Tartu Anu Realo, and Professor of Tallinn University of Technology Tõnis Timmusk.

**2009-2012** Professor of the University of Tartu Pärt Peterson, Senior Research Scientist of the National Institute of Chemical Physics and Biophysics Martti Raidal, and Senior Research Scientist of the Estonian University of Life Sciences Tiina Nõges.

**2005-2008:** Extraordinary Professor of the University of Tartu and Member of the Academy Ilmar Koppel, Leading Research Scientist of the Tallinn University of Technology Malle Krunks, and Professor of the Estonian University of Life Sciences Ülo Niinemets.

**2002-2004:** Professor of the University of Tartu and Member of the Academy Agu Laisk, Professor of the Tallinn University of Technology and Member of the Academy Raimund-Johannes Ubar, and Senior Research Scientist of the University of Tartu Asko Uri.



Photo: Annamari Realo

Anu Realo



Photo: TTÜ

Malle Krunks



Photo: TA

Martti Raidal



Photo: TA

Ülo Niinemets



Photo: TA

Agu Laisk



Photo: TA

Ilmar Koppel

The inter-sectorial mobility of scientists is one of the invisible pillars supporting the competitiveness of a country. Dutch experts consider unlimited movement one of the foundations of the economic strength of their state and its absence in Estonia is likely one of the factors restricting our growth.

As is the case with collaboration between university- and public sector-employed specialists and private companies, such mobility depends on a large number of factors, such as the character traits and preferences of professors or researchers themselves, as well as the traditions and customs within research organisations. It is not all chaos, though. Research conducted in the United Kingdom at the beginning of the century identified the development of a certain “extended” (academic) internal labour market (EiLM) in the spheres of influence of their private enterprises and universities that contributed to the mobility of academic staff. For any given enterprise or sector, the extended labour market is formed of potential employees who have either familial or other close social ties to the existing staff. Through those connections, they get advance information on the nature of the work in the enterprise, which in turn enables them to adapt more easily to e.g. the goals and organisational culture of the enterprise than other potential new staff could.

In Estonia, the development of this type of labour resources could be supported by the establishment of a “topical research professorship”. Apart from solving specific challenges, this would help to achieve the circulation of the specific kind of information (e.g. what it really means to work at the R&D department of a company or a public institution) that reflects the needs of private businesses and public institutions. This might develop into an attractive opportunity for scientists to temporarily leave academia for other sectors.

A minimal adaptation of the system would make it possible to finance top scientists in a way that enables them to focus on solving a particular practical problem without leaving academia for an extended time.

Right now, research professors are elected personally, based mainly on their qualifications, success, potential and the description of their planned research. The research professor is free to choose his/her subject. The Academy recommends expanding the corps of research professors with topical professorships, i.e. the topics, problems or fields for the newly created professorships should be set by private businesses or public institutions. The funding for such research would be granted by various ministries, institutions or enterprises, but the high qualification requirements similar to those for current research professors (at least ten years of work as a senior researcher or professor, and at least one successful doctoral supervision) and the prestige of the position would be maintained and the duration of the professorship would be relatively short.

In other words: different institutions would collaborate to find highly qualified specialists who would like to focus on a narrow subject and/or research problem that corresponds to a problem encountered in the work of a public institution or a company, preferably in close cooperation with a working group at a university or R&D institution. The requirements for the qualification of a topical research professor would remain the same as for a “classic” research professor.

This approach would allow for the creation of research professorships of flexible duration (e.g. 0.5-3 years). Unlike regular studies, which are ordered through a competition (adjudication) or public procurement, where the extent, sum and deadline are prescribed, the research professor would be expected to offer the best solution to a problem in a predetermined time.

Since the status of a research professor is considered high in academia, it can be reasonably expected to become an attractive step (or perhaps side step) in a career. It is likely that this process would attract outstanding academic competence to solve various problems that are important to the Estonian state and/or specific companies. It would also function as an alternative option to regular grants for creating competence in fields that are currently under-explored in Estonian research.

An important detail is that the research professor would work in close cooperation with his or her working group (generally a university or research and development institution) and would draw his or her salary from the university. This would allow for the harnessing of much broader academic potential (contacts, colleagues’ recommendations etc.) to solve the given problem or develop the missing insight. This would make returning to academia generally painless.

Such a connecting link would facilitate the development of an extended labour market between academia and other sectors. As a bonus, it would make it possible to finance the rare outstanding scientists whose specific research does not fit into the current science funding framework, but whose work has the potential to find application in the long run in the public sector or in business.

The topical research professor institution is intrinsically compatible with the tenure system. This instrument would cover e.g. situations where a researcher on a tenure track wishes for some reason (including urgent national need) to temporarily focus on a specific subject (where external funding is present) and is chosen to tackle it, but at the same time, could contribute through his or her presence to the goals of the tenured position. Thus the status of a topical research professor can be interpreted as a natural option to enhance the flexibility of the entire scientific system.

# Estonian Academy of Sciences Foundation

The Estonian Academy of Sciences Foundation was set up with the Estonian National Culture Foundation on 1 May 2006 for the purpose of supporting research efforts of young Estonian scientists holding doctorates. The initial funding of the new sub-foundation of the Estonian National Culture Foundation came from the 400,000 Estonian kroons [about €25,600] from the sale of the Academy's summer house on Vormsi Island. The Academy member Mart Ustav made a large contribution to this foundation.

The Academy calls on organisations, enterprises, institutions and private individuals to contribute to the economic, social and cultural development of Estonia through supporting top-level knowledge, research and young scientists now and in the future.

Scholarships are awarded by the board of trustees, comprised of the members of the Academy Mart Ustav, Leo Mõtus, Jaan Ross and Peeter Saari.

In 2017, the foundation is supporting research into non-destructive testing. To put it simply: we'll tap an object or light it up and listen to or observe the response. This will enable us to decide whether the object is intact, broken or about to break. This straightforward description conceals extremely complex mathematics and physics. The foundation supported the work of Martin Lints, a

researcher at the Department of Cybernetics of the Tallinn University of Technology with 2600 EUR to enable him to apply his knowledge from foreign universities to making and using testing appliances for non-destructive testing and signal analysis.

A special Tiit Talpsep scholarship has been awarded since 2009 with the aim of advancing the studies of graduate students in the field of molecular microbiology and virology. A 900 EUR scholarship was given to Jelena Beljantseva, a PhD student at the University of Tartu. She is researching the general regulatory mechanisms of bacterial cells, which are important in understanding the development of infection and antibiotic sensitivity. In this way, she's contributing to better health for all of us.



Photo: private collection

**Tiit Talpsep** (22.01.1954-26.02.2008) was an Estonian biologist who researched applied molecular biology. Establishing of the scholarship fund named after Tiit Talpsep was accomplished thanks to a financial donation from the Academy member Mart Ustav.

## Previous scholarships

- 2015:** **Priit Vahter** – Young Scientist Scholarship (2225 EUR)  
**Sirle Saul** – Tiit Talpsep Graduate Student Scholarship (1000 EUR)
- 2014:** **Bert Viikmäe** – Young Scientist Scholarship (3000 EUR)  
**Mart Toots** – Tiit Talpsep Graduate Student Scholarship (961 EUR)
- 2013:** **Tõnu Esko** – Young Scientist Scholarship (1500 EUR)  
**Triin Reitalu** – Young Scientist Scholarship (500 EUR)  
**Agnes Kütt** – Young Scientist Scholarship (500 EUR)  
**Anneli Kurve** – Young Scientist Scholarship (500 EUR)  
**Liisi Henno** – Tiit Talpsep Graduate Student Scholarship (674 EUR)
- 2011:** **Liisi Laineste** – Young Scientist Scholarship (1600 EUR)  
**Jaan Masso** – Young Scientist Scholarship (1600 EUR)  
**Liisi Võsa** – Tiit Talpsep Graduate Student Scholarship (789 EUR)
- 2010:** **Jürgo-Sören Preden** – Young Scientist Scholarship (50,000 Estonian kroons)  
**Jelizavete Geimanen** – Tiit Talpsep Graduate Student Scholarship (15,000 kroons)  
**Margus Varjak** – Tiit Talpsep Graduate Student Scholarship (15,000 kroons)
- 2009:** The first Tiit Talpsep scholarship (10,000 kroons) was conferred on **Jens-Konrad Preem**.

## Donations to support the Estonian Academy of Sciences Foundation can be made to the following bank account:

Sihtasutus Eesti Rahvuskultuuri Fond,  
Registry Code: 90000340  
A. Lauteri 7–13, 10145 Tallinn  
Account (Swedbank): EE672200221001101347  
Swedbank, Liivalaia 8, 15040 Tallinn  
SWIFT/BIC – HABA EE 2X  
Alternative account:  
Account (LHV) EE117700771000664610  
NB! Please note “Estonian Academy of Sciences Foundation” on the details line.

# NEW BEGINNINGS

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## Endel Lippmaa Memorial Lecture and Memorial Medal

The first Endel Lippmaa Memorial Lecture, delivered by the Nobel Prize winner Kurt Wüthrich (b. 1938; Nobel Chemistry Prize 2002), was held on 12 September 2017 at the Academy of Sciences Great Hall. The lecture was introduced by President of the Republic of Estonia Kersti Kaljulaid. Professor Wüthrich was awarded the Endel Lippmaa Memorial Medal.

The Academy member Endel Lippmaa (15.09.1930-30.07.2015) was one of the greats of Estonian science and politics and one of the most internationally renowned Estonian scientists. Lippmaa, a man of legendary astuteness, breadth and capability, contributed to restoring Estonian independence and a free society. He influenced the development of the country for a long time.

The Estonian Academy of Sciences founded the Endel Lippmaa Memorial Lecture and Memorial Medal tradition to commemorate the departed colleague. The Academy hopes that this tradition will bolster new high-level achievements in science and the spread of new ideas, as well as acknowledge and support the mission of scientists in the development of society. Therefore, the Endel Lippmaa Memorial Lecture will be delivered by outstanding scientific or societal figures whose ideas have significantly impacted the development of science or society and whose activity connects top research with serving society.

The lecturer was named by a committee consisting of Mart Kalm (chairman), Ene Ergma, Mart Saarma, Raivo Stern and Jaak Lippmaa.

### **The Estonian Academy of Sciences grants various prizes and medals:**

**Medal of the Estonian Academy of Sciences** (the highest award granted to individuals for outstanding contributions to Estonian science or for contributions to fulfilling the tasks of the Estonian Academy of Sciences)

**The Academy's letter of appreciation** (for long-time and dedicated work at the Academy in successfully fulfilling important and extensive work assignments or successfully preparing and conducting large-scale events, as well as for long-term assistance to the Academy or participating in the Academy's activities, or for important extraordinary assistance to the Academy in fulfilling its tasks or in preparing and conducting Academy events)

**Bernhard Schmidt Prize** (to recognise young scientists and engineers working in Estonia for their achievements in

research and development activities and for disseminating research results)

**Nikolai Alumäe Medal** (highest prize for Estonian scientists in informatics and engineering)

**Karl Schlossman Medal** (highest prize for Estonian scientists in medical science and related fields)

**Paul Ariste Medal** (highest prize for Estonian scientists in social sciences and the humanities)

**Wilhelm Ostwald Medal** (highest prize for Estonian scientists in chemistry and related fields)

**Karl Ernst von Baer Medal** (highest prize for Estonian scientists in life and earth sciences)

**Harald Keres Medal** (highest prize for Estonian scientists in astronomy, physics and mathematics).



Photo: Reiti Kõkk

The Medal was designed by Risto Tali.



Photo: Reiti Kõkk

All of these prizes are either connected to the activities of the Estonian Academy of Sciences or meant for Estonian scientists. In the contemporary world, scientists' contributions to world science are increasingly important; the same goes for the scientists' mission as trailblazers of society. Therefore, it is only logical that the Academy rewards scientists who unite excellence in research with work that benefits society.



Photo: Reiti Kõkk



Photo: Reiti Kõkk

### Endel Lippmaa Memorial Lectures and Memorial Medal Fund

In order to assure the funds necessary to conduct the Endel Lippmaa Memorial Lectures with due dignity, a fund for specific purposes has been formed with the Estonian Academy of Sciences. The money in the fund is used to finance memorial lectures and related activities.

A committee, consisting of Riivo Sinijärv (chairman), Tiit Vähi, Enn Õunpuu, Jaak Järv and Margus Lopp, has been formed to solicit private resources for the fund.

### The Estonian Academy of Sciences appreciates its partners and supporters:

Riivo Sinijärv, Tiit Vähi, Heiti Hääl, Hans H. Luik, AS Sillamäe Sadam, AS Elcogen, Finest Rannahotell OÜ, Silberauto AS, AS Silmet Grupp, AS IEG, the Tallinn University of Technology, and the National Institute of Chemical Physics and Biophysics.

# Estonian Young Academy of Sciences

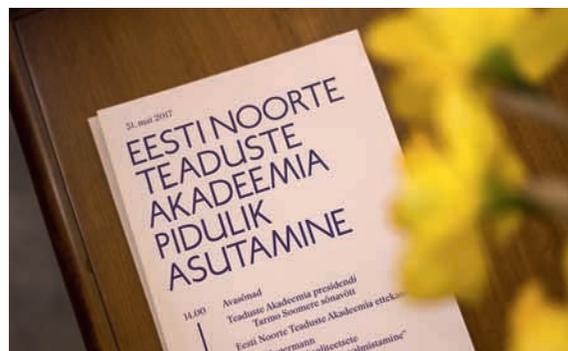


In 2017, the Estonian Young Academy of Sciences (EYAS) was founded on the initiative of the Estonian Academy of Sciences. It is a legally independent non-profit association focused on topics related to young scientists. Its goal is to represent the interests of young Estonian scientists and amplify their voices in society, while contributing to the development of science and society, and promoting the role of science in society.

The founding members of the Estonian Young Academy of Sciences are outstanding active scientists who are up to 37 years old and hold PhD degrees, and who have been nominated by Estonian research institutions at the request of the Estonian Academy of Sciences.

The Estonian Young Academy of Sciences deals with issues related to the funding of (young) scientists, collaborates with other young academies of sciences abroad, promotes cross-disciplinary research, promotes the scientific method and evidence-based decision-making, and contributes to expanding the career choices of PhD

degree holders in Estonian society. It collaborates with the Estonian Academy of Sciences and the public and private sectors. It introduces Estonian science abroad, organises scientific conferences and events and promotes mobility for researchers, creating a support network for young scientists active outside Estonia.



## The general assembly of the Estonian Young Academy of Sciences elected a five-member board on 31 May 2017:

**Eis Heinsalu** – President

**Heisi Kurig** – Vice-President

**Gert Preegel** – Secretary-General

**Innar Liiv** – Development Manager

**Andra Siibak** – Communications Manager

## Founding Members of the Estonian Young Academy of Sciences:

**Juhan Aru** – Post-Doctoral Researcher, ETH Zürich

**Peeter Espak** – Senior Researcher, University of Tartu

**Maarja Grossberg** – Senior Researcher, Tallinn University of Technology

**Eis Heinsalu** – Senior Researcher, National Institute of Chemical Physics and Biophysics

**Kristo Karjust** – Associate Professor, Tallinn University of Technology, Faculty of Mechanical Engineering, Chair of Production Engineering, and Director of Mechanical and Industrial Engineering Institute

**Karin Kogermann** – Associate Professor and Senior Researcher, University of Tartu

**Heisi Kurig** – Researcher, University of Tartu

**Kajar Köster** – Academy Researcher, University of Helsinki

**Rainer Küngas** – Principal Research Engineer, Haldor Topsoe A/S

**Äli Leijen** – Professor of Pedagogy, University of Tartu

**Innar Liiv** – Associate Professor, Tallinn University of Technology

**Lili Milani** – Senior Researcher, University of Tartu

**Kerli Mötus** – Associate Professor, Estonian University of Life Science

**Eva Näripea** – Senior Researcher, Estonian Academy of Arts

**Kärt Ojavee** – Senior Researcher, Estonian Academy of Arts

**Ester Oras** – Senior Researcher, University of Tartu

**Gert Preegel** – Researcher, Tallinn University of Technology

**Priit Purge** – Researcher, University of Tartu

**Marju Raju** – Researcher, Estonian Academy of Music and Theatre, and R&D Advisor, Estonian Ministry of Social Affairs

**Ringa Raudla** – Professor of Public Finance and Governance, Tallinn University of Technology

**Tuul Sepp** – Post-doctoral Researcher, Arizona State University

**Andra Siibak** – Professor of Media Studies, University of Tartu

**Leho Tedersoo** – Senior Researcher, University of Tartu

**Elmo Tempel** – Senior Researcher, Tartu Observatory, and Post-doctoral Researcher, Leibniz Institute for Astrophysics, Potsdam

**Katrin Tiidenberg** – Associate Professor of Social Media and Visual Culture, Tallinn University, and Post-doctoral Researcher, Aarhus University

**Aare Tool** – Lecturer in Music Theory, Estonian Academy of Music and Theatre

**Hannes Tõnisson** – Senior Researcher, Coastal Research Group, Institute of Ecology, Tallinn University

**Anneli Veispak** – Post-doctoral Researcher, KU Leuven

**Hendrik Voll** – Professor, Tallinn University of Technology



Breaking traditions: three Presidents together. Pictured: EYAS with guests, 31 May 2017.

### How to become a member of the Estonian Young Academy of Sciences?

The Estonian Young Academy of Sciences (EYAS) has active members and supporting members. Active members are Estonian scientists with doctoral degrees who participate in fulfilling the goals of the organisation. The procedure of becoming a member is being determined. Membership ends at the 41st birthday of the member or at the cessation of active participation. The vacancies are filled with new members elected from among active young scientists every year.

Supporting members of EYAS are legal or natural persons from Estonia or abroad who support the activities of the organisation. Supporting members enjoy the same rights as active members, other than the right to vote. Supporting members are accepted through the approval of the board. To become a supporting member, please apply at [enta@akadeemia.ee](mailto:enta@akadeemia.ee).



## Els Heinsalu, President of EYAS

Interviewed by Piret Suurväli

**You are a member of the Estonian Young Academy of Sciences. What made you join, and where did the impetus come from?**

In general, I'm not one for organisations. I haven't even joined the physics society [Estonian Physical Society – ed.], even though I could. I am an observer by nature. But when I was asked to join the Estonian Young Academy of Sciences, which was taking shape at the time, I knew I was interested!

People mature and change over the course of their lives, after all. I joined not because I saw myself as an eminent scientist, but rather out of a need for social participation. When this organisation was being established, one of the intentions was that the people in it should be interested in societal issues. I take the entire Estonian Young Academy of Sciences business very seriously. I truly hope it takes root. The name is a bit bittersweet, because the previous EYAS - Estonian Young Academy of Scientists - didn't last long. I find myself worrying about that now. For God's sake, I don't want this new EYAS to wither and die. I want it to also celebrate an 80th anniversary. I believe we have been given an extremely important opportunity.

**How do you perceive the EYAS group? How united and how strong are you?**

We haven't been working together very long yet. The EYAS is still taking shape. I imagine that it will remain an organisation in motion. People stay in the Estonian Academy of Sciences for decades. This establishes traditions. Because members stay in the EYAS for just a handful of years and each new generation is different, I believe that the EYAS will always change with the times. But hopefully, its principles will remain.

I believe that it is possible to make the EYAS work very well and I think that our current group works well. What is especially good is that whatever topic comes up, people from different fields bring different visions and we can see things from a lot of perspectives. As a physicist, when talking with other physicists we might never even realise that social scientists experience completely different problems at the university. I simply do not have this shared foundation, experience and information. One of the goals of the EYAS should certainly be to maintain a balance between different disciplines to create synergy and see the broader picture.

**How did the election of the president work? How do you approach the role?**



Photo: Reiti Kõkk

Els Heinsalu

I came up with a few other candidates myself. The establishment of the EYAS was preceded by five months of rule setting and statute writing. In this sense, I've put quite a bit of time into the EYAS. In a way, I've been foolish. Having four children in rapid succession has slowed my science activities quite a bit. If I were a sensible, rational and smart scientist, I'd just be concentrating on science, along with parenting, of course. But as it stands, I have been contributing time to the EYAS as well.

Being elected president seemed kind of a natural development. Many people said that I should be president and I didn't argue. In a way, I'm a bit of a yes-woman, so that when I'm told to come here and do this, I generally do so, unless I think there is a lack of perspective. But if I see that it's at all necessary and useful, then I say yes. People were pretty united about the decision. There weren't many candidates or intense competition; people really came together. *(Original publication)*

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Els was born in 1980. She has a PhD in theoretical physics (University of Tartu, 2008). Her research mainly focuses on stochastic processes, diffusion processes and complex systems (models inspired by ecology, language dynamics and econophysics). Els continued her University of Tartu education in Spain (iFiSc - Institute for Cross-Disciplinary Physics and Complex Systems, University of the Balearic Islands, and the Spanish National Research Council, Post-doctoral Researcher, November 2008-July 2011) and Denmark (Niels Bohr International Academy, Niels Bohr Institute, Copenhagen University, Post-doctoral Researcher, January 2012 - May 2014).

She is currently working as a senior researcher at the Estonian National Institute of Chemical Physics and Biophysics.

Els is married and has four children. In 2017, she became the first Estonian to be awarded the L'Oréal-UNESCO For Women in Science scholarship.

## *Gert Preegel, the secretary-general of the EYAS*

*Interviewed by Piret Suurväli*

**Why did you join the EYAS, what is it that you like about it, why is it needed, and why are you one of its executive officers?**

I was told that this was a thing that was happening, and was asked what I thought. I have a knack for leadership. I can say I've got vision and some leadership qualities. So why am I the secretary-general? This position involves a lot of organising. We will be building up the Estonian Young Academy of Sciences for a long time and doing so with pleasure. We hope it will endure. What's more, academies of young scientists have become ubiquitous abroad and have formed their own international organisations. Estonia will catch up soon enough.

The voices of young scientists need to be heard, and we need to speak up more. Although a scientist is a scientist, young ones have their own particular problems. If you have no reputation of your own yet, it's difficult to apply somewhere side by side with somebody who has had 15 years to build their's up. Could these things be viewed from a different perspective? Young people are the ones who carry things on; they should be supported. Of course, it doesn't make problems like funding any easier to solve. But perhaps our government could be given a slight nudge towards making the state more committed to knowledge and to specialists, and to putting competent people in decision-making.

**How active are the rest of the young academics? How is the company?**

The company is great. It's amazing how such very good people have come together. Usually, these organisations have leaders and then others who are carried along. We have a lot of active members, which is absolutely a great thing. I'd also like to say that people get active if you interact with them directly. Sending general letters about needing help will get you nowhere. It is like when we went to the next village over to play football. We needed to get a team together, and we knew the core people to call. And then their friends would certainly show up as well. The pattern is simple: be direct! Get the phone and call them! I believe that most people can be talked to. The EYAS crew contains the extremes and everything in between. There are humanities people and science people: different people good at different things. The elections are coming up. We hope to enlist a young scientist from the field of law as well.



Photo: private collection

Gert Preegel

**I have heard criticism that your new group is already closed, and no more new people can join: that everything has already been settled.**

This criticism is not accurate. The current membership comes directly from the decisions of the universities who decided on the first members. It is not set in stone at all; it's in flux. In the next five years, half of the members will change. The current headcount of the academy is 29. We're missing four more people to get to [the maximum number of members - ed.] 33. I understand the worries of onlookers, but what we're asking is: is there even anybody out there for us? There have been no elections. We cannot imagine who wants to join [the EYAS] and whether they're ready to contribute. Since those procedures haven't been carried out so far, we cannot even guess what is going to happen.

**An application round?**

There are overall relatively few researchers. The criteria are strict: you must have a doctoral degree and be less than 41 years old, very competent in science and willing to contribute. How many such people are there? Maybe 40? New people meet the criteria every year, but then some people also turn 41 every year. We don't have the talent pool that, say, Germany does. But the group we do have now is a genuinely capable one.

*We will be building up the Estonian Young Academy of Sciences for a long time and with pleasure. We hope it will endure.*

## Three-minute Science

**P**ractical Science Communication III - the three-minute lecture contest 2017 - continued the tradition that was begun two years earlier. The entire undertaking is meant as a practical exercise in experiential learning in science communication for doctoral students of Estonian public universities and research institutions, as well as for young scientists, with the dual purpose of introducing their work to as broad an audience as possible.

The competition's gala evening finale took place at the great hall of the Academy on 27 October 2017. The young scientists had to fit their entire research into an attractive presentation of exactly three minutes that would explain the content and importance of their work to a broad audience.

The finale presented the best lectures selected through qualifying rounds held at universities and research institutions. Eight of them were declared winners by the jury. The winning lectures were broadcast on Estonian Television. These mini-portraits were collected into the TV show "Three-minute challenge". Additionally, the science magazine Horisont awarded the laureates half-year subscriptions.

Viktoria Ladõnskaja-Kubits (XIII Riigikogu shorthand records, VII session, 10 January 2018, as a reflection on the Prime Minister's overview of research and development activity in Estonia in 2017): At the end of October, the "Three-minute Science" competition took place at the Academy of Sciences. The competition is necessary and interesting, because it makes young scientists explain simply and clearly why their research is useful for society. The contest serves two purposes: 1) the researcher has to explain complex science clearly and attractively, and 2) the general public, who might not know much about these fields, learn why these research directions are important in general. In other words: competitions like this bring the scientific community closer to the general public and vice versa. The goal is to involve science and have it answer society's questions, and for this to be successful, the face in front of the camera needs to be confident, articulate and happy.

### LAUREATES 2017 (listed in alphabetical order by first names):

**Andrea Giudici** (Tallinn University of Technology):

"Technology for pollution tracking in the Gulf of Finland"

**Elisabeth Dorbek-Kolin** (Estonian University of Life Sciences):

"Cryptosporidiosis – an unknown enemy?"

**Elise Joonas** (Institute of Chemical Physics and Biophysics):

"Microalgae vs nanoparticles: diversity enriches or the stronger prevails?"

**Fideelia-Signe Roots** (Estonian Academy of Arts):

"The female tractor driver - a poetic hero"

**Janeke Urvik** (University of Tartu):

"On the impossibility of living forever"

**Madis Uemaa** (Tallinn University of Technology):

"Digital power grids are almost within reach"

**Oliver Laas** (Tallinn University):

"Virtual = reality?"

**Tiina Laansalu** (Institute of the Estonian Language):

"*Nomen est omen* - or what we can learn from place names"

The jury (listed in alphabetical order): Indrek Allmann, Alar Karis, Laur Kaunissaar, Viktoria Ladõnskaja, Ingrid Peek, Birgit Sarrap, Tarmo Soomere (chairman) and Hannes Tõnisson. The moderator of the gala, Ronald Väli, was one of the laureates of the 2015 competition.



Photo: Maris Kruvaid

Fideelia-Signe Roots



Photo: Maris Krünvald



Photo: Maris Krünvald

**On 10 April 2017, the Academy hosted the presentation of the book Three-minute Science.**

Born from a collaboration between Argo Publishers, Estonian Public Broadcasting and the Academy of Sciences, this book describes the finalists of the 2015 and 2016 editions of the show and their work. The texts of the presentations are supplemented with QR-codes linking to videos, sound files, animations and other materials. The annex to the book includes the training materials for each year. The book was discussed at the Estonian Television “Kirjandusministeerium” (Ministry of Literature) show on 26 April 2017.

A reader's comment in the Estonian National Broadcasting culture section (“Tarmo Soomere: if scientists disappeared into thin air, we might not notice for five years”, ERR culture portal, user Tõnismöldre 26.04.2017 at 18:42): Science came alive at Mart Juur’s Kirjandusministeerium show [a discussion of the book based on the show] /---/ Yesterday’s “three-minute summary” /---/ of our scientists’ entries was astonishing in how concisely, yet richly things were explained. Regular interviews don’t usually have the same clarity. Perhaps the current competitors at Rakett can make themselves understood in the same way. /---/ what an experience! [The comment has been slightly edited for clarity; the author’s style has been retained - ed.]

## For Women in Science

In 2017, Estonian female scientists had their first opportunity to apply for the L'Oréal-UNESCO Baltic scholarship "For Women in Science". In Estonia, one scholarship in the sum of 6000 EUR was available to a researcher under the age of 40 holding a doctoral degree whose research focuses on natural sciences or physics or a related field.

The 23 Estonian applications were assessed by a committee formed by the Estonian Academy of Sciences

consisting of the Academy members Ergo Nõmmiste and Ain-Elmar Kaasik and the Academy's former and current Research Professors Anne Kahru, Malle Krunks and Tiina Nõges.

Estonian, Latvian and Lithuanian fellowships were announced on 26 May 2017 in Riga at an event organised by the Latvian Academy of Sciences.

The Estonian fellowship winner was Els Heinsalu, Senior Researcher at the National Institute of Chemical

Physics and Biophysics (pictured with her husband and children), who researches linguistic and ecological systems. Superficially, these systems might seem rather different, but the mathematical models they are based on are relatively similar and the methods, models and means used in one can be adapted to solve problems in the other.

In addition to a successful research career, Els has four children, is an active science communicator and is a founding member of the Estonian Young Academy of Sciences.

Photo: TA



## Appreciation of Student Research Efforts

Two Estonian student research competitions used to run in parallel for decades. The special-purpose Estonian Academy of Sciences fund was established in 1990 and the first grants/research grants rather than awards were paid out in 1991. From 1994 onwards, the grants awarded were similar in nature to those handed out by the Ministry of Education. The chairman of the committee for over 20 years, Georg Liidja, achieved a lot and inspired his colleagues. /---/

In a small country like ours, it is a bit strange to have two parallel competitions, especially since the applications tend to overlap, at least in part. In 2016, the two were merged. Common sense suggests that the new system

should be something more than a jointly held competition, otherwise the merger would make no sense. On the other hand, it is wise to be able to assess the submissions from many different perspectives. Therefore, this year's competition [2016 - ed.] sees the President of the Academy's special prizes awarded in addition to the national awards.

Why is this knowledge necessary if we want to shift from contemplating the past to predicting the future? Perhaps we can give an example with numbers to illustrate the situation. Natural numbers - 1, 2, 3, etc. - are the simplest of numbers. Some of them, such as 7 and 9, have been thought of as "magical"; others, such as 13 or in some cultures 40, have been associated with bad luck. It is quite easy to describe rational numbers and a bit harder



to describe irrational numbers. Algebraic numbers are found through solving certain equations, and all the rest can be grouped together as transcendental numbers.

We can get a much larger set of numbers by considering all of the numbers that we can find to any accuracy through an algorithm of a finite number of steps, whether an equation, a convergent series or something else entirely. Such numbers are called computable numbers. They include  $\pi$ , the ratio of a circle's circumference to its diameter, and  $e$ , the base of the natural logarithm function. They exhibit a profound philosophical dualism: we can calculate them to whatever level of accuracy we want, but we will never know their precise value. They reflect the nature of science: we get more true information faster and faster, but we will probably never know the whole truth. Thus the number pi means much more than any of its definitions or approximations might suggest, and these numbers express simultaneously the huge amount of knowledge circulating in the academic world and the immeasurable number of things we don't know.

In our indicator-riddled world, there is a constant danger of being blinded by numbers, e.g. a journal's impact factor, a university's ranking or an article's number of citations.

Those numbers, too, have their place. But we find it crucial to retain the ability to see beyond the numbers and notice things that are currently immeasurable but might be part of our future. Equally important is the ability to think outside the box, to do things that push the limits of our knowledge. Hence the criteria we hope to maintain in the joint competition are elegance and departure from tradition as aspects that add dignity to even very good science. As a result of these two arguments, two special prizes are given on the levels of master's and doctoral studies: one for "the most elegant student research paper",  $\pi \times 1000$  EUR, and the other for "an unconventional student research paper",  $\pi \times 500$  EUR. Gaining new knowledge is often shown metaphorically as a torch or the bringing of light. Therefore, the special prize for the professional higher education and bachelor's levels is awarded for "auspicious scintillating sparks",  $\pi \times 250$  EUR.<sup>1</sup>

<sup>1</sup> Fragments from the speech at the final event of the national student research awards competition. Some material taken from "Elegance, unconventionality and showing promise". From Soomere, T. Truudus Eestile, Argo Publishers, Tallinn 2017, 158-160.

## Student Research Papers' $\pi$ -prizes

Papers that were considered for the President of the Academy's special prizes -  $\pi$ -prizes - were selected by a subcommittee consisting of the following members of the Academy: Jaan Aarik (chairman), Mati Karelson, Agu Laisk, Andres Metspalu, Lauri Mälksoo, Tõnu-Andrus Tannberg, Jaan Undusk, Gennadi Vainikko and Urmas Varblane.

On 5 December 2017, the laureates of the national student research paper awards competition were announced at the final event of the competition.

**The special prize for the most elegant student research paper ( $\pi \times 1000$  EUR or 3141.59 EUR) went to Rauni Lillemets for the doctoral thesis “Generating systems of sets and sequences” (University of Tartu, supervised by the Academy member Eve Oja and Dr Andrei Lissitsin).**

Selecting the most elegant paper required delving deeply into the meanings of words. The concept of elegance is generally relevant only where individual contributions can be recognised, whether in *realia*, *humaniora* or *socialia*. Elegance appears differently in different fields. It is easy to use elegance in exact sciences and mathematics in particular. In this context, the laureate has had some luck in planning the work. A lot of Évariste Galois' contribution to mathematics, which is in some sense continued in this work, has been not just very influential, but also extremely elegant, and it is relatively easy to maintain elegance while working in this discipline or in this spirit.

**The special prize for an unconventional student research paper ( $\pi \times 500$  EUR, or 1570.80 EUR) went to Liisa Eero for the master's thesis “Quantitative analysis of paper using the ATR-FT-IR Spectroscopic Method” (University of Tartu, supervised by Dr Signe Vahur and Prof Ivo Leito).**

The master's thesis that received the unconventional paper award is surprisingly compact for the volume of research done, yet completely professional. Unusually, the author has managed to bring together the preparation of a product as complex as paper with her own hands with a modern high-technology study of the finished product and good mathematical culture. The result is a new, easy-to-use method for determining certain properties of paper. All of this by far surpasses the requirements set for a master's thesis.

**The special prize for auspicious scintillating sparks ( $\pi \times 250$  EUR or 785.40 EUR) went to Oliver Paukson for the bachelor's thesis “Between sanity and bloodshed:**



Photo: Jüri Luht

Rauni Lillemets



Photo: Jüri Luht

Liisa Eero



Photo: Jüri Luht

Oliver Paukson

**hegemonic masculinity ascribed to MMA fighters” (Tallinn University, supervised by Peeter Vihma, MA).**

The paper that merited the auspicious scintillating sparks prize is characterised by its unconventionality. It is not common that one of the informants is the author himself, who has succeeded in giving, through detailed insights and precise and impactful descriptions, an adequate picture of the functioning of an extremely complex subculture, where even gaining access is an achievement for a researcher. While at times the paper veers towards essay or portrait form, it offers important information about the complex structure of our society and shows the significant role of knowledge, thought, practice and self-control even in an apparently brutal environment.

The following works were awarded letters of appreciation:

Bruno Strandberg’s elegant doctoral thesis “Threshold  $\pi$ –photoproduction and Compton scattering on the deuteron” (University of Glasgow, supervised by Dr John R. M. Annand);

Hanna Hõrak’s elegant doctoral thesis “Identification of key regulators of stomatal CO<sub>2</sub> signalling via O<sub>3</sub>-sensitivity” (University of Tartu, supervised by Prof Hannes Kollist and Dr Mikael Johan Brosché);

Kaisa Ling’s elegant master’s thesis “In search of the neobaroque image” (University of Tartu, supervised by Prof Jüri Talvet),

Pikne Kama’s unconventional doctoral thesis “Combining archaeological and folkloristic sources: human remains in wetlands” (University of Tartu, supervised by Dr Heiki Valk, Dr Ester Oras and Dr Christina Fredengren), Geidi Hein’s unconventional master’s thesis “Cooling ceramic container for fruit and vegetables” (Estonian Academy of Arts, supervised by Heikki Zoova, MA); Tanel Uibokand and Kaur Vahtrik for their scintillating bachelor’s thesis “Technological properties and areas of application of processed biomass” (Tallinn University of Technology, supervised by Prof Toomas Pihl).

**Letters of appreciation were also awarded to the supervisors of winning theses:**

Eve Oja and Aleksei Lissitsin for supervising the winner of the most elegant paper prize, Rauni Lille mets’ doctoral thesis “Generating systems of sets and sequences”;

Signe Vahur and Ivo Leito for supervising the winner of the most unconventional paper prize, Liisa Eero’s master’s thesis “Quantitative analysis of paper using the ATR-FT-IR Spectroscopic Method”;



Photo: Jüri Lüh

Pikne Kama



Photo: Jüri Lüh

Geidi Hein

Peeter Vihma for supervising the winner of the scintillating spark prize, Oliver Paukson’s bachelor’s thesis “Between sanity and bloodshed: hegemonic masculinity ascribed to MMA fighters”.

Pikne Kama, a winner of an Academy letter of appreciation, gave a presentation at the award event.

# ESTONIA AS A SOURCE OF INSPIRATION

Professor emeritus Anu Raud, Member

*Postimees AK, 14 April 2017, pp. 8-9*

*<http://pluss.postimees.ee/4076161/anu-raud-eestimaa-kui-inspiratsiooniallikas>*

**T**here are no other sources of inspiration. This is the only one.

The flower wreaths, the memory sheaths, the land, the forest and the sea, the invisible bonds between so many people, the love and friendship that unite us: it all comes back to Estonia. The flat limestone alvars in the north and sweetly rolling drumlin hills in the south. Generation after generation of ancestors, their stories and songs and patterns committed to memory. Families and forefathers. Our people, so few: like a single big family. And our mother tongue, this ringing language of countless shades of colour and dialect, spoken only in this single tiny country. It's the language of home.

Estonia is but a button on the vast expanse of the world, no more. A patch of land next to the sea, with a sprinkle of islands. This is Estonia. Eesti. A Nordic land.

Small though we may be, there is oh so much variety. Counties. Parishes and communes, villages and farmsteads. Each parish with its church, its own whirlwind of colours, in phrase and in pattern, its subtle customs that spell out home. The pattern of life shifts slightly between parishes. But many things are the same across the land.

All over the country, people visit graveyards on the day of souls and on Christmas Eve. Candles lit for the dear departed light up the darkness of winter all over Estonia. Thousands of tables boast almost identical holiday feasts: blood sausages and gooseberry jam,



Photo: Reiti Kõkk



pickled pumpkin and sweet bread. And first thing in the morning we all grab a bite to eat to avoid hearing birdsong on an empty stomach – linnupete, the bird-deceiver, as we call it – so that the bird won't jinx us. We pass on our wisdom as proverbs, and sing songs that nearly everyone knows by heart.

Those of us who know a lot of songs gather every five years at the Song Festival Grounds, on the stage under the great arch. This party draws a lot of people together. A sense of belonging. During those days, we rejoice simply that we still exist. At least a seed of our people still exists. If only our ancient places and their names, our long-standing counties and parishes survive: in reality, not just in books. This is our hope.

Estonia is a source of inspiration. What people notice is what they need, what is related to their field or discipline. And therefore, I can write about what I notice. What I see through the eyes of an artist. Beauty visible to the naked eye, mostly. But it is intertwined with what the ear hears and the nose smells. You watch a bird sing and smell the springtime forest.

The beauty of the land. The many hues of field soil: sandy grey, freckled with scree, rich and dark and red with clay. Plough-stripped fields. Then the mottled grey of undergrowth, the greens of the fir and the pine, and

the deciduous trees about to spread their budding leaves. The blue of a lake flashing through the trees here and there. Every season has its image. The spring is heavy with blossoms, the opulent summer lies mellow, the autumn ripens in the richness of colour and the winter stands stark and ascetic. Each season has a face.

The moments of being struck by this beauty are the culminations of your life: northern lights and rainbows, glowing sunrises and radiant sunsets, the magic of moonlit nights. Instants of wonder and moments of joy. Flowers, blossoms, berries, from the first anemone to the late rowan, triangles of migratory birds in the sky, and more and more and so much more.

Estonia is a divine country. Maarjamaa, Land of the Virgin Mary, we call it. A paradise garden under the sun. If only there is strength to get to work and the inner warmth to marvel at ice flowers. The ancient home of an ancient folk, the lovely abode of a nature-loving tribe, a generous source for artists, a place to walk, on and on. Holy sites. Springs to quench your thirst. Shallow doorsteps. Simple wooden houses. Tall rooftops. Six-paned windows. Wide floor planks. Ruddy rye fields. Cattle grazing in the pasture. Daily bread, black and rough.

# OTHER BITS ABOUT US

## Top of the Worlds

### *An Elegant Solution to a Centuries-old Puzzle*

**M**olten glass, dripped into cold water, sometimes creates peculiar long-tailed drops called Prince Rupert's drops. The bulbous heads are strong enough to resist even a hammer blow. But if you break off the long thin tail, the entire drop disintegrates explosively into powder. The Academy member Hillar Aben's working group found an elegant explanation for this centuries-old mystery in 2016.

It excited the science world so much that the iconic journal *Science* published a video clip about it. The video rapidly gained popularity and reached the top of the list of most-watched science videos on Facebook last year: the first known such instance in Estonian science.<sup>1</sup>

<sup>1</sup> Sarah Crespi 2017. These Science videos topped the charts – and stole our hearts – in 2017. *Science*, 29.12.2017, <http://www.sciencemag.org/news/2017/12/these-science-videos-topped-charts-and-stole-our-hearts-2017>

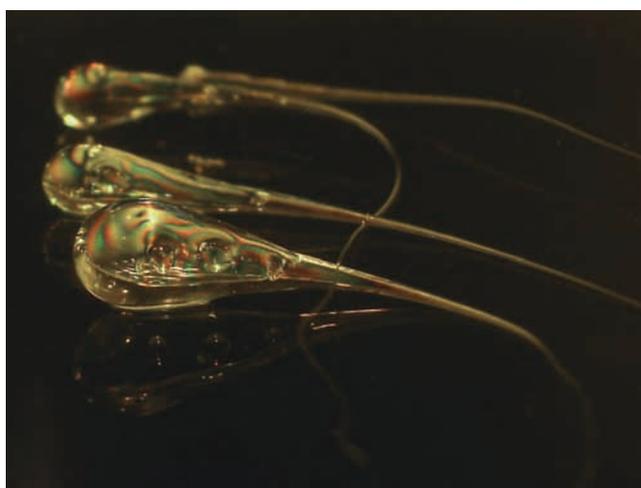


Photo: Michael Grogan

#### A Dialogue on Facebook, or a Timely Question

**Alar Karis on Facebook on 14 December 2017:** "Today's issue of *Nature* discusses research papers that never get cited. According to WoS, they form 10% of all papers. However, we cannot quite conclude that those papers or the science behind them are useless. But how about Estonian science and articles that, according to official statistics, end up never eliciting any interest? Have they been analysed and how - if at all - is this issue connected to science funding?"

**Tarmo Soomere, Facebook comment, January 2017:** "Our dear colleague Alar Karis asked on 14.12.2017 at 8:58 am about Estonian science and research papers that, according to official statistics, elicit no interest [are never cited]. An excellent question. The article that the video [under discussion] is based on [Aben, H., Anton, J., Õis, M., Viswanathan, K., Chandrasekar, S., Chaudhri, M. 2016. On the extraordinary strength of Prince Rupert's drops. *Applied Physics Letters*, 109 (23), Art. No. 231903, doi: 10.1063/1.4971339] has never been cited in any journals listed on the ISI Web of Science or on SCOPUS, i.e. the databases on which the majority of all bibliometrics are based. Juxtaposing this argument with a certain delicate personal datum (i.e. year of birth), any fool can plainly see that the Academy member Aben's working group shouldn't receive another cent of Estonian taxpayers' money. (For those who missed the joke: the preceding sentence was intended as sarcasm rather than a guideline.)

## Ratzinger Prize

The Academy member Arvo Pärt was awarded the Ratzinger Prize. This award is sometimes called the Nobel Prize of theology. It is awarded to outstanding individuals for research in theology or related disciplines. The prize can also be awarded for ecclesiastical artistic creation. The first Ratzinger Prize was awarded in 2011. Arvo Pärt is the first musician to receive this prize.

In 2017, Arvo Pärt's works were the most performed in the world for the seventh successive year.

It is only logical that Eesti Päevaleht has named Pärt the most influential cultural person in Estonia <http://rahvahaal.delfi.ee/news/uudised/mojukas-kultuuritegelane-2017-kes-on-sinu-arvates-mojukaim-spordis-kultuuritegelaste-voi-meelelahutajate-seas?id=80255458>.

Arvo Pärt has given something to every Estonian, according to Ruth Alaküla. Tireless, unrelenting work

has taken the composer Arvo Pärt from the residential district of Mustamäe to the very top of the world's music culture.

In 1989, Dorian Supin made his first remarkable film, "And Then Came the Evening and the Morning", about Arvo Pärt. Supin included in the film a repeated scene where the director asks German-speaking people on the street whether they know who Arvo Pärt is. No one does. Back then, the composer had been living in the free world for nearly a decade and the first Grammy nomination was soon to come.

A few years later, we asked the same question of people walking down Viru street in Tallinn's Old Town and everybody knew Pärt. Every flower seller had something good to say about him. Even though the composer was living in Berlin, his music had rooted itself deeply in the hearts of the Estonian people.



Photo: Scanpix

## *The Seven Influencers*

Clarivate Analytics' Highly Cited Researchers List, published in November 2017, lists over 3000 of the most influential natural and social scientists on the planet. Seven Estonian researchers made the list. Four of them are members of the Academy of Sciences: Andres Metspalu, a geneticist, Urmas Kõljalg, a mycologist, and Martin Zobel and Ülo Niinemets, plant scientists.

The other Estonian mycologist on the list, Leho Teder-  
soo, is a founding member of the Estonian Young Academy of Sciences; the other two geneticists, Tõnu Esko and Markus Perola, are Andres Metspalu's colleagues.

This year, over 3300 researchers representing 900 institutions made the list. Estonia was the only Baltic country to be represented by two universities: six researchers from the University of Tartu and one from the Estonian University of Life Sciences.

The extensive report, whose data were formerly published under Thomson Reuters, assesses researchers' impacts based on the extent to which other researchers use their work (i.e. the number of citations). The more frequently others use a researcher's work to support or contradict something in their work, the more impactful it is, according to Clarivate's analysis.<sup>1</sup>

## *Peregrinus Prize*

The member Lauri Mälksoo, Professor of International Law at the University of Tartu, received the renowned Peregrinus Prize. It has been awarded by the Berlin-Brandenburg Academy of Sciences biennially since 1996. The award ceremony took place on 1 December 2017 in Potsdam.

In awarding the prize, the jury especially noted Lauri Mälksoo's research on Russian concepts of international law. In particular, the 2015 Oxford University Press monograph "Russian Approaches to International Law" was acknowledged. The appreciation of the international science community is expressed by the award of the non-monetary Marshall Shulman Book Prize.

The Peregrinus Prize is awarded to eastern and south-eastern European researchers, who, despite their young age, have achieved outstanding results in any scientific discipline. The prize was established by the

German lawyer and economist Rudolf Meimberg. Previous awardees hail from Russia, Poland, Romania and Croatia. Lauri Mälksoo is the first Baltic laureate.

Lauri Mälksoo's cycle of works, of which this monograph forms the core, was awarded the Estonian National Science Award in social science this year. Experts consider this the most thorough analysis in the last half century of the development of international law in Russia, from imperial literature to the present. It ties together a historical overview, an interdisciplinary approach and modern issues.

It uses the lens of comparative law to illuminate the relationships, ties and differences between Russian law and the laws of neighbouring countries, and shows how the norms and principles of international science, while universal in principle, are interpreted differently in different countries.

Such an acknowledgement of an Estonian scientist shows that research papers that win Estonian awards are well received internationally.

Lauri Mälksoo demonstrates that the doctrine of international law in Russia changed along with the development of international relations in the world and, in particular, with Russia's own internal metamorphoses, while still retaining a relative continuity.

He explains: "International law is based on certain fundamental principles, but Russia emphasises them differently than the West does."

One of the subjects closest to Estonians is the right of self-determination for small countries. "Russia generally prefers to emphasise sovereignty without putting any emphasis on human rights or human-centredness. In that regard, Russia mainly has in mind its own sovereignty rather than that of smaller neighbouring states; smaller countries, in Russia's view, have to get in line behind the bigger ones," explains Mälksoo.

Lauri Mälksoo mainly became a jurist due to the good example set by his great-grandfather, the University of Tartu-educated lawyer August Leps (1896-1972). In 2015, the Academy member Mälksoo was the second Estonian citizen to be elected a member of the prestigious Institute of International Law. Established in 1873 in Gent, this extremely reputable law organisation is comprised of a maximum of 132 members appointed for life (not counting members over the age of 80). Mälksoo, 40 years old at the time of the nomination, is one of the youngest nominees in modern times.<sup>1</sup>

<sup>1</sup> Katre Tatrik, 2017. Seven Estonian scientists among the world's most influential. Postimees online, 21.11.2017, at 09:01, [http://forte.delfi.ee/news/teadus/seitseestiteadlastvalitimaailmamoju\\_kaimatesekka?id=80228816](http://forte.delfi.ee/news/teadus/seitseestiteadlastvalitimaailmamoju_kaimatesekka?id=80228816); see also <https://novaator.err.ee/643729/seitseestiteadlastvalitimaailmamojukaimateks>

<sup>1</sup> Sven Randlaid (ed.). Academic Lauri Mälksoo was awarded a renowned international prize. Postimees online, 09.12.2017 at 20:37, <https://www.postimees.ee/4339325/akadeemiklaurimalksoopalvismainekarahvusvaheliseauhinna>

## Baltic Assembly Prize

The international jury of the Baltic Assembly decided to award the Baltic Assembly Prize for Science to Andres Metspalu, Director of the Estonian Genome Centre at the University of Tartu, for his innovative, broad and lasting contributions to genetic engineering and molecular diagnostics. The award was given out at the Baltic Assembly meeting in Tallinn on 9-10 November.

The forward-looking ideas and persistent work of Professor Andres Metspalu have resulted in the creation and development of the Estonian Biobank - Estonian Genome Centre at the University of Tartu. The Genome Centre currently stores the data of 52,000 gene donors, or five per cent of the adult Estonian population. The existence of such an internationally relevant large databank has marked Estonia on the world genome sciences map and created the necessary preconditions for introducing personalised medicine in Estonia.

Professor Andres Metspalu is one of the initiators of the biobanks programme and a founding member and board member of the P3G international biobank consortium. He has participated in the work of the editorial boards of multiple prestigious science magazines, and he is a member of science councils, steering committees and expert advisory bodies. He is a European Commission ERC panel expert, an expert on science projects for several countries, and a European science representative in Brussels.

Furthermore, Prof Metspalu was the head of the biotechnology chair of the Institute of Molecular and Cell Biology of the University of Tartu (of which he was also the founder) for over 25 years and he played a significant role in the development of



Photo: Ernests Dinka

genetic engineering as a discipline at the university and in Estonia as a whole. His contribution to introducing molecular diagnostics at the Tartu University Clinics, where he founded and for over ten years headed the Molecular Diagnostics Centre, is also significant.

Prof Andres Metspalu's scientific research has been very successful. He has co-authored over 400 heavily referenced articles and book chapters. He has also led Baltic researchers' collaboration in human genetics, which has resulted in articles being published and European Union research grants being received. Prof Metspalu has supervised or co-supervised over 22 doctoral theses defended at the University of Tartu and he has been the opponent for doctoral theses in Estonia, Latvia, Lithuania and the Netherlands.<sup>1</sup>

<sup>1</sup> <http://opleht.ee/2017/11/prof-andres-metspalu-palvis-balti-assamblee-teaduspreemia/>

## Member Ene Ergma Received a Lifetime Achievement Award for Science Communication

The 2017 Estonian science communication awards were presented on 22 November 2017. The Tiiu Sild Memorial Lifetime Achievement Award for long-time systematic communication of science and technology was awarded to the Academy member Ene Ergma.

Our colleague Ene Ergma has spent her entire life fighting for science using all possible (and sometimes seemingly impossible) means. In her case, it is nearly impossible to separate scientific content creation and science communication in very different contexts. She has pursued both since her days as a young scientist and in her semi-administrative positions in Moscow, as well as in the position of the President of the Riigikogu.

As soon as it was technically feasible, she began to intertwine the message of the beauty, importance and relevance of science with texts of a political nature regardless of their level, from local life up to the European Parliament and European Commission.

Ene Ergma has made time for dozens of speaking engagements to discuss the meta-level questions of science communication, has given presentations on science to very different audiences everywhere in Estonia, and has written various articles (and initiated articles), including while in the position of the President of the Riigikogu, which set extreme demands on her time. Thus, she has spent decades communicating the message of the central importance of science in societal progress.



Photo: Sven Tupits

Ene Ergma is a scientist known by probably every Estonian regardless of job or education. She is an astrophysicist with an overwhelming interest in space. During her academic career she has been a lead researcher at Moscow University, a professor at the University of Tartu, and a visiting professor at several universities. She was elected a member of the Estonian Academy of Sciences in 1997 and was its Vice President in 1999-2004.

In 2003, Ene Ergma chose to switch the halls of the University of Tartu for even bigger ones with a broader audience; she made a move into politics and spent over ten years as the President of the Riigikogu. She kept her observant eye on the governing process throughout this period. Ene Ergma also proved to the general public that scientists can make it outside of science. Within the last fifteen years, she has had numerous public speaking engagements, given interviews and astrophysics lectures in schools and outside of them, made high-level visits and hosted visits from other delegations. Throughout all this, she has always emphasised the importance of education and science. She has encouraged young people to study exact and natural sciences and engineering.

Her career in politics witnessed a significant achievement for both Estonian science and economics: Estonia's accession to the European Space Agency. Preparing for the accession took a decade and it involved very extensive and high-level negotiations and agreements and the contributions of a lot of people. Ene Ergma's contributions and lasting vision in this achievement are impossible to overestimate. Her good example encourages and shows the way to many future scientists and states(wo)men.

Modified from the EYAS proposal to nominate Ene Ergma for the Estonian science communication prize in the Tiiu Sild Memorial Lifetime Achievement Award for long-time systematic communication of science and technology category.

## Academy Member Maarja Kruusmaa, Friend of Science Journalists and Owl Prize Winner

The Academy member Maarja Kruusmaa was awarded the Estonian Science Journalists' Association's prize, the Owl Prize, for being the biggest friend of science journalism.

A professor of biorobotics at the Tallinn University of Technology, she represents the changing Academy as a young, talented and capable top researcher with a sharp social sense. Her election reflects the basic principles of choosing new members: a combination of creative achievements, standing out in society, and multidisciplinary achievements. Her work is an exemplary study in bringing together classical engineering and information technology, which in her case has meant work on modern robotics. Since underwater communication is tricky, robots working in this environment have to be extremely smart and independent. It probably takes a member of the Academy to learn from fish, who sense the movement of

water through their lateral lines, an ability which we humans lack altogether.

The academic world is built on solid fundamental science. Kruusmaa supplements her scientific knowledge with the skill of getting ideas financed through projects and the ability to use successful start-ups to propel interesting fresh products from the laboratory into the economy. All of this takes the resilience and stamina of a marathon runner and an ability to get along with the people who use the products of cutting-edge science. Her skill at putting in a good, honest and helpful word - in quite a few languages, no less - has earned her a place among the opinion leaders in Estonian education and science. She is the third youngest member of the Academy, and increased the number of female members by 50%.<sup>1</sup>

<sup>1</sup> T. Soomere. Akadeemik, kes õpib kaladelt. [The Academy member who learns from fish.] *Mente et Manu*, January 2017, 16.



Photo: TA

“Professor **Maarja Kruusmaa** is an excellent example of a renowned younger-generation scientist who, apart from an undoubtedly heavy workload, takes for granted the task of popularising robotics and discussing its impact on society,” says the chairman of the award committee, Priit Ennet.

Kruusmaa has led the development of underwater robots who mimic the movement of fish and turtles at the Tallinn University of Technology Centre for Biorobotics. She co-founded the technology company fits.me and the startup SafeToAct.

“My sincere thanks to the Science Journalists’ Association for long and interesting interaction,” Kruusmaa says. “Communicating with journalists and the general public is a necessary experience for scientists. It helps in thinking about the meaning of results and in seeing work in a larger context” (Tallinn University of Technology press announcement, 15.11.2017. Photo credit: Vallo Kruuser / Horisont).



Photo: Ylva Rajasaar

The laureate of the friend of science journalism prize was chosen by a committee consisting of Andi Hektor, Kais Allkivi, Priit Ennet and Ulvar Käärt. The prize figure - the Owl [Maybe “Ovl” to mimic the broken Estonian “Ökul”? – Tarmo Soomere], by the ceramic artist Piret Kändler - was given to Kruusmaa at the final ceremony of the “Let’s give science a chance II” science hobby education conference, which took place on 22 November in Tallinn and was organised by the Estonian Research Council.

Maarja Kruusmaa is a laureate of the stade decoration of the Order of the White Star Fourth Class and of the annual national science prize (2016). She has been a member of the Academy since 2016.

Other laureates of the Owl Prize include the seismologist and volcanologist Heidi Soosalu (2011), the physicist Mart Noorma (2012), the water wave researcher Tarmo Soomere (2013), the climate scientist Ain Kallis (2014), the physicist Jaak Kikas (2015) and the cell biologist Toivo Maimets (2016).

## Friend of the Press Award

**O**n the day of the winter general assembly, the editors-in-chief and publishers of the newspapers belonging to the Estonian Newspaper Association chose President of the Academy Tarmo Soomere as the Friend of the Press 2017. Soomere believes that the key competence of the Academy members does not lie in communication, but rather in the fact that the Academy is a concentration of a huge amount of knowledge that can be put to the best possible use in collaboration with the media, politicians, etc.

The Friend of the Press award - a megaphone - was presented on 28 December 2017. The columnists of Postimees listed Soomere as one of the five most distinguished people in Estonia in 2017 (Postimees, 29.12.2017, 14).



Photo: Seapix

## Six small steps

*Academician Tarmo Soomere (Postimees AK, 30 September 2017, p 6)*

**H**ow wide is the foundation of the newest technology and how many seemingly absolutely impractical theoretical researches are cemented therein? Tarmo Soomere, the President of the Estonian Academy of Sciences writes that a recent analysis of the relations between the patents and scientific articles surprisingly shows that almost all of the world scientific creative work has been used.

The modern scientific landscape has grown extremely large, complex, and diversified. One may easily get an impression that even light-years are separating it from real life, and in order to create real values needed for the society it is necessary to stay away from the complex theories as far as possible and delve into practical applications only.

Such kind of illusion is intensified by an enormous volume of the existing scientific information and the increasing pace of growth. The world's biggest database of proper scientific publications, Clarivate Analytics (former Web of Science, WoS) contains information about more than 55 million units. Articles are added there six times faster than during the last half a century.

Working with such inconceivable data volume is extremely difficult. Understandably, it is increasingly more complicated to find from there ideas, on the basis of which it would be possible to manufacture some cool profit-making product. Simple ideas have already been used and engineers and developers do not have time to dig deeper into the heaps of publications. No wonder that more and more often the claims that the majority of the scientific articles and especially theoretical researches are totally useless, can be heard and seen. If the physicists hear this, they make loud noise over it and bang LED lamps and graphene on the table as simple examples, the mathematicians are often sadly silent. However, for example, Riemannian geometry that was regarded as useless for a long time, is one of the key components in the operation of the GPS systems and the advancements in the mathematical statistics during the last half-century form the basis for forecasting extreme climate phenomena.

How wide is the foundation of the newest technology and how many seemingly absolutely impractical theoretical researches are cemented therein became clear in the researches published in the journal *Science* in August.

Standing on the shoulders of the giants and the use of earlier information for the creation of new content is expressed in the scientific world by referring to the existing scientific publications. The connections appearing this

way show whether or how much the patents used for defending the technologies in the industry rely on earlier scientific work.

Mohammad Ahmadpoor and Benjamin Jones<sup>1</sup> checked how 4.8 million patents defended in the United States during 1976–2015 were interconnected with 32 million scientific articles published during 1945–2014 and reflected in the database of WoS. Nearly half of these articles have not been cited at all in the works of others, wherefore their connection with the development technology cannot be identified right now. Therefore, these were discarded.

Relying on earlier scientific achievements often takes place as a multi-stage chain. A big part of patents refers only to the earlier patents. Such practice is common in the laboratories of the big companies where the scientific research results that have become the basis for innovations are often published after defending the patent. Scientific articles also rely generally on many of the earlier results. They often come from very different scientific fields. When such work is cited in the patent, indirectly much longer knowledge chain is used.

Merely one sixth of patents refer directly to the scientific articles (in other words rely on them). There are altogether 1.4 million references to the articles of WoS database in them.

But it would be extremely short-sighted to conclude from here that only approximately 5 per cent of the information contained in the scientific articles is applied in the technological solutions of the latest 50 years. These figures are as the tip of the iceberg and reflect only a fraction of the information flow. A completely different picture opens when the knowledge chains are followed from different scientific fields in several scientific research works or patents, relying on each other.

In the case of more than 60 per cent of all the patents, the chain reaches the articles in WoS database only through a couple of patents. In other words, nearly two-thirds of all the U.S. patents rely in one or another way on the scientific research results of the latest 70 years.

It is even more surprising that the knowledge chains reach 80% of all these WoS articles to which references from other works or patents have ever been made. In other words, of those articles published in international scientific literature on which somebody has ever relied, be it in research work or development of technology, 80 percent is already directly or indirectly used in the the U.S. patents during the latest 50 years.

As new articles are added faster and faster, there is reason to believe that the remaining 20 percent that has not yet been used are, for the most part, just too new. WoS

<sup>1</sup> Mohammad Ahmadpoor and Benjamin F. Jones. The dual frontier: Patented inventions and prior scientific advance. *Science* 357(6351), 11 August 2017, 583–587, doi 10.1126/science.aam9527. <http://science.sciencemag.org/content/357/6351/583/tab-pdf>

database covers nearly the entire spectrum of theoretical studies and a considerable part of the social sciences and humanities. Hereby, resulting from these figures, almost the entire scientific creative work has been used.

Articles dealing with the issues of molecular biology, superconductivity technology, artificial intelligence and modern chemistry reach the production along the shortest way. In their case, the chain consists of less than 1.5 links in the world of patents. Thus, the majority of the patents of these domains rely directly on scientific research results. However, the chains are very long for the patents that defend the renewal of such classical products like locks, buttons or armchairs. There the reliance on four-five generations of patents is usual.

Information from mathematics to production moves along the longest chain. Nevertheless, this chain is not excessively long. In the scientific landscape it has an average of 5 links, or altogether 6 steps from the theorem to commercializing. The chain is the shortest (only a little more than two steps) from the nanoworld researches, the material science and the computer science to the patent protected applications. Herewith a total of 42% of the computer science articles have already been used in the patents.

The longer the chain the more time it takes for implementation of the scientific research results. In no case does it happen as fast as the politicians wish, or our science financing system longs for. Even when the patent relies directly on some scientific publication, it will take an average of 6-7 years from the publication of the article to defending the patent. For the more rare branches of mathematics and astronomy where the chain consists of

6 links, it will take about 20 years for implementation. This seems perfectly reasonable and even surprisingly short time, especially considering the indirect support these researches give for the patents.

Currently, in Estonia, approximately 60 per cent of the research and development financing comes from the state budget, from where it mainly moves to the universities and scientific institutes. 40 per cent is added by private entrepreneurship. It is different in many developed countries. Our strategic aim is also to attain a goal where the private enterprise would account for 2/3 of the funding of science and the contribution of the state would be 1/3. This analysis shows that reaching this may become a kind of development accelerator. The chains of use of information regarding the scientific research work carried out in the universities are significantly longer than in the case of private companies. 0.4 steps is the difference on an average. In the case of molecular biology and computer science this already means strategic backwardness. Only 1/3 of that difference is caused by a different profile of the universities (incl here also an obligation to take care of the sciences dealing with national culture). Of course, there are also nice excuses for the remaining lion's share, but quite likely it is just an academic convenience that the private enterprise cannot afford.



Photo: Kalju Suru

*Tarmo Soomere is the first scientist and second member of the Academy to receive the Friend of the Press award. In 1998, this title was conferred upon the member of the Academy Lennart Meri (a former President of the Republic of Estonia). Meri, a versatile figure, also received the Enemy of the Press award.*

*"People can be successful only in environments where they either understand or think they understand the underlying causal relationships."*

L. Meri, Hõbevalge, 1976

# ODDS AND ENDS

## Science Breakfasts and Five-o-clock teas

In Spring 2015, the Academy initiated a series of meetings entitled “Science and Society”. We invited people from all walks of public life to attend: politicians, public servants, the leaders of the Eesti Kultuuri Koda [the NGO Estonian Council of Culture – ed.], journalists and editors, radio journalists and radio editors, businesspeople, writers, artists, architects, etc. A few Academy members were also allowed in. The goal was to see and hear what our work looked like from the countryside, the towns, and the government hill, or whether it was even in sight.

We sought to exchange views on socially relevant topics, define important new challenges, build a common world-view, look for common interests with different

societal and political parties, create new opportunities for collaboration and try out elegant solutions: all of this in an informal, free and inspiring atmosphere (either over morning coffee or in the format of a science afternoon). To our mild surprise, it seems to have occasionally worked.

The 8 June 2017 discussion of the models of research careers was discussed in Sirp [Niinemets, Ü., Randma-Liiv, T., Soomere, T. *Kombineerides vastandeid. [Combining the opposites.]* – Sirp, 28 (3648), 14.07.2017, 4–6]. The intense discussion it sparked lasted into the autumn.

This year (2017) we added another format: meetings and discussions organised by the Estonian Science Journalists’ Association.

**On 9 February 2017**, Tiit Kändler (who was recently awarded the Tiiu Silla lifetime contribution award for long-time systematic work in science and technology communication) presented his “Vaatlusi maailmale teaduskirjaniku seisukohalt” [Observations of the world from the point of view of a science writer].

**On 19 May 2017**, we came together to discuss the indicators that enabled us to estimate the state of affairs in science journalism.

**On 19 September 2017**, another discussion took place.

**On 2 November 2017**, we met to discuss who would receive the Owl Prize of the Friend of Science Journalism.

**On 24 November 2017**, we held a meeting with the members of the Estonian Young Academy of Sciences. Priit Ennet spoke about the relationship between scientists and journalists from the perspective of a journalist, and Els Heinsalu discussed the perspective of a scientist.



Photo: Ebe Pill



Photo: Ebe Pilt

## Academy Members at the Postimees Meet-up and at the Nature Cafe

The Postimees Meet-up is an event that seeks to open up and go public with topics that have outgrown the Academy's classic interaction formats and inflexible space. After all, not everything has to be confined to the Academy. The Academy is happy to inspire its fellow travellers.

The Academy member Maarja Kruusmaa spoke at the Postimees Meet-up of 8 February 2017. The other speaker was the banker Peeter Koppel. The topics included the possibility of robots taking our jobs, whether Estonia would be a nation of machine makers or machine destroyers or even a nation that could not afford any machines to destroy, etc. The dangers and dreams of robotics were

summarised at the end of the day by the comedian Peeter Oja.

[http://arvamus.postimees.ee/4004885/postimeehetrevunks-kas-robot-votab-aera-ka-sinu-toeokoha?\\_ga=1.59761645.1302864755.1457283952](http://arvamus.postimees.ee/4004885/postimeehetrevunks-kas-robot-votab-aera-ka-sinu-toeokoha?_ga=1.59761645.1302864755.1457283952)

On 11 October 2017, the Academy member Andres Metspalu and the research professor Anne Kahru participated in the science journal Nature's discussion format Nature Cafe, an engaging discussion on the impact of science, ways to measure it, and the collaboration between politicians, scientists and journalists in science communication.

<https://www.eventbrite.com/e/nature-cafe-the-importance-of-measuring-and-communicating-scientific-research-impact-registration-36521971199#>

## Academic Columns at Postimees (The Postman)

Collaboration between the Academy and Postimees resulted in a new column appearing in Postimees' weekend culture supplement Arvamus. Kultuur (AK; Observations. Culture). Unlike regular science communication or the explanation of research results and their background, this column draws inspiration from the questions raised in the recent editorials of the world's most influential science journals and discusses what science as a whole might mean for our world. Academy members offer insights into the relationship of science and society and discuss international hot topics in the Estonian context.

By 12 January 2018, the "Academic columns" of Postimees AK included 37 published pieces. The 27 articles of 2017 included columns from Raimund Ubar, Tarmo Soomere, Urmas Kõljalg, Dmitri Kaljo, Agu Laisk, Nobel Prize winner Kurt Wüthrich, Mart Kalm, Raivo Uibo, Toomas Asser, Cornelius Hasselblatt, Jaak Vilo, Anu Raud, Ülo Lepik, Martin Zobel, Karl Pajusalu, Jaan Ross, Jüri Engelbrecht, Anto Raukas, Enn Tõugu, Peeter Saari and Olav Aarna. The foreign member Cornelius Hasselblatt's article on the message of Kalevipoeg can be found on pages 17-19 of this volume, Ubar's article is on pages 12-13 and Raud's article is on 50-51.

## New Associated Societies

Professional scientific societies and broader-profiled learned societies are inseparable parts of the science and education spheres of developed countries. The oldest such societies have reached very respectable ages. The Õpetatud Eesti Selts (the Learned Estonian Society), for example, goes back to 1838, which is 100 years older than the Academy and 80 years older than the Estonian Republic itself. The Society's role in the development of Estonian-speaking culture and our nation in general is hard to overestimate. It is important to note that it is in symbiosis with the Academy that several such societies have survived radical societal changes.

Some of them fulfil national or other socially crucial functions. The Emakeele Selts (the Mother Tongue Society) together with the Eesti Keele Instituut (Estonian Language Institute) bear the official responsibility for maintaining Estonian written language norms. The numerous sections of the Estonian Naturalists' Society extensively contribute to the collection of data on our nature, the organisation of nature protection, nature education, etc. The Estonian Geographical Society and the Society of Estonian Areal Studies systematically document particular features of our country and collect, archive and categorise, from the

micro level to the regional level - from family farms to parishes - fragments of historical memory whose disappearance would be an unimaginable loss for future generations.

Scientific societies and associations whose activities and goals are in line with the Academy's and who are not part of its structure can associate with the Academy. As of 1 January 2017, the Academy had 17 associated societies and associations, with a total of over 5000 members. On 31 May 2017, an association agreement was signed with the Estonian Society of Toxicology. On 31 October 2017, the associated societies gave an overview of their activities at the Omicum at the University of Tartu.

"Citizen science, currently rapidly developing globally, is a long-standing feature of Estonian life. It is led by scientific societies. This tradition is twice as old as our state. Their primary role is to gather knowledge on our country and to pass on their findings to our own people in our own language."<sup>1</sup>

<sup>1</sup> Soomere T., Tammiksaar E. 2018. The invisible support pillars of the Estonian culture and self-awareness. Postimees nr 16 (8221), 20.01.2018, Arvamus. Kultuur nr 453, 7.

## Stately Paintings for the Academy Halls

The Academy building is no stranger to museums. The building at Kohtu 6 housed a provincial museum organised by Baltic Germans for a long time. Even after the Second World War, the Academy's building was used as a museum. Associates of the Academy include the Estonian Literary Museum, Estonian National Museum, and since 2016 the Art Museum of Estonia.

The beautiful, carefully renovated halls of the Academy present classic paintings in their full impact. On 19 December 2017, the Estonian Academy of Sciences and the Russian Museum in Estonia NGO signed a contract that gives a selection of the Museum's paintings a stately and visible home in the Academy building.



Photo: Ede Pilt

The contract was signed by President of the Academy Tarmo Soomere and the Director of the Russian Museum Irina Budrik (pictured).

## Varia

### *The Board of the Academy Visited the Estonian National Museum*

The board of the Academy held its 14 March 2017 meeting at the Estonian National Museum (ERM). The Academy members took part in the opening of the ERM library and the Mother Tongue Day joint seminar. Pille Runnel and Tõnis Lukas gave an overview of the research done at the ERM and its role in the museum's activities. Mari Sarv spoke about the opportunities and challenges presented by collection-based science and research at the Estonian Literary Museum. Kristel Rattus, the curator of the permanent exhibition "Encounters", spoke about the exhibition. The members also visited the permanent exhibition "Echo of the Urals", which reflects the cultural connections between Finno-Ugric peoples, their languages, genetics and much else.



Photo: Sven Tupits

Photo: Sven Tupits

### *Students' Science Festival*

The annual students' science festival took part on 27-28 April 2017 at the Tallinn song festival grounds. Poster presentations were given by the best participants in the national student research competition; national prizes and special prizes were awarded. The Estonian Academy of Sciences gave out four special prizes. The Academy's prize committee consisted of Secretary-General Jaak Järv and the members Jüri Engelbrecht and Ain-Elmar Kaasik, Ester Oras (University of Tartu), Ringa Raudla (Tallinn University of Technology), and Katrin Tiidenberg (Tallinn University). <http://www.akadeemia.ee/et/tegevus/uudised/teated/20170428022556/>



Foto: Sven Tupits



Foto: Sven Tupits

## Research Ethics in Malta

The European Union Marie Curie Actions initiative hosted the conference “Mobility takes research further” in Malta on 11-12 May 2017. The event brought together scientists and science organisers from the EU and abroad, including the Director-General of the European Commission for Education and Culture Martine Reicherts. The member of the Estonian Academy of Sciences Raivo Uibo was invited to speak about the need for and meaning of training young scientists in research ethics within the session “Research Integrity and Ethics”. [https://europa.eu/newsroom/events/maltese-presidency-conference-mobility-takes-research-further\\_en](https://europa.eu/newsroom/events/maltese-presidency-conference-mobility-takes-research-further_en)

## Visiting Member Anu Raud

The division of the Humanities and Social Sciences held its 12 June 2017 meeting in Heimtal, at the museum founded by the Academy member Anu Raud and at her home, Kääriku farm. The members tried their hand at contributing to the carpet being woven for the 100th anniversary of the Republic of Estonia and the carpet stripe book.

## The President of Germany Visits the Academy

President of the Federal Republic of Germany Frank-Walter Steinmeier delivered a speech entitled “Germany and Estonia – a chequered history, a common future” at the Academy hall on 23 August 2017.

## A Joint Undertaking of Two Generations

The Academy members Jüri Engelbrecht and Tarmo Soomere, with the member of the EYAS Anneli Veispak participated in the ALLEA, Academia Europaea, and European Young Academy of Science joint annual meeting and conference “Sustainability and resilience” at the Hungarian Academy of Sciences in Budapest on 3-6 September 2017.

## Science Days of High School Students in Võrumaa

The member Jüri Allik and his doctoral students spoke at the traditional science day of Võrumaa high school students on 20 November 2017. See also: Võrumaa Teataja, 21. november 2017, p. 3. <https://www.vorumaateataja.ee/arhiiv/46-elu-ja-kultuur/18661-vorumaa-guemnasistide-teaduspaeval-esines-akadeemik-jueri-allik-koos-omadoktorantidega>

# Publications on the Academy, Phosphorite, Pseudoscience and Loyalty

Were presented:

**10.10.2017** Tarmo Soomere “Truudus Eestile” (Fidelity to Estonia)

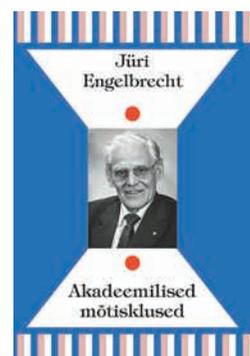
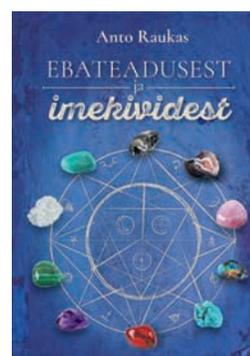
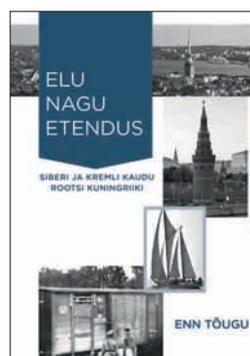
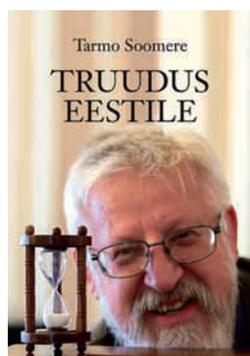
**03.10.2017** Anto Raukas “Fosforiit - meie ühine rikkus” (Phosphorite - our common wealth)

**06.09.2017** Enn Tõugu “Elu nagu etendus” (Life as a spectacle)

**15.06.2017** Jüri Engelbrecht “Akadeemilised mõtisklused” (Academic contemplations; Ilmamaa, “Eesti mõttelood” 133).

**12.06.2017** Anto Raukas “Ebateadusest ja imekividest” (Pseudoscience and miracle stones)

**09.03.2017** The member Jaan Undusk’s “Teekond Hispaania” (Journey: Spain; Loomingu Raamatukogu, 2016) was awarded the best travel book of 2016.



## Navigating the Minefield of Advising the State

One of the duties of the Academy is advising the Riigikogu, the government and state institutions, and offering them recommendations (see the Framework chapter above).

Opinions are divided on how best to go about this. Some believe that the old Estonian saying “Speech is silver, silence is golden” applies: that the Academy would do well to remain silent as long as possible and answer only direct requests.

Others (and they are in the majority) believe that scientists (including Academy members) have been trained to identify problems early on and can make good guesses as to how they can be solved. Therefore they have a moral obligation to follow the principle “Where there’s a will, there’s a way [to help]”.

In modern terms, this means proactively taking action, i.e. if necessary, insisting on helping. In the academic

world, this comes with a duty to be informed about issues in depth and to offer the best possible counsel at all times.

In this spirit, the fourth conference on science policy in the series “Science as a driver of Estonian development” took place in the Riigikogu conference hall on 4 October 2017. The discussion was focused on increasing the intersection of science and state governance. The conference was jointly organised by the Estonian Research Council, the Culture Committee of the Riigikogu, Universities Estonia, the Estonian Academy of Sciences, and the Ministry of Education and Research. On 11 October 2017, the Academy hosted the European Research Council conference “Strengthening Europe’s Science Base”, where the member Mart Saarma gave a presentation. See also: <https://erc.europa.eu/event/european-research-council-conference-strengthening-europes-science-base>

### *Europe “Mining” Advice from Academies of Science*

Both in Europe and globally, the need to take scientific advice into account in political decision-making is becoming increasingly urgent. In order to fulfil this need, the European Commission decided to create the Science Advice Mechanism (SAM) system.

The unit serving it, composed of about 25 people, was created in 2015-2016. It currently has two pillars. One of the pillars is the SAM High-Level Group, consisting of seven top specialists in their fields, together with supporting staff. The other pillar is the SAPEA (Science Advice to Policy by European Academies) project within the Horizon 2020 framework. It involves four consortiums of academies of sciences (ALLEA and EASAC were introduced above; the Euro-CASE brings together academies of applied sciences and engineering, and the FEAM connects academies of medicine), as well as the pan-European academy with the individual membership Academia Europea. The advice from the academies of sciences thus becomes a core component of the European Commission Science Advice Mechanism. The third planned pillar will include the competence of scientific societies and learned societies.

On 13 October 2017, the Academy hosted the SAPEA conference “New approaches to science for policy in Europe”. The event was organised within the framework of the Estonian presidency of the European Council, as a follow-up event to the 12 October forum on the influence of top science, science funding and the future of scientific collaboration.



Science Advice for Policy by European Academies

Simultaneously with ensuring a supply of good advice, the European Commission is prodding member states to listen more to their scientists. This prodding gave rise to the European Science Advisors Forum. President of the Academy Tarmo Soomere gave a co-presentation, “Handling digital avalanche: I-country and Big Data”, at its third meeting, held in Amsterdam on 28-29 June 2017, which discussed the societal impact of the global digital revolution.

*Scientists have been trained to identify problems early on and can make good guesses on how they could be solved. Therefore they have a moral obligation to follow the principle “Where there’s a will, there’s a way [to help]”.*

## *Big Initiatives Can Be Controversial*

**T**wo big initiatives polarised Estonian society in 2017. Those were the Rail Baltic initiative and the Est-For Invest Ltd. consortium's plan to build a large wood processing factory in south Estonia. The Academy made an effort to get a detailed understand-

ing of the plans for the latter. In the academic world, the way to do this is to bring together experts, listen to them and then proceed to a fact-based discussion. Things are not always that simple, though.

To start with, the academy organised the seminar "The perspectives of Estonian wood chemistry" on 27 June 2017.

One of Estonia's principal renewable natural resources is wood. Its exploitation has so far largely focused on simpler activities with modest added value, such as exporting timber and using wood for fuel.

Modern wood chemistry technologies offer ways to take several big steps up the global value chain. To realise those technologies, however, we must thoroughly understand them, appreciate the corresponding risks to forests and other natural resources, and soberly estimate the effects, all the while keeping in mind the broader significance of the forest for society and culture.

The Academy invited the strategic parties of the wood chemistry sector (entrepreneurs, state representatives, technological experts, wood and natural conservation specialists and scientists from related fields) to discuss the risks and benefits of wood processing.

The main goal of the event was to get a detailed fact-based overview of the different arguments, to identify the gaps in our understanding, and to determine the studies or analyses necessary for strategic decision-making.

### **Central topics:**

- Wood processing as an opportunity to advance in the global value chain: entrepreneurs' plans, the state's perspectives and current regulations
- Modern technologies of wood processing
- Forest, nature and society in the context of big plans

Keynote speaker: Professor Per Engstrand (Mid-Sweden University): "Modern trends in pulp technology development and is 'clean' processing affordable?". There were presentations by the Ministry of the Environment, the Ministry of Economic Affairs and Communications, EST-FOR Invest OÜ, the Estonian Fund for Nature, the University of Tartu, the Estonian University of Life Sciences and the Tallinn University of Technology, in which positions were stated. Jaan Kers, Toomas Kivimägi, Mart Loog, Aleksei Lotman, Priit Rohumaa and the member of the Academy Andres Õpik discussed wood processing and the perspectives, challenges and issues connected with wood chemistry. ERR Novaator and Postimees offered live transmissions of the event. It can be viewed on the website of the Academy <http://www.akadeemia.ee/et/tegevus/uudised/teated/20171108111833/>, as well as elsewhere.

On 23 November 2017, the Academy hosted a follow-up seminar, "The Perspectives of Estonian Wood Chemistry II". The keynote speaker was the member Sergey D. Varfolomeev (Lomonosov Moscow State University, Department of Chemistry; Russian Academy of Sciences, N. M. Emanuel Institute of Biochemical Physics). The speakers were Peep Pitk (AS Graanul Invest) and Professor Mart Loog (Tartu University Institute of Technology).

The nature conservation committee of the Estonian Academy of Sciences discussed the situation of Estonian forestry at its 55th presentation day, "Science and law in the forest", in the Baer House in Tartu on 13 December 2017. The discussion formed the foundation for a memorandum to the Environment Committee of the Riigikogu and to the Ministry of the Environment.

The board of the Academy asked an interdisciplinary committee consisting of University of Tartu, Tallinn University of Technology and Estonian University of Life Sciences experts to produce an overview of the problems discussed. Among other conclusions, the committee remarked in its summary: “The technology applied must meet modern requirements. Rather than cellulose production alone, the goal should be producing biological prod-

ucts which make it possible to diversify the processing chain and to use raw materials more purposefully. In this context, supporting knowledge-based production is especially important, particularly by adding a biotechnological technology block.” These positions formed the core of the letter sent to the Riigikogu and the relevant ministries and offices.

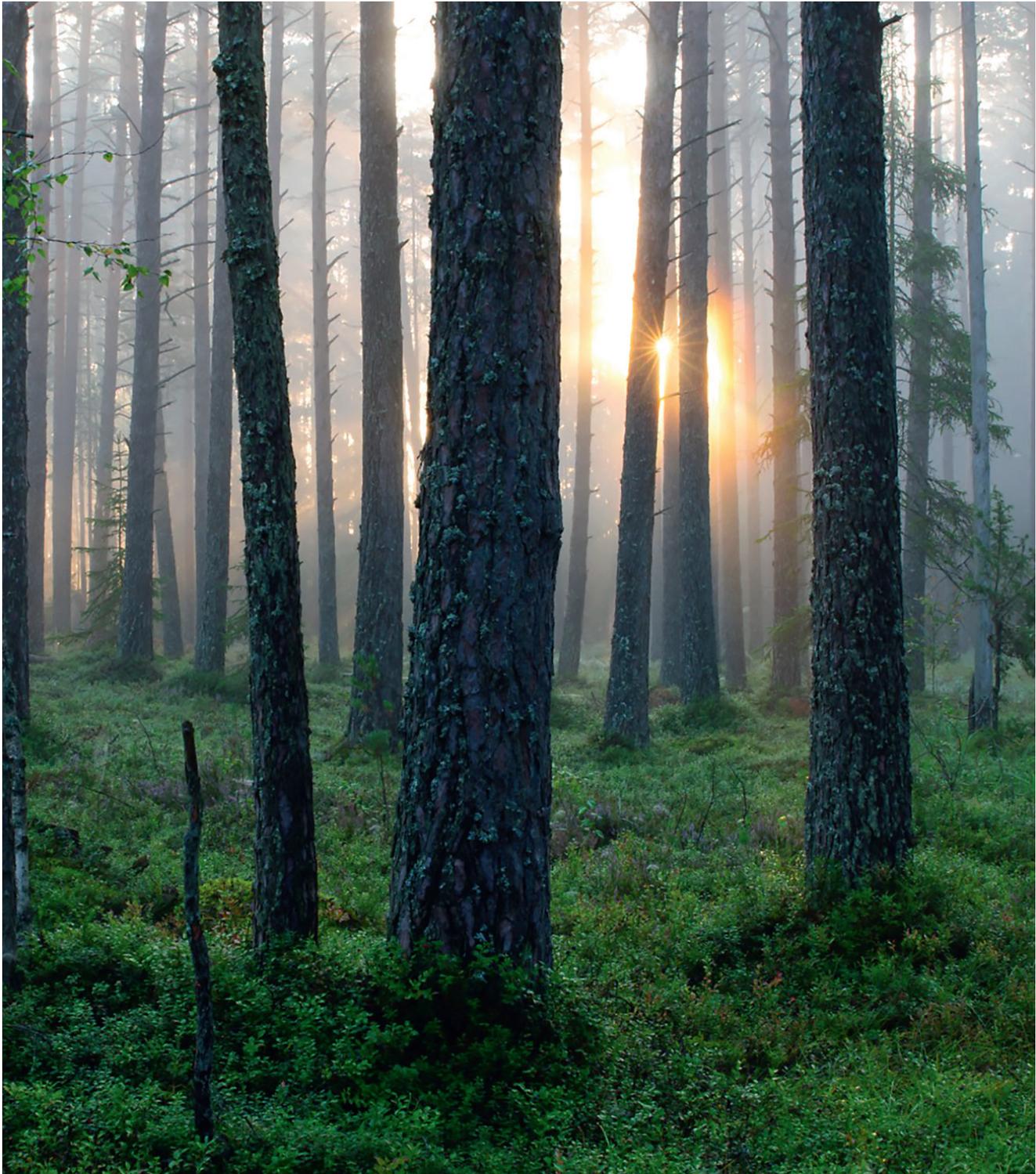


Photo: Sven Zacek

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## *Did you know?*

The tower of the historic building of the French Academy of Sciences is oval on the inside and round on the outside?

Front cover: Front door of the Academy. Photo: Kaspar Ehvest

Inside front cover: Main hall of the Academy. Photo: Reti Kokk