

*Facta non solum verba*

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# FOREWORD

It has already become a cliché to say that our world is rapidly changing and, in a similar manner, both science and its role, as regards supporting social progress and steering the society, are undergoing transformation.

These changes touch the very foundations of how science serves the society. If I may generalise to a certain extent, the situation is as follows. In the relatively recent past, just a few decades ago, there was a strong chain, localised in space and configured in time, from a scientist in a laboratory to an inventor in an adjacent room, from there to an engineer working in a neighbouring house, and finally to a manufacturer in a factory next street. The scientist was paid from the profit earned from selling the finished goods.

This chain does not exist anymore. Instead, we have two cohorts of people. On the one hand, many excellent scientists contribute to the worldwide knowledge pool. On the other hand, science brokers and entrepreneurs fish for ideas in this pool, with a view to converting them into new items. A few successful cases among such fishings generate tax money, whereby a large part of science is funded.

Thus, the pattern of knowledge production has been radically altered together with the pattern of using this knowledge. It is natural that alongside this principal change, several other major alterations are currently underway in the practical aspects how knowledge (or science in general) can be used for national level steering. The former includes how science can be used for policy-making, for keeping environmental resources sustainable and the environment itself resilient.

Peter Drucker (1909-2005) spoke golden words about the power of knowledge when he said that knowledge is the source of wealth. He also mentioned how it should be handled or used, referring to two categories. If knowledge is applied to tasks we already know, it becomes productivity. Alternatively, if knowledge is applied to tasks that are new, it becomes innovation.

The problem of converting knowledge into wealth has thus a perfect solution in theory. Fundamental research is essential if we really want to secure

the future. None of the burning issues of today can be solved without substantial progress in many fields of science. Shimon Peres has said that there is no way to escape poverty without science and there is no way to achieve peace without science. Foreign Member of the Estonian Academy of Sciences Helmut Schwarz has commented in a private conversation, “Without science we are unlikely to be able to construct a future that is worth living.”

Everybody on the academic landscape will surely subscribe to these ideas. The problem is how to convince other people to do the same. Here, the academies of science have a crucial role. A good example is presented by the National Academy of Sciences (NAS) in the United States of America. It is not merely a body representing top scientists all over the country. Created in 1863, during hard times of the civil war, the NAS is responsible for providing independent, objective advice to the nation on matters related to science and technology. The presence of such advice belongs to the cornerstones of the strength with regard to the entire country.

It is most likely that one of the key issues that are going to shape the progress in Europe is whether this continent will be able to mobilise the knowledge that has been accumulated in various layers of science into constructing the future worth living. Currently, many institutions have set out to provide the best advice to the European Commission. New players are arriving, most notably the Science Advisory Mechanism (SAM) unit at the European Commission and four consortia of academies unified together with Academia Europaea into SAPEA (Science Advice for Policy by European Academies), where also the Estonian Academy of Sciences is engaged. It is very likely that the competitiveness of Estonia will also strongly depend on how effectively the country is able to use the competence accumulated in our science landscape for steering the country. This Year Book provides some examples and initiatives in this direction, but also offers a flavour about how much work remains to be done.

Tarmo Soomere  
9 March 2018

# CRONICLE 2017

January 4 – Academy organised and hosted the initial meeting of the constitutional body for the establishment of the Estonian Young Academy of Sciences.

January 4 – Academy House was the venue for a round-table meeting among organisers of a conference aimed at young Estonian researchers working or studying abroad scheduled for 2018.

January 20 – SIA L'Oréal Baltic as the funding agency and the Estonian National Commission for UNESCO together with the Estonian Academy of Sciences as organising partners signed a Memorandum of Understanding on Trilateral Cooperation in the Academy Hall. This agreement laid the foundations for the enlargement of the L'Oréal-UNESCO fellowship programme “For Women in Science” to Estonia.

January 24 – Board at its meeting approved the first year progress reports presented by the Research Professors of the Academy Anne Kahru, Rainer Kattel and Kaupo Kukli. Discussed topics included: an interim report of the panel for updating the Academy Statutes, information about the Estonian Academy of Sciences sub-fund with the Estonian National Culture Foundation and proposed amendments to the Higher Education Act. The Academy Schedule of Events for 2017 was approved, Members of the Board were tasked with individual assignments and the principles for electing new Members of the Academy were reviewed.

February 7 – Memorial Conference for Raimund Hagelberg was held in the Oeconomicum building of the University of Tartu to mark the 90th birth anniversary of the distinguished Member of the Estonian Academy of Sciences.

February 9 – Academy hosted a meeting for members of the Estonian Science Journalists' Association and representatives of the mass media that was organised under the partly EU-funded *TeaMe+ programme* scheme. The roundtable discussion focused on the topic “Observations about the surrounding world from the viewpoint of a science journalist” (see p.54-55).

February 25 – Academic conference was held at the University of Tartu to celebrate the 60th birthday of Member of the Academy Martin Zobel.

February 27 – 100th anniversary of the birth of legal philosopher Ilmar Tammelo was marked with a Memorial Conference at the University of Tartu Narva College (see p.48).

March 14 – Board held its meeting off premises at the Estonian National Museum in Tartu, where it considered and approved the Academy's budget implementation in 2016, the 2017 budget, the agenda for the Annual General Meeting and the composition of the Committee on Meteoritics. Basic funding was allocated to the societies associated with the Academy to support their activities in 2017. Members of the Academy participated in the opening of the Estonian National Museum's library and the traditional joint colloquium dedicated to Mother Tongue Day (see p.51).

March 30-31 – President Tarmo Soomere and Head of the Division of Informatics and Engineering Jakob Kübarsepp participated in the 15th Baltic Conference on Intellectual Cooperation “The Future of Teacher Education in the Baltic Region: Towards Research Based Teacher Education” in Helsinki.

April 4 – Secretary General Jaak Järv and representatives of the delegate body of Tartu school principals discussed possible areas for collaborative activities between the Academy and general education schools during a meeting at Miina Härma Gymnasium.

April 10 – “Teadus kolme minutiga” (Science in three minutes), a collection that was composed and published as a collaborative project between Argo Publishers, Estonian Public Broadcasting and Estonian Academy of Sciences, was presented at the Academy House.

April 19 – Three scientific presentations in the programme of the Annual General Assembly were given by Foreign Member Cornelius Theodor Hasselblatt and two Members of the Academy – Lifetime Achievement Award Laureates in 2017, namely, Enn Tõugu and Gennadi Vainikko. Afterwards, the General Assembly considered an overview of the Academy's activities in 2016, approved the updated Statutes and elected Jaak Järv as Secretary General of the Academy (for more details see p.24-25).

April 21 – Secretary General Jaak Järv and executives of the Estonian Naturalists' Society arranged a meeting to talk over the future perspectives

of the society. The following meetings focused on real property matters and were held together with the University of Tartu in May and June.

April 26-27 – President Tarmo Soomere participated in the European Marine Board (EMB) Spring Plenary in Tenerife, Canary Islands (Spain).

April 27-28 – Tallinn Song Festival Grounds was the venue for the annual Young Scientists' Festival, including the final judging round of the National Contest of Young Scientists and the Award Ceremony, where the Estonian Academy of Sciences handed over four special prizes (see p.118).

May 11-12 – Secretary General Jaak Järv and Assistant to Secretary General Anne Pöitel participated in an annual meeting of the European ICSU Members (informal group of National Members of the International Council for Science from countries in the Council of Europe region) in Riga. The focal theme was the imminent merger of two authoritative international scientific unions – ICSU and the International Social Science Council (ISSC).

May 11-12 – Member of the Academy Raivo Uiho participated in the conference “Mobility Takes Research Further” that was held under the so-called EU Marie Curie actions programme in Malta. He gave a paper in the session “Research Integrity and Ethics” where he focused on the necessity and import of providing scientific integrity training to young researchers.

May 16 – Board at its meeting discussed the Statutes of the Estonian Young Academy of Sciences as well as the new composition of the Academy's Energy Council. A special fund was instituted for organising Endel Lippmaa Memorial Lectures and a fundraising committee established to attract private money and to administer the prize pool. Various aspects regarding the 80th anniversary of the Academy were contemplated. The Board decided to announce two vacancies for Foreign Members and to sign an agreement of association with the Estonian Society of Toxicology.

May 18 – Secretary General Jaak Järv and representatives of the Estonian Mother Tongue Society considered options for closer cooperation in preparing and organising events within the Academy's 80th anniversary programme in 2018 as well as during Mother Tongue Year celebrations in 2019.

May 19 – Academy in cooperation with the Estonian Science Journalists' Association arranged a meeting with representatives of mass media at the Academy House under the partly EU-funded *TeaMe+* programme scheme. The main topic in question was to determine possible applicable indicators for estimating the factual state of things in science journalism.

May 25-26 – Estonian Academy of Sciences hosted the EASAC Council meeting in Tallinn. EASAC – the European Academies' Science Advisory Council – is formed by the national science academies of the EU Member States. The Estonian Academy of Sciences was represented by Member of the Academy Margus Lopp (Member of the EASAC Council) and President of the Academy Tarmo Soomere (Member of the EASAC Environment Steering Panel).

May 26 – President Tarmo Soomere gave a salutatory speech at the Award Ceremony of the L'Oréal-UNESCO Baltic Fellowship "For Women in Science" at the Latvian Academy of Sciences in Riga. He also introduced the Estonian laureate – Els Heinsalu, Senior Researcher at the National Institute of Chemical Physics and Biophysics (see pp.114-117).

May 29 – Members of the Academy Mart Kalm and Anu Raud gave a talk in the programme of the Science Day at Võru Gymnasium (see p.52).

May 31 – Estonian Young Academy of Sciences (EYAS) held its inaugural ceremony at the Academy House.

May 31 – Academy signed an agreement of association with the Estonian Society of Toxicology.

June 8 – Academy House was the venue for a Science Afternoon devoted to research career models that could be potentially viable in Estonia.

June 12 – Academy Division of Humanities and Social Sciences held its meeting at Heimtali Museum established by Member of the Academy Anu Raud. The meeting was followed by a visit to her home on Kääriku farmstead (see p.52).

June 14 – Secretary General Jaak Järv and Chairman of the Committee on Nature Conservation Urmas Tartes reasoned about the activities of the committee.

June 14 – Academy hosted a delegation of European science journalists during their visiting trip to Estonia. Among other information they got an overview on the organisational structure of research in Estonia and major scientific achievements of our country.

June 15 – Recently published book “Akadeemilised mõtisklused” (Academic Reflections) by Member of the Academy Jüri Engelbrecht was presented at the Tartu Literature House. It was issued as the 135th volume in “Eesti mõttelood” (Stories of Estonian Thought), a series of essay collections by Estonian historical thinkers, published by Ilmamaa Publishing House. In the course of the event moderated by Member of the Academy Hando Runnel, the participants paid homage to the recently departed Member of the Academy Peeter Tulviste, who had long been intently committed to the undertakings of Ilmamaa.

June 17 – Main topics at the enlarged meeting of the Academy Division of Informatics and Engineering were the work stress experienced by researchers and lecturers, activities of the Academy Energy Council, upcoming elections of Foreign Members, the objectives and operation of the Foresight Centre at the Parliament in 2017-2018 as well as conceivable contribution of the Academy to the activities of the centre in the future.

June 19 – Memorial Conference celebrating 100 years since the birth of Ilmar Öpik, Member of the Estonian Academy of Sciences well-known for his expertise as an energy researcher and developer of oil-shale industry, was held at the Academy House (see p.48).

June 20 – Board at its meeting decided to merge separate Statutes of the Academy divisions into a single updated document and formed a task group comprising representatives of all the divisions to draw up the unified Statutes. It was decided to complement the composition of the programme committee for the Academy anniversary events with representatives of the Estonian Young Academy of Sciences.

June 27 – Academy organised and hosted the seminar “Prospects for Wood Chemistry in Estonia” (see p.50-51).

June 28-29 – President Tarmo Soomere participated in the 3rd meeting of the European Science Advisors Forum (ESAF) in Amsterdam with the commentary “Handling digital avalanche: I-country and Big Data” on one of the topics selected for discussion at that meeting – global digitisation and its repercussions for democratic societies.

July 12-13 – Academy House was the venue for an international seminar organised within the EXOSYSTEM project under the ERA-NET PLUS action.

July 25 – President Tarmo Soomere and Prof. Jorge Alberto Huete-Pérez, Vice Rector of the Central American University (Universidad Centroamericana) and Vice President of the Academy of Sciences of Nicaragua (La Academia de Ciencias de Nicaragua) had a meeting in Managua (Nicaragua), where they discussed possible measures and resources available to the academies to bring research-based balance into political decisions. Also, various ideas for future cooperation were considered.

July 31 – President Tarmo Soomere had a meeting with leaders of the Academy of Sciences of Nicaragua – President Manuel Antonio Ortega Hegg and Vice President Jorge Alberto Huete-Pérez (La Academia de Ciencias de Nicaragua), also attended by representatives of several major universities in Nicaragua.

August 1-2 – President Tarmo Soomere had a meeting with President Pedro León Azofeifa and other Members of the Board of the National Academy of Sciences of Costa Rica (Academia Nacional de Ciencias) in San José. They exchanged experiences and ideas about the role of academies and various forms of activities practised by them. Also, potential areas for developing science communication and popularising academic research in Estonia and Costa Rica were considered.

August 9 – President Tarmo Soomere gave a public lecture “Smart use of ocean currents for environmental management of maritime activities” in the programme of the traditional Science Month organised by the Costa Rican National Academy of Sciences.

August 14 – President Tarmo Soomere visited the Florida Institute of Technology in Melbourne (USA), where he had a meeting with President Kelli Z. Hunsucker and former President Richard L. Turner of the Florida Academy of Sciences. The focal themes in their conversation were: the role and functions relevant to different types of academies; ways to popularise research and communicate science to a wider public; attracting young researchers (incl. young academies of sciences); research career models; publications of academies; citizen engagement in science; feasible options for future collaboration.

September 1 – Academy was visited by the US National Science Foundation (NSF) Europe Office Head Sonia Ortega, who had a meeting

with President Tarmo Soomere to discuss opportunities for supporting collaborative research. The meeting was attended by Board Members of the Academy Jakob Kübarsepp and Martti Raidal, and Adviser to the President Rein Vaikmäe.

September 3-6 – Members of the Academy Jüri Engelbrecht and Tarmo Soomere together with a Member of the Estonian Young Academy of Sciences Anneli Veispak participated in the first joint annual meeting and conference “Sustainability and Resilience” organised by the European Federation of Academies of Sciences and Humanities ALLEA, Academia Europaea (AE) in partnership with the Young Academy of Europe (YAE) and the Hungarian Academy of Sciences in Budapest.

September 12 – Board at its meeting decided to submit to the General Assembly for approval two candidates for Foreign Member positions (Gábor Stépán and Jaan Valsiner). Agenda items included administrative matters, information about the seminar “Prospects for Wood Chemistry in Estonia” (held on 27 June), as well as current activities of the societies associated with the Academy.

September 12 – Academy House was the venue for the first Endel Lippmaa Memorial Lecture, given by Nobel Laureate Kurt Wüthrich. The lecture was preceded by the conferral of the Endel Lippmaa Memorial Medal on Professor Wüthrich (see p.109-110).

September 12 – Academy was visited by a delegation from Shanghai Academy of Social Sciences. President Tarmo Soomere, Secretary General Jaak Järv and Head of the Academy Division of Humanities and Social Sciences Urmas Varblane had a meeting with the guests dedicated to possible areas of mutual interest.

September 18-19 – President Tarmo Soomere participated in a meeting of the European Academies’ Science Advisory Council (EASAC) Environment Steering Panel in Warsaw.

September 26 – Academy was visited by Dr.Silke Schumacher, Director of International Relations at the European Molecular Biology Laboratory (EMBL). A definite message from EMBL as a non-governmental organisation was communicated by her at a meeting with President Tarmo Soomere that Estonia’s association would be truly appreciated with a view to capacitating cooperation in molecular biology and related areas of study.

September 28 – Secretary General Jaak Järv and executives of the Learned Estonian Society considered the society's operation and plans for future development.

October 4 – Fourth conference addressing Estonian science policy issues in the series “Teadus kui Eesti arengumootor” (Science as an Engine of Development for Estonia) was held in the Riigikogu Conference Hall (see p.48-49).

October 9-10 – Academy co-organised and hosted an international conference on the marine environment under the title “From Small Scales to Large Scales” (see p.49).

October 10 – Academy was visited by Aija Miglane, a representative of the L'Oréal Baltic subsidiary. At an informal meeting, President Tarmo Soomere and the guest talked over and agreed upon major principles for the Activity Plan 2018 of the L'Oréal-UNESCO Fellowship Programme “For Women in Science”.

October 10 – President Tarmo Soomere presented his new book “Truudus Eestile” (Faithfulness to Estonia) at the Academy House.

October 11 – Academy House was the venue for a conference “Strengthening Europe’s Science Base” organised by the European Research Council (ERC). Keynote speech was given by Member of the Academy Mart Saarma.

October 11 – Member of the Academy Andres Metspalu and Academy Research Professor Anne Kahru were participants in a debate circle on the premises of Tallinn Creative Hub that followed the Nature Cafe format initiated by the scientific journal Nature and focused on measuring and communicating the scientific research impact, as well as various forms of cooperation between policy-makers, scientists and journalists in communicating research outcomes to the public.

October 13 – Academy hosted a symposium “New Approaches to Science for Policy in Europe” organised by SAPEA (Science Advice for Policy by European Academies), a consortium within the European Scientific Advice Mechanism (SAM).

October 17 – Enlarged meeting of the Academy Division of Informatics and Engineering was devoted to trends in up-to-date industrial production (a topical presentation was given by Professor Tauno Otto, Tallinn University of Technology). Agenda items included suggestions of the Academy

concerning the Action Plan of the Foresight Centre and the conceptual framework of the collection “Teadusmõte Eestis. Tehnikateadused III” (Scientific Thought in Estonia. Engineering III).

October 27 – Academy House was the venue for the 2017 Finals and Gala Evening of the “Three Minute Lectures Contest” (see p.53-54).

October 31 – Board at its meeting off premises in Tartu discussed and approved the agenda for the upcoming General Assembly meeting and the draft Statutes of the Academy divisions. It also considered the principles for funding the activities of associated societies and a report from Professor Ülo Mander on major problems that had been brought up at the wood chemistry seminar on 27 June 2017.

October 31 – Academy organised and hosted a colloquium aimed at the societies associated with the Academy (see p.52).

November 7-11 – President Tarmo Soomere participated in the World Science Forum in Jordan.

November 20 – Academy organised a Science Day at Võru Gymnasium (see p.52).

November 23 – Seminar “Prospects for Wood Chemistry in Estonia II” was held in the Academy Hall (see p.51).

December 6 – Meeting of the General Assembly started with a survey of major events and accomplishments of the Academy in 2017 presented by President Tarmo Soomere. Invited presentations were given by Maive Rute, Deputy Director General at EU Joint Research Centre (JRC) and Tea Danilov, Head of Foresight Centre at the Parliament of Estonia. Two new Foreign Members of the Academy were elected: Gábor Stépán, Professor of Applied Mechanics at Budapest University of Technology and Economics (BME) and Jaan Valsiner, Niels Bohr Professor of Cultural Psychology at Aalborg University. Eero Vasar was elected a non-executive Member of the Board (See p.25-26).

December 15 – Secretary General Jaak Järv had a meeting with representatives of the Estonian Academic Agricultural Society as a means to gain knowledge about the activities of the society in the light of its recently submitted application to conclude an association agreement with the Academy.

December 18 – Academy House was the venue for a book presentation – Professor of History at the University of Toronto (Canada) Jüri Kivimäe presented his monograph “Rector Hans Kruus”. Complementary commentaries were given by President of the Academy Tarmo Soomere and fellow historians in Estonia – Küлло Arjakas and Heino Arumäe.

December 19 – Board at its meeting discussed and approved the annual reports presented by three Research Professors of the Academy, appointed members to the jury evaluating the L’Oréal-UNESCO Fellowship applications, decided to start consultations on preparing an agreement of association with the Estonian Academic Agricultural Society, and considered the Academy Schedule of Events for 2018.

December 19 – President of the Academy Tarmo Soomere and Director of the NGO Russian Museum Irina Budrik signed an artwork loan agreement. In conformity with the contract, the Academy became obliged to exhibit a selection of paintings from the collections of the museum inside the Academy House in a readily observable and favourably exposed position.

# MEMBERSHIP OF THE ACADEMY

Two new Foreign Members were elected by the General Assembly on 6 December 2017:



Gábor Stépán, Professor of Applied Mechanics at Budapest University of Technology and Economics (Hungary)



Jaar Valsiner, Niels Bohr Professor of Cultural Psychology at Aalborg University (Denmark) and Professor of Psychology at Clark University (USA).

The membership of the Estonian Academy of Sciences was composed of 73 Members and 21 Foreign Members as of 31 January 2018. Their distribution among four divisions was the following:

#### DIVISION OF ASTRONOMY AND PHYSICS

(16 Members, 6 Foreign Members)

**Members:** Jaan Aarik, Jaak Aaviksoo (Head of Division), Jaan Einasto, Ene Ergma, Vladimir Hižnjakov, Arvi Freiberg, Tšeslav Luštšik, Ergo Nõmmiste, Eve Oja, Martti Raidal, Enn Saar, Peeter Saari, Mart Saarma, Arved-Ervin Sapar, Gennadi Vainikko, Richard Villems.

**Foreign Members:** Jonathan (John) R.Ellis, Richard R.Ernst, Charles Gabriel Kurland, Jaan Laane, Jaak Peetre, Alar Toomre.

#### DIVISION OF INFORMATICS AND ENGINEERING

(19 Members, 4 Foreign Members)

**Members:** Olav Aarna, Hillar Aben, Jüri Engelbrecht, Ülo Jaaksoo, Maarja Kruusmaa, Valdek Kulbach, Jakob Kübarsepp (Head of Division), Rein Küttner, Ülo Lepik, Enn Lust, Enn Mellikov, Leo Mõtus, Arvo Ots, Tarmo Soomere, Enn Tõugu, Raimund-Johannes Ubar, Tarmo Uustalu, Jaak Vilo, Andres Öpik.

**Foreign Members:** Steven R.Bishop, Michael Godfrey Rodd, Gábor Stépán, Esko Ukkonen.

#### DIVISION OF BIOLOGY, GEOLOGY AND CHEMISTRY

(23 Members, 6 Foreign Members)

**Members:** Toomas Asser (Head of Division), Jaan Eha, Jaak Järv, Ain-Elmar Kaasik, Dimitri Kaljo, Mati Karelson, Ilmar Koppel, Urmas Kõljalg, Hans Küüts, Agu Laisk, Ülo Lille, Margus Lopp, Udo Margna, Jüri Martin, Andres Metspalu, Ülo Niinemets, Anto Raukas, Valdur Saks, Martin Zobel, Raivo Uibo, Mart Ustav, Eero Vasar, Mihkel Veiderma.

**Foreign Members:** Carl-Olof Jacobson, Ülo Langel, Pekka T.Männistö, Matti Saarnisto, Helmut Schwarz, Jānis Stradiņš.

#### DIVISION OF HUMANITIES AND SOCIAL SCIENCES

(15 Members, 5 Foreign Members)

**Members:** Jüri Allik, Mihhail Bronštejn, Mart Kalm, Valter Lang, Lauri Mälksoo, Karl Pajusalu, Arvo Pärt, Anu Raud, Jaan Ross, Hando Runnel, Huno Rätsep, Tõnu-Andrus Tannberg, Jaan Undusk, Urmas Varblane (Head of Division), Haldur Õim.

**Foreign Members:** Yuri Berezkin, Cornelius Theodor Hasselblatt, Päiviö Tommila, Endel Tulving, Jaan Valsiner.

During 2017 on the whole Members of the Estonian Academy of Sciences proceeded with their research and academic activities as leading experts in their fields of study. Complementary to their principal occupation they followed the tradition of acting as experts and advisers both at home and abroad. Several Members serve in expert panels and councils of national significance:

President's Academic Advisory Board – Peeter Saari, Richard Villems;  
Board of President of the Republic's Cultural Foundation – Jaan Undusk;  
Government of the Republic Research and Development Council – Jaak Aaviksoo, Mart Saarma, Tarmo Soomere;  
Government of the Republic Sustainable Development Committee – Margus Lopp;  
National Science Prize Committee – Tarmo Soomere (Chair), Jaan Aarik, Toomas Asser, Maarja Kruusmaa, Valter Lang, Jüri Martin, Lauri Mälksoo, Ülo Niinemets, Karl Pajusalu, Eero Vasar (Vice Chair);  
Advisory Board of the Foresight Centre at the Riigikogu – Jaak Aaviksoo, Tarmo Soomere;  
Board of Estonian Research Council – Mart Ustav;  
Evaluation Committee at Estonian Research Council – Lauri Mälksoo (up to 1.09.2017), Ergo Nõmmiste, Eero Vasar, Richard Villems, Jaak Vilo;  
Estonian Science Communication Award Appraisal Panel at Estonian Research Council – Jakob Kübarsepp (Chair);  
Estonian National Contest for University Students Appraisal Board at Estonian Research Council – Jaan Aarik;  
TeaMe+ Programme Advisory Board at Estonian Research Council – Tarmo Soomere;  
Supervisory Board of Eesti Pank – Urmas Varblane;  
Fiscal Council – Urmas Varblane.

A considerable number of Members were involved in the work of expert panels reporting to a particular ministry.

Ministry of Education and Research:

Research Policy Advisory Committee – Ülo Niinemets and Ergo Nõmmiste;  
Working Group on Internationalisation of Estonian Research and Steering Committee for Internationalisation of Research

Programme – Jüri Engelbrecht;  
Steering Council for Research and Innovation Policy Monitoring  
Programme – Jüri Engelbrecht and Urmas Varblane;  
Steering Committees of National R&D Programmes: Language  
Technology Support for the Estonian Language (2011-2017) – Jaak Vilo  
(Chair); Supporting Terminology in Estonian (2013-2017) – Valter  
Lang; Compilation and Publishing of Textbooks in Estonian for  
Higher Education (2013-2017) – Margus Lopp;  
Programme Board of the National Programme: Values Development  
in Estonian Society (2015-2020) – Olav Aarna and Jüri Engelbrecht;  
Estonian Lifelong Learning Strategy 2020 Steering  
Group – Olav Aarna;  
Estonian Language Council – Karl Pajusalu (up to 16 March 2017);

Ministry of Finance:

Cohesion Policy Operational Programme Monitoring Committee –  
Tarmo Soomere (permanent member), Margus Lopp (substitute  
member).

Ministry of the Environment:

Gene Technology Committee – Eero Vasar;  
Environmental Monitoring Advisory Committee – Anto Raukas.  
Ministry of Social Affairs  
Advisory Professional Committee for Neurosurgery – Toomas Asser;  
Advisory Professional Committee for Cardiology – Jaan Eha;  
Advisory Professional Committee for Allergy and Immunology –  
Raivo Uibo;  
Health Research and Innovation Council – Eero Vasar.

Estonian Centres of Excellence in Research were headed by five  
Members of the Academy: Martti Raidal – Dark Side of the Universe;  
Ülo Niinemets – Ecology of Global Change: Natural and Managed  
Ecosystems; Enn Lust – Advanced Materials and High-Technology Devices  
for Energy Recuperation Systems; Andres Metspalu – Centre of Excellence  
for Genomics and Translational Medicine; Maarja Kruusmaa – EXCITE,  
Excellence in IT in Estonia.

Two Members of the Academy belonged to the decision making bodies  
of doctoral schools: Karl Pajusalu (Chairman of the Council) – Graduate  
School of Linguistics, Philosophy and Semiotics; Eve Oja (Chairman of  
the Council) – Estonian Graduate School in Mathematics and Statistics.

Similarly to previous years, Members of the Academy were widely represented in international scientific organisations and editorial boards of scholarly journals.

Members of the Academy Enn Tõugu and Gennadi Vainikko were recognised with the National Science Prize for Outstanding Lifetime Achievements in Research and Development. Two Members of the Academy received an annual award of the National Sciences Prize within a specified category of research area: Richard Villems (as member of research team) in chemistry and molecular biology and Lauri Mälksoo in social sciences (see p.105-108).

Members of the Academy were also publicly acknowledged by various institutions, associations and organisations:

Ene Ergma was awarded the Tiiu Sild Memorial Lifetime Achievement Award for the long-standing and systematic popularisation of research and technology (see p.112);

Maarja Kruusmaa received the Õkul Prize of the Estonian Science Journalists' Association that is awarded every year to a friend of science journalism;

Hans Kүүts was acknowledged with an Honorary Bench installed in front of the Estonian Crop Research Institute office in Jõgeva;

Valter Lang was elected a Foreign Member of the Finnish Academy of Science and Letters;

Jüri Martin received a Badge of Merit from Tallinn Botanic Garden and was elected an Honorary Member of the Academic Union in Oxford, UK;

Andres Metspalu was granted the Baltic Assembly Prize for Science; Leo Mõtus was rewarded with the Distinguished Service Medal *Mente et Manu* by Tallinn University of Technology;

Lauri Mälksoo received the Prize of the Berlin-Brandenburg Academy of Sciences and Humanities (donated by the Peregrinus Foundation);

Arvo Pärt was awarded the Ratzinger Prize (Vatican), elected the Most Influential Person in Estonian Culture in 2017 by the daily Eesti Päevaleht and the Honoured Artist of Music by the International Association of People in Music (Moscow);

Anto Raukas received a Letter of Appreciation from Euroacademy for his significant contribution through teaching;

Hando Runnel was awarded the annual President's Restoration of Independence memorial stone (a piece of the barricade that formed a defence at Toompea in 1991) that is traditionally conferred on persons who have played a consequential role in the re-establishment of independence in Estonia;

Tarmo Soomere was elected an Honorary Member of the Estonian Learned Society in Sweden, awarded an Honorary Doctorate by Klaipėda University and honoured with the annual Friend of the Press award by the Estonian Newspaper Association;

Martin Zobel was granted the Grand Medal of the University of Tartu;

Jaan Undusk received an annual award of the Estonian Cultural Endowment for his book “Eesti kirjanike ilmavaatest” (Observations on the world view of Estonian writers) and another book by him “Teekond Hispaania” (A journey around Spain) was selected the Best Travel Book published in 2016 by the Estonian travel magazine Go Reisiajakiri;

Urmas Varblane was acknowledged with the Badge of Honour, 2nd class of the Estonian Chamber of Commerce and Industry.

Members of the Academy Jaak Aaviksoo, Toomas Asser, Jaan Eha, Ain-Elmar Kaasik, Mati Karelson, Andres Metspalu, Peeter Saari, Raivo Uibo, Gennadi Vainikko, Urmas Varblane, Eero Vasar and Jaak Vilo were selected among the hundred persons to be portrayed for the travelling exhibition of portrait photographs “Get your mind ready! A hundred faces featuring the University of Tartu”, prepared for the 100th anniversary of their *alma mater*.

Seven Estonian researchers, among them four Members of the Academy: Andres Metspalu, Urmas Kõljalg, Martin Zobel and Ülo Niinemets were listed among the world’s most impactful scientific researchers. The list was compiled by Clarivate Analytics, which measure the performance of a researcher by citation count and incorporates more than 3,300 highly cited researchers in 21 fields of the sciences and social sciences.

Eight Members of the Academy, namely, Jüri Allik, Urmas Kõljalg, Andrus Metspalu, Ülo Niinemets, Martti Raidal, Richard Villems, Jaak Vilo and Martin Zobel were incorporated among the scientists ranking in the top 1% by citations for field and publication year according to Essential Science Indicators.

A science video, chiefly based on explanations given by Member of the Academy Hillar Aben about the latest research findings of his lab team, reached a position in the top ten most popular videos of 2017 according to the well-known scientific journal Science.

Foreign Members continued participating in the activities of the Academy and research institutions of Estonia in compliance with time-honoured collegial relationships, scientific collaborations and research alliances.

# GENERAL ASSEMBLY

The General Assembly of the Academy was convened twice in 2017:

## April 19 – Annual Meeting

- Cornelius Theodor Hasselblatt “Message of Kalevipoeg”
- Enn Tõugu “How I have performed scientific research and implemented it”
- Gennadi Vainikko “Looking back on life’s work”
- Reports from Heads of Divisions Jaak Aaviksoo, Jakob Kübarsepp, Toomas Asser, Urmas Varblane and President Tarmo Soomere on the activities of the Academy in 2016
- The composition of the Board of the Academy
- Approval of the updated Statutes of the Academy
- Report from Secretary-General Jaak Järv on the financial activities of the Academy in 2016 and the 2017 budget
- Assigning of member allowances for the period 1 May 2017 – 30 April 2018

## December 6 – Meeting

- Summary of the activities of the Academy in 2017
- Presentation by Maive Rute, Deputy Director-General at EU Joint Research Centre (JRC)
- Presentation by Tea Danilov, Head of Foresight Centre at the Parliament of Estonia
- Election of new Foreign Members to the Academy
- Election of non-executive Members of the Board
- Approval of the Statutes of the Divisions

The first session of the General Assembly was organised as the Annual Meeting of the Academy that focused on summing up the activities of the Academy in 2016. Detailed data concerning the activities of the Academy in the financial year were presented in the Estonian Academy of Sciences Year Book XXII (49), which was sent to all Members in advance.

Tea Varrak, Secretary General of the Ministry of Education and Research, greeted the participants of the General Assembly. President Tarmo Soomere handed over the Foreign Membership Certificate to

Cornelius Theodor Hasselblatt. Thereafter, Cornelius Hasselblatt spoke on the topic “Message of Kalevipoeg” (see p.63).

In accordance with tradition, the laureates of the National Science Award of 2017 for outstanding lifetime achievements in research and development gave the following presentations:

- Member of Academy Enn Tõugu “How I have performed scientific research and implemented it” and
- Member of Academy Gennadi Vainikko “Looking back on life’s work”

Heads of Divisions Jaak Aaviksoo, Jakob Kübarsepp, Toomas Asser and Urmas Varblane gave an overview of the activities performed by their Divisions in 2016. President Tarmo Soomere summarised the reports (see p.83-89). On the proposal of Acting Secretary General Jaak Järv, the General Assembly approved the Academy’s annual report 2016 based on the reports and supplementary information in the Year Book.

President Tarmo Soomere announced the resignation of Margus Lopp from the position of Secretary General and introduced the statutory options for further activities. Subsequent to a proposal put forward by the President, Jaak Järv was elected Secretary General for a term until 14 December 2019 by secret ballot. The General Assembly adopted a decision on the structure of the Board, whereby the Board would continue its activities with 15 members until a further decision of the General Assembly.

Chairman of the Statutory Committee Jüri Engelbrecht and Secretary General Jaak Järv outlined final amendments to the Statutes of the Academy and the General Assembly approved the updated Statutes.

Secretary General Jaak Järv reported on the implementation of the 2016 budget and presented the 2017 budget. Both were approved by the General Assembly. The Secretary General briefed the General Assembly on a plan for assigning member allowances for the period from 1 May 2017 to 30 April 2018. The General Assembly decided to keep distributing the allocated amount among all Members of the Academy on an equal basis.

In the second session of the General Assembly, which took place on 6 December, the speakers included Maive Rute, Deputy Director-General at EU Joint Research Centre, (see p.95-104) and Tea Danilov, Head of Foresight Centre at the Parliament of Estonia.

President Tarmo Soomere gave a summary of the activities of the Academy in 2017 (see p.92-95).

On the proposal of President Tarmo Soomere, the General Assembly decided to change the structure of the Board and approved to maintain the 16 member size of the Board. As a result of secret ballot, Eero Vasar was elected a non-executive Member of the Board. At the same time, elections of Foreign Members were held, whereby Professor Gábor Stépán (Budapest University of Technology and Economics) and Professor Jaan Valsiner (Aalborg University) were elected.

Jakob Kübarsepp, Head of the Division of Informatics and Engineering delineated the draft consolidated Statutes of the Academy divisions that was approved by the General Assembly after thorough discussion.

# BOARD

The Board of the Estonian Academy of Sciences was composed of the following members in 2017:

President	Tarmo Soomere
Vice-President	Ergo Nõmmiste
Vice-President	Mart Kalm
Secretary General (until 31 January 2017)	Margus Lopp
Acting Secretary General for the interim period (6 February 2017 – 19 April 2017) and Secretary General from 19 April 2017	Jaak Järv
Head of Division of Astronomy and Physics	Jaak Aaviksoo
Head of Division of Informatics and Engineering	Jakob Kübarsepp
Head of Division of Biology, Geology and Chemistry	Toomas Asser
Head of Division of Humanities and Social Sciences	Urmas Varblane
Non-executive Members Jüri Engelbrecht, Jaak Järv (until 5 February 2017), Valter Lang, Ülo Niinemets, Karl Pajusalu, Martti Raidal, Peeter Saari, Andres Öpik, Eero Vasar (from 6 December 2017)	

During the year, the Board held seven working meetings and once the decision was passed under the procedure of electronic poll.

In relation to the resignation of Margus Lopp from the position of Secretary General, the Board decided to propose that the General Assembly elect Jaak Järv as the Secretary General and confirm the composition of the Board in the size of 15 members until December. According changes were made in the allocation of tasks to the Members of the Board.

Board meetings were traditionally combined with other events or visits to receiving institutions. On two occasions, Board meetings were held as field sessions outside of the Academy House. The Board meeting at the Estonian National Museum on 14 March was followed by a celebration of Mother Tongue Day and a guided tour through the museum. The Board meeting in October was held at the University of Tartu Natural History Museum and involved viewing its exhibitions. After the meeting, a colloquium was arranged at the Omicum building for the societies associated with the Academy.

Since new Foreign Members were to be elected at the end of the year, various aspects of the elections were repeatedly placed on the agenda. The Board decided to announce two Foreign Member vacancies: one in the Division of Informatics and Engineering, and one in the Division of Humanities and Social Sciences. Reckoning with the proposals of Divisions, the Board presented two candidates, namely, Gábor Stépan and Jaan Valsiner to the General Assembly for election.

In connection with the 100th anniversary of the Republic of Estonia and the 80th anniversary of the Academy, the programme of celebrations was discussed time and again. The schedule of events was associated with significant dates of the Academy in 1938. The programme committees of the conferences to be held in the anniversary year were confirmed along with the logo of the anniversary year.

Research Professors gave presentations to the Board twice. At the meeting of the Board in January, Anne Kahru, Rainer Kattel and Kaupo Kukli presented their reports on their first working year as Research Professors. For the meeting at the end of the year, the Research Professors had already completed their reports on the second working year.

After a long preparatory period, the Estonian Young Academy of Sciences (EYAS) was finally established in 2017, and the Board discussed options for involving these young scientists in the activities of the Academy. The Board further considered the draft Statutes of EYAS and recommended the adoption and registration of the Statutes.

Discussions and decision making about daily work issues comprised a significant portion of the functions of the Board. The Academy's Action Plan for 2017 was approved. The implementation of the consolidated budget of the Academy in 2016 and the 2017 budget were reviewed and submitted to the General Assembly for approval. Information about the productivity of the Estonian Academy of Sciences sub-fund with the Estonian National Culture Foundation and the assignment of scholarships was considered. The Statutes of the Committee on Polar Research were approved. A special fund for organising Endel Lippmaa Memorial Lectures and a fundraising committee (Chairman Riivo Sinijärv) for attracting private funds were established. Changes in the composition of the Scientific Advisory Council to the Institute for Advanced Study (Chairman Jaak Järv), Energy Council (Chairman Arvi Hamburg), Committee on Meteoritics (Chairman Jüri Plado) and the L'Oréal-UNESCO Fellowship Jury Panel (Chairman Ergo Nõmmiste) were approved. A committee was formed to prepare summaries of the issues raised at the seminar "Prospects for

Wood Chemistry in Estonia II” (Chairman Ülo Mander), whereafter a summary report was presented by Professor Ülo Mander. Candidates for the Member of the Estonian Research Council’s Evaluation Committee were nominated. The contacts of the Academy with international scientific organisations and associations of academies as well as possible options available to the Academy to participate in their activities were discussed. Problems encountered in nominating a new Member to the Council of the University of Tartu were repeatedly discussed to settle disagreements between opponents.

Proposals of the Statutory Committee for updating the Statutes of the Academy were discussed and presented to the General Assembly for approval. Development of a merged Statutes of the Academy Divisions was started and a committee, composed of the Heads of Divisions was formed. The Board examined the draft Statutes of the Academy Divisions prepared by the Committee and submitted it to the General Assembly for approval.

As the Board found it expedient to enhance cooperation with the Estonian Society of Toxicology it agreed to conclude an Association Agreement with the Society. Having examined the application of the Estonian Academic Agricultural Society for association with the Academy, the Board decided to start negotiations to conclude an Association Agreement. The principles for funding the activities of associated societies were discussed and it was decided to finance the publishing of the societies’ yearbooks via the Estonian Academy Publishers.

Weekly meetings and negotiations of the Management Board to discuss organisational aspects of science policy as well as in-house matters continued.

# DIVISIONS<sup>1</sup>

The foundations for a smooth operation of the Academy as a whole lie in good cooperation of the divisions and rapid exchange of information. During the year, several meetings of division assemblies were held (in more detail, see the chapters “Chronicle” and “Academy events”) as well as several meetings between the Heads of Divisions and discussions on topical issues.

Joint activities with the scholarly societies associated with the Academy and various committees of the Academy form a significant part in the work of the divisions. Professional relationships of the Academy with the societies and committees are chiefly maintained by the divisions. In addition to the usual activities related to science and popular science, the Management Board of the Estonian Naturalists’ Society was consulted on a number of occasions at the level of Secretary General. The rapidly growing cost of living and notable increase in expenditures on real property, owned by the Society, together with restructuring of the Academy’s funding scheme have presented serious challenges to the Society.

The possibilities to feature 2019 as a national language year were planned together with the Mother Tongue Society and Secretary General; the future plans of the Committee on Nature Conservation were jointly discussed. Members of Academy affiliated with the Division of Humanities and Social Sciences together with Secretary General on several occasions participated in the work of the Estonian Society for the Study of Religions and the Estonian Literary Society. Negotiations about the association of the Estonian Academic Agricultural Society with the Academy through the Division of Biology, Geology and Chemistry were started.

On February 28, Toomas Asser and Urmas Varblane, Heads of the Division of Biology, Geology and Chemistry and the Division of Humanities and Social Sciences, together with Secretary General Jaak Järv discussed major issues in relation to organising a conference for scholarly societies associated with the Academy and the events in the programme of the

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1 Prepared on the basis of materials submitted by Heads of Divisions Jaak Aaviksoo, Jakob Kübarsepp, Toomas Asser and Urmas Varblane

80th anniversary of the Academy. A plan to start collaboration with the schools of Tartu was under consideration.

A seminar on the prospects for wood chemistry in Estonia held at the Academy in June put the complex of problems related to planning of a wood refining plant, on the agenda. On a committee formed for summarising the issues raised, the representatives of the Academy divisions and experts from outside of the Academy worked together. The Committee, including also two Members of Academy, Jaak Järv and Urmas Varblane, held several meetings. The final consensus-based report was presented to the Board of the Academy on October 31 by Ülo Mander, Chairman of the Committee. The summary of the report was presented to the public and to relevant state agencies. Discussion of the issue continued in November during the seminar “Prospects for Wood Chemistry in Estonia II”, whereafter it was decided that the Committee would be engaged anew.

On October 9 Secretary General Jaak Järv together with Heads of the Division of Biology, Geology and Chemistry and the Division of Humanities and Social Sciences, Toomas Asser and Urmas Varblane, held a meeting. The new Statutes of the Divisions as well as a proposed Societies’ Day were considered. Topics included: creating a mailing list for the societies, updating the Wikipedia articles about Members of the Academy as well as issues concerning the wood refining plant and on the subject of appropriating the Academy’s original premises (the building at Lai 36, Tartu), etc.

In September and October Heads of the Divisions discussed the new joint draft Statutes of the Divisions – this task had been assigned by the Board of the Academy. The draft was submitted to Secretary General Jaak Järv on October 2. It was approved by the Board of the Academy at its meeting on October 31 and by the General Assembly on December 6.

Two divisions out of four – the Division of Informatics and Engineering and the Division of Humanities and Social Sciences were involved in the election of Foreign Members. In May, the Board opened a vacancy for two Foreign Members. Potential candidates were discussed at the meetings of the divisions; both divisions reached a common position. At the General Meeting of the Academy in December, the Academy welcomed two new Foreign Members: Gábor Stépan, Professor of Applied Mechanics at Budapest University of Technology and Economics (Hungary), Head of the Section of Engineering Sciences at the Hungarian Academy of Sciences, and Jaan Valsiner, Professor of Cultural Psychology at Aalborg University (Denmark) and Professor of Psychology at Clark University (USA).

The Division of Informatics and Engineering put forward a concept about publishing a new volume in the so-called “Blue Series” of the Academy. By enhancing science communication the scientists can contribute to being better understood in the society, as had been emphasised at the conference “European Research Excellence – Impact and Value for Society” that was held in the framework of the Estonian Presidency of the Council of the European Union. The Estonian language publication “Scientific Thought in Estonia. Engineering” would be one of the ways to communicate science to. The previous two volumes on technology topics were published in 2002 and 2007. Now that the third one is in the conceptual phase, three classical questions should be approached first of all: why (what is the aim), to whom (who is the target group) and how (in which form should science be portrayed). In preparing the new publication, a broader context should be considered, i.e., what formats have already become commonplace in communicating science to a wider readership of Estonia. It became clear in discussions that the texts had to be understood by all readers with higher education, also outside the domain. A call for contributions was addressed to prominent scientists in the field of technology and information technology in November 2017 with the deadline in March 2018.

# COUNCILS, COMMITTEES

## COMMITTEE ON METEORITICS

Set up in 1954

Chairman Jüri Plado, PhD

The research in meteoritics in Estonia is carried out at the University of Tartu and in the Department of Geology of the Tallinn University of Technology. In 2017 geological and geophysical surveys of Kaali meteorite crater area were conducted and the origin and age of Ilumetsa structures were specified (Department of Geology at the University of Tartu, Jüri Plado, Argo Jõelet and Kalle Kirsimäe). The coal discovered under the rims of the Ilumetsa crater dates from 5,000 years BC approximately, which is similar to the age of the sediments of the larger crater (Põrguhood). Finding coal under the rims and the identical age of the coal from both craters excludes the (late) glacial origin of the structures and strongly supports their meteoritic origin.

The seismic surveys of the Ries and Steinheim meteorite craters (Germany), magnetometric mapping of Lonar meteorite crater (India) in cooperation with the Central University of Karnataka, and geological and mineralogical surveys of the structure located in Central Finland were conducted. During the latter, the associated shatter cones and planar deformation features were detected, proving the existence of the 12th explosion crater in Finland.

Reelika Helde defended her Bachelor's thesis "Studies of Põrguhood Bog using ground-penetrating radar (GPR) and determining profile density" (supervisor Argo Jõelet) at the University of Tartu.

In January, Jüri Plado delivered a public lecture "Geophysical Methods in Impact Studies" at the Central University of Karnataka (India) and a presentation "Studies of Estonian meteorite impact structures: Recent progress in Kaali and Ilumetsa" at the conference "Effects of meteorite impact in unconsolidated sediments – case of iron meteorite shower "Morasko"" at the Adam Mickiewicz University in Poznań (Poland). In July, an international intensive course "Molecules in Space – Formation of complex molecules in space and on planets: From interstellar clouds to life" was held at the University of Tartu. During the course, students were given an overview of the biochemical evolution of the Universe from

the generation of the first molecules in interstellar space to the formation of cells. The course was organised in cooperation with the Stockholm University Astrobiology Centre, University of Tartu, European Astrobiology Network Association and Nordic Network of Astrobiology. In July/August, an international course “Impacts and their Role in the Evolution of Life” took place in Kuressaare and Kaali craters. The course addressed doctoral students with the objective to give an overview of the impact of meteor explosions on the formation of the Earth, atmosphere and life. Lectures were accompanied by practical work in the Kaali meteorite crater area. So far, the largest Kaali meteorites were discovered during the course and these were handed over to the University of Tartu Natural History Museum in November 2017. The course was organised in cooperation with the Stockholm University Astrobiology Centre, University of Tartu, European Astrobiology Network Association and Nordic Network of Astrobiology.

In August, an international conference “The Early History of Planetary Systems and Habitable Planets” for young scientists of astrobiology was held at the University of Tartu. The conference addressed early-stage scientists, doctoral students and master’s students. The conference was organised in cooperation with the European Astrobiology Network Association, Nordic Network of Astrobiology, Stockholm University Astrobiology Centre, University of Tartu and COST Action TD1308 “Origins and Evolution of Life on Earth and in the Universe”.

In September, Sten Suuroja participated in the congress “The European Planetary Science Congress 2017” in Riga with a presentation “The real diameter of the Neugrund impact structure (Gulf of Finland, Estonia)”. In October, Siim Veski made a presentation on the topic “Age of the Kaali crater” at the conference dedicated to the 70th anniversary of discovering the radiocarbon dating and the 60th anniversary of establishing the first  $^{14}\text{C}$  laboratory in Estonia. The conference took place in Tartu. On October 8 and 9 Jüri Plado instructed master’s students and doctoral students from the Central University of Karnataka, India in the geological and geophysical field works at the Lonar crater.

During the year, the employees of the University of Tartu Natural History Museum, Department of Geology at the University of Tartu and Department of Geology at Tallinn University of Technology consulted dozens of people and officials on various meteoritics-related issues (the possible link of occasional findings to meteorites, the possible link of round structures to meteorite craters, development works in the Kaali meteorite crater area).

## COMMITTEE ON NATURE CONSERVATION

Set up in 1955

Chairman Urmas Tartes, Professor

The Committee on Nature Conservation at the Estonian Academy of Sciences continued working on the premises of the Estonian University of Life Sciences in Tartu, namely, the Baer House. At the end of the reporting year, the Committee comprised 23 members. The Committee suffered a sad loss – Hans-Voldemar Trass (Member of the Academy), a founding member and the first Secretary of the committee, passed away. A memorial exhibition dedicated to H.-V. Trass was organised by the Committee at the Baer House. Among the exhibits were photos from different times and articles from the distant post-war period when as much as talking about nature conservation was prohibited. This exhibition was open at the Baer House from February to April 2017.

On December 13, a traditional colloquium, organised by the Committee on Nature Conservation, was held on the topic “Science and law in the woods”. Presentations were given by Urmas Tartes, Meelis Pärtel (University of Tartu), Olav Renno (Estonian Ornithological Society), Ivar Ojaste (Estonian Ornithological Society), Anneli Palo (University of Tartu), Riina Martverk (Ministry of the Environment), Üllas Ehrlich (Tallinn University of Technology), Ragne Oja (Environment Agency) and Rainer Kuuba, who represented private forest owners. Professor Toomas Frey (PhD in Biology), a longtime active member of the Committee was congratulated on his 80th birthday. The journal *Eesti Loodus* (Estonian Nature) published in its December edition a thorough overview of Professor Frey’s life and work.

The 2017 Kumari Award was granted to Agu Leivits, a well-known ornithologist. It was handed over at an event ushering in the nature conservation month that was held at Tallinn Botanic Garden on 17 May 2017. In addition to the award named after Eerik Kumari (1912-1984), memories of him are kept alive by the Penijõe Museum in Matsalu, where his personal belongings are exhibited along with his scholarly works in word and image. The Kumari café will soon be opened as well.

From February 17 to the end of June, an exhibition of the ornithologist-environmentalist, farmer, translator, Candidate of Sciences in Biology “Olav Renno 85 – in word and image” was hosted by the Baer House. Olav Renno worked at the Institute of Zoology and Botany during 1986-1992 and he was the first Director of the Matsalu Nature Reserve. He belonged among members of the Committee on Nature Conservation in 1968-1998, and was Academic Secretary of the committee during 1968-1979. Exhibits

originated from the personal archive of O. Renno. Urmas Tartes, Chairman of the Committee on Nature Conservation gave a speech at the opening of the exhibition.

On November 22, an impressive exhibition marking the 80th birthday of Heino Mardiste “Orientation through life – nature, maps and sports” was opened at the Baer House. Heino Mardiste is a longtime geography lecturer, Associate Professor and a member of the Committee on Nature Conservation (1988-2010). The jubilarian gave a thorough scientific presentation.

The November edition of Eesti Loodus magazine published an article “The Institute of Zoology and Botany was established 70 years ago” by Urmas Tartes.

The daily work of Committee members is mainly involved in nature conservation or closely related activities. Some of the active pensioners still carry on their activities under the auspices of this committee.

On June 15, Heiki Tamm, Vice Chairman of the Committee on Nature Conservation, gave a presentation at the opening of the summer season of Kadriorg Park, titled “A nature lesson in Tammesalu – about the ancient trees of Kadriorg”. He also organised and supervised a cleanup day initiated by the Tallinn Botanic Garden Friends’ Society that took place in the territory of the Garden on October 15.

Vilma Kuusk introduced the schoolchildren interested in nature to the knowledge of plants on the island of Manija. She is also monitoring the vegetation conditions of the rare marsh orchid species in Puhtu that is becoming scarcer over the years. She continued to monitor the protected plant species on the coastal meadow in Pärnu. The Urbancows project received European funding for the period 2012-2016 to restore the urban coastal meadow. At the same time, V. Kuusk selected areas of different size in certain places where she started monitoring the condition of the protected plants. Her vision was to fence and mow the more representative areas of the protected plants before the beginning of grazing. It was not considered necessary. In addition, the extension of the beach towards Raeküla has caused the disappearance of protected plants. There are too many muddy places trampled by heavy beef cattle as regards the whole coastal meadow. V. Kuusk also continues to monitor the conditions of the protected plants in Tahkuranna golf course, removes weeds and instructs mowing on the permanent course so that the seeds of the protected plants will remain there.

Are Kont prepared an expert opinion on maintaining and preserving the beautiful Ruu dunes on request of Jõelähtme rural municipality. A new quarry for excavating limestone is planned there. A. Kont explained the inevitable need for preserving that landscape, since the dunes and the depressions turned into peat between them have priceless paleo-geographic value that help explain the formation and development of North Estonian landscapes and make reliable predictions about the future developments on the background of climatic changes.

Urmas Tartes delivered nature education lectures in various places in Estonia – the Estonian Museum of Natural History, Tallinn Central Library, Kiidjärve Visitor Centre, Peetri School, Türi Co-educational Gymnasium and the University of Tartu Natural History Museum. He participated in the work of the evaluation panels of the contest Nature Photo of the Year, photo contest of *Eesti Loodus* (Estonian nature) and the photo contest “Notice me” organised by Vapramäe-Vellavere-Vitipalu Foundation. He was also a frequent guest in the TV series *Osoon* (Ozone). He was a member of the Kumari Award committee and continuously represented the Academy in the Council of *MTÜ Loodusajakiri* (NPO Nature Magazine).

#### ESTONIAN POLAR RESEARCH COMMITTEE

Set up in 1993

Chairman Rein Vaikmäe, Professor Emeritus

The Estonian Polar Research Committee at the Estonian Academy of Sciences (hereinafter EPRC) is an independent expert panel that shapes the Estonian strategy of polar research, advises the national authorities and has a say on international level. The committee represents Estonian polar research in international organisations and in the framework of area-related international agreements and conventions, primarily in the European Polar Board (EPB) and Antarctic Treaty System (ATS).

The European Polar Board (EPB) is a non-governmental strategic expert body that coordinates the interests of member states in planning research in the polar regions and optimising the use of correlative infrastructures in Europe. EPB advises the European Commission in these issues. Until 2015, the EPB was an expert panel at the European Science Foundation (ESF) and from 2015 it is an independent legal entity that is registered with the city government of Hague (the Netherlands). Estonia is a member of the EPB from 2001 with EPRC as the national contact point.

Due to the delayed restructuring process of the ESF, EPB has been focusing on designing and discussing the future scenarios during the last years. The plenary meeting of EPB that took place in Prague in April 2017 approved the EPB strategy for 2017-2020. As an important substantive activity, EPB contributes to the implementation of Horizon 2020 project EU-PolarNet – “Connecting Science with Society” that is carried out during the years 2015-2020. The objective of the project is to develop an integrated European Polar Research Programme. The Institute of Geology of the Tallinn University of Technology represents Estonia in that consortium. Representatives of all the participating countries elected Tallinn as the place for the next EU-PolarNet plenary meeting in 2018. EPRC intends to use the already traditional format of this one-day public-oriented meeting as an event that introduces and propagates the importance of polar studies to the Estonian public.

In addition to participation in the above indicated EU project and updating the Statutes, EPRC was engaged in promoting the polar research domain primarily among the young people in 2017. Members of EPRC participated actively in organising a demanding polar quiz for schoolchildren, arranged by the Estonian Polar Club and the Polar Foundation in cooperation with the Estonian Maritime Museum and the Geography Teachers’ Association of Tallinn. The grand prize for the winners was an opportunity to travel to the Arctic Circle within the programme of an expedition to the Scandinavian polar areas that took place from July 22 to July 30.

Estonian participation in the work of the EPB has enabled our scientists directly and effectively to contribute to drafting and designing the R&D strategies and specific research programmes in the domain of European polar research. This opens up the possibilities for our relatively small, but active and high-level groups of scientists (from the University of Tartu, Tallinn University of Technology, Tallinn University, Tartu Observatory, National Institute of Chemical Physics and Biophysics and others) to participate in international cooperation, and it ensures the logistical support and access to the expensive and unique infrastructure. An active and constructive participation in the work of EPB has helped create a positive image of Estonia in that internationally prestigious area.

## ENERGY COUNCIL

Set up in 1998

Chairman Arvi Hamburg, Professor

The Energy Council held four meetings in 2017, dated: April 24, June 6, September 20 and October 26.

The main subject of the April 24 meeting was desynchronisation of the Estonian power system from the North-Western Russia power system. The meeting analysed the practice of operation of the power system of the Baltic countries during the period of the restoration of Estonian independence and predicted potential technical, economic and political risks and disturbances potentially associated with the desynchronisation. Kalev Stoicescu, the researcher of the International Centre for Defence and Security explained the aspects of the energy security. After the discussion and conclusions, the Energy Council decided:

- Desynchronisation of the Baltic States from the Unified Power System of Russia and the connected power system of Belarus is not technically and economically expedient and it will damage the reliability and immunity of the power systems of the Baltic States. The council does not support desynchronisation of Estonian power system from BRELL (Belorussian-Russian-Estonian-Latvian-Lithuanian) transmission network.
- Synchronisation of the connected power systems of European mainland and BRELL would allow optimising the operation of the power systems of connected states.

Other topics discussed at the meeting were administrative matters of the Energy Council and organising a memorial conference to mark the 100th anniversary of the birth of Ilmar Öpik, Member of the Estonian Academy of Sciences.

The meeting on June 6 focused on the professional “aftergrowth” issues in the energy and technology sector. Field session with the Management Board of the Estonian Association of Engineers (EIL) was held at the ABB Jüri plant where the delegation was hosted by Bo Hendriksson, the outgoing Chairman of the Board at ABB Baltics, Jukka Patrikainen, the new Chairman of the Board, and Leho Kuusk, Member of the Board. Arvo Oorn, Dean of the School of Engineering at Tallinn University of Technology, participated as a guest of the meeting who presented statistics on the University’s study and research activities and the structural reform of the University. Based on the statistics provided and conclusions from following discussions, the Energy Council decided:

- The existing measures (corporate training programmes, educational industry-university cooperation projects) do not ensure the sustainable development of the energy sector.
- With joint efforts of training providers for future engineers, entrepreneurs and the state we must build a new functioning programme for promoting the technological education (incl. power engineering).

The main subject of the session on September 20 was markets and future trends of gas and liquid fuels. Raul Kotov, Member of the Management Board of AS Eesti Gaas, explained the opportunities for expanding the natural gas market as well as the assortment and services of offered goods (gas fuel). The discussion of the speaker and the Council members dealt with the structure of consumption, the pricing, the security of supply, the comparison of the supply sources (directly from the pipeline, from the Latvian gas storage facility or from the Lithuanian Klaipeda LNG terminal, of LNG, CNG, biogas and petroleum gas). Freedom of choice of the fuel type from the consumers' point of view and the restrictions imposed on the operators and the return on investments were tackled. The Energy Council's position is that natural gas is a valuable fuel, both for covering energy consumption as well as raw material. The political argument – dependence on Russian Gazprom as the sole supplier – has caused a regression in the use of the natural gas and cannot be rationally handled. Significant current and planned investments also presume equal opportunities for all the market operators guaranteed by government regulation, a well-functioning competitive fuel market, purposeful formation of the taxation system, and optional energy and fuel sources for the consumer.

Toomas Saks, Managing Director of the Estonian Oil Association spoke about mineral fuels and biofuels produced from petroleum products, the pricing and future trends. The substitutes of petroleum fuels – biofuels, electricity, hydrogen; the EU requirements, the Estonian regulations and assumptions and the ways of drawing up a long-term strategy and creation of equal market conditions for all market participants were likewise approached. The Energy Council is of the opinion that the relative importance of liquid fuels in the energy balance of our country is by far the largest (40%). Consequently, the security of liquid fuel supply, as well as the developments and applications of alternative motor fuels are definitely among priorities. As there are no crude oil refineries or automotive industry in Estonia, we have to focus on regional pricing and legal regulation to avoid extra costs for our consumers in planning the liquid fuel policy.

The main subject discussed on October 26 was innovation in the energy sector. The field session was held together with the Management Board of the Estonian Association of Engineers at the public listed company Harju Elekter Grupp. The hosts Andres Allikmäe, Chairman of the Board of Harju Elekter, and Jan Osa, Manager of the Subsidiary Elektrotehnika, both gave a presentation at the meeting. Andres Allikmäe's presentation was followed by a lively debate on the long-term competitiveness of the Group with international reach in the electrotechnical industry. Successful business activities and economic results of the company, as well as the future trends for the Group's business divisions and operations were envisaged.

#### COMMITTEE ON PHYLOGENY AND TAXONOMY

Set up in 2007

Chairman Urmas Kõljalg, Member of the Academy

Committee on Phylogeny and Taxonomy represents Estonia in the Consortium of European Taxonomic Facilities (CETAF AISBL, <http://www.cetaf.org>). CETAF is a network coordinating European research and development of collections related to biological diversity and geosciences. In Estonia, the Committee on Phylogeny and Taxonomy plays essentially the same role as CETAF in Europe. The Committee coordinates the work of natural sciences collections, including their digitisation.

#### INTERNATIONAL ACTIVITY

CETAF 41st General Meeting took place at the Zoological Research Museum Alexander Koenig (Bonn, Germany) on April 25-26. Estonia was represented with the right to vote by Urmas Kõljalg, Chairman of the Committee, and Olle Hints, Vice Chairman of the Committee. The agenda included a report on the 2016 expenditure; activity reports by the Secretariat and working groups, and the working plan for 2017-2018. Olle Hints also participated in the meeting of the working group on geosciences that took place the day before. The document "CETAF Responsible Research and Innovation Framework" was presented.

CETAF 42nd General Meeting took place at the Natural History Museum of Crete (Greece) on October 3-4. Estonia was represented by Villu Soon, Head Curator of Zoological Collections at the Natural History Museum and Botanical Garden of the University of Tartu. In addition to approving the 2018 budget, the meeting discussed various aspects of publishing and electronic publishing in particular. CETAF working group on publishing briefed on the preparation of the best practice guidelines on taxonomic research publishing.

## INTRA-ESTONIAN ACTIVITY

The Committee on Phylogeny and Taxonomy continued active participation in the work of the Estonian research infrastructures roadmap NATARC (<http://natarc.ut.ee>). Urmas Kõljalg (Committee on Phylogeny and Taxonomy) and Olle Hints (Tallinn University of Technology) belong to NATARC Council. Developing of the e-infrastructure for scientific collections in Estonia continued. Its two main components are PlutoF (<https://plutof.ut.ee>) for biology database management and SARV (<http://geokogud.info>) for geology database management. Members of the Committee and the NATARC Council together with Tiiu Kull, a representative of GBIF Eesti, participated in a meeting held at the Estonian University of Life Sciences in September 2017. Issues concerning the development of scientific collections were discussed and an overview of the activity of CETAF in 2017 was given. It was decided to hold one of the CETAF general meetings of 2019 in Estonia.

Members of the Committee participated in the work of an expert board for the Collections of Humanities and Natural Sciences at the Ministry of Education and Research. Vice Chairman of the Committee Olle Hints continued chairing the board, whose task is to advise the government on improving and funding the work of natural science archives.

## COMMITTEE ON MARINE SCIENCES

Set up in 2007

Chairman Tarmo Soomere, Member of Academy

In 2017 the Committee followed the regular routine of electronic meetings in daily work. Three electronic surveys-negotiations were held:

- January 8 – the report of the Committee on Marine Sciences for 2016 was sent to members of the Committee for review and supplementation.
- March 13 – an electronic survey was initiated to prepare recommendations and supplements to the draft position paper of the European Marine Board (Position Paper #23 Advancing Citizen Science for Seas and Ocean Research).
- April 9 – an electronic survey was initiated to find experts who could be recommended to the working group “Foods from Ocean” established under the umbrella of the European Science Advisors Forum and the European Commission’s Scientific Advice Mechanism (SAM). Georg Martin, a member of the Committee on Marine Sciences, was nominated as a candidate; however, he was not included in the working group.

The highlight of the year was the conference “From Small Scales to Large Scales – The Gulf of Finland Science Days 2017”, a follow-up event in the framework of the trilateral cooperation between the Gulf of Finland States on October 9-10. Read more about the conference on p.49.

In the reporting year, the Committee on Marine Sciences continued to represent Estonia in the European Marine Board (EMB). Chairman of the Committee Tarmo Soomere participated in the EMB Executive Committee Meeting in Brussels (19 January), EMB Executive Committee Meeting (25 April) and EMB Spring Plenary Meeting (26-27 April) in Santa Cruz de Tenerife (Spain, Tenerife). With the Spring Plenary, the second term of office of T.Soomere as Vice Chairman of the European Marine Board came to an end. Chairman of the Committee T. Soomere sits on EASAC (European Academies’ Science Advisory Council) Environment Steering Panel as the representative of the Estonian Academy of Sciences and a founding member of the panel. One of his tasks is to be the contact person for the European Marine Board, facilitate exchange of information between these organisations and harmonise their work. In the reporting year, T. Soomere participated in a meeting of the EASAC Environment Steering Panel (Warsaw, Poland, 18-19 September).

Due to a busy schedule, reflecting the media coverage of the Committee was less intensive than in previous years. The Committee was still present on nearly all TV and radio channels and in newspapers because of the high wave problems caused by the new high-speed craft Viking Faster of the Viking Line. As usual, a good many invitations to make presentations on marine and coastal subjects were received. T. Soomere gave numerous invited and public lectures on topics of marine and coastal science, both within and beyond the Estonian context.

Under the Estonian Presidency of the EU Council, the conference “Nature-based Solutions” (24-26 October, Tallinn University Conference Centre) was held that approached questions in the subject area of the Committee. T. Soomere was appointed to the steering committee of the conference. The opening statement of the conference focused on problems concerning microplastics in the marine environment.

The formation of a new national geology service indirectly belongs to the subject matter of the Committee as well. T. Soomere was invited to the working group for setting up the Geological Survey of Estonia and was appointed to its advisory board as a substitute member.

The Committee continued work on initiating an action to accede the European joint programming initiative “Oceans, Climate and Water” that had started in 2013. One of the official representatives of Estonia is Professor Kalle Olli, Vice Chairman of the Committee. Since summer 2008, Chairman of the Committee T. Soomere has been serving as an observer on an inter-ministerial coordination committee on issues of marine studies, marine conservation and pollution control that was set up by the Ministry of the Environment. The Marine Environment Department at the Ministry of the Environment has invited the members of the Committee to advise on issues arising during drafting the concepts for the Marine Environment Use and Conservation Act.

For 10 years by now, the Committee on Marine Sciences has fulfilled its main tasks: representing the Estonian marine science in the European Marine Board and excellence in the marine sciences on the European academic landscape. With regular intensity, the Committee has forwarded messages about marine sciences to the society and, wherever possible and necessary, given the government of Estonia a steer. Estonia’s voice in the renewed European Marine Board (EMB-IVZW) is often decisive in marine science policy issues regarding the Baltic Sea. In addition, we have excellent opportunities to present high-end research currently performed in Estonia and to get funding for the ideas born here from European sources. The activity of the Committee has increased the visibility of the countries around the Baltic Sea, as well as the Estonian marine science. It has contributed to the formation of the marine science strategy and refreshed the trilateral cooperation between the Gulf of Finland States, contributed to data exchange management and reciprocal transfer of competence.

In scale of Estonia, the Committee has managed to maintain the visibility of marine sciences on an excellent level for quite a few years. An ongoing interest towards the topics of marine, lake and coastal science is detectable within research landscape, media and society. Several areas of study have arrived among the prominent research directions of universities. A member of the committee Tiit Kutser belonged to the 1% of the most highly cited scientists in his field in 2017. Vice Chairman of the committee Tiina Nõges is (again) a candidate for a member of the Evaluation Committee at the Estonian Research Council. Organising of different events has helped to make the potential of Estonian marine and coastal science along with limnology better known in the neighbouring countries.

However, the intensity and effectiveness of the intra-Estonian activity of the Committee is far more modest compared to the potential, effectiveness and visibility of the committee members. In view of an increase in

the percentage of base funding allocated to research, a greater need will probably arise to develop the Committee into an assembly that focuses on coordinating and consolidating the activities of different areas of marine, lake and coastal sciences. The Committee on Marine Sciences has worked with the same membership for ten years already. Some of the original members of the Committee have started working elsewhere. Negotiations for their substitution have been started. It is intended to make a proposal to the Board of the Estonian Academy of Science to nominate for committee member(s) the leaders of strong research groups that currently have no representation in the committee.

#### STANDING COMMITTEE ON MEDICAL SCIENCE AND HEALTH STRATEGY

Set up in 2011

Chairman Eero Vasar, Member of Academy

In 2016 the Health Research, Development and Innovation Council was set up with the Ministry of Social Affairs. Unfortunately, this has not led to any significant sudden change in the activities of the Ministry in the respective directions. In 2017 the Standing Committee on Medical Science and Health Strategy organised two events in cooperation with the Faculty of Medicine of the University of Tartu with an aim to get more information about the plans of the Ministry of Social Affairs in the area of research and development.

On June 13 the meeting of the Extended Council of the Faculty of Medicine at the University of Tartu discussed the situation of funding medical research and the implementation of the Estonian Health Research, Development and Innovation Strategy for 2015-2020. The decision of the meeting noted that the Council of the Faculty of Medicine was worried that implementation of the developed and approved strategy as a whole had not started yet. The Research and Innovation Council of the Ministry of Social Affairs had been tasked with the discussion and approval of the implementation plan of the strategy but up to that moment the Council had not been put into operation. The medical scientists have no information about organising research based on the needs of the health system. A significant increase of the budget of the Ministry of Social Affairs for financing research and innovation in order to implement the strategy has not been achieved. Unfortunately, opinions based on belief are spreading in the society, resulting in negative impacts on the health of people. The situation in funding medical science is as alarming as in all the fields of science in Estonia. The state funding of science is diverging from achieving the target

of 1%. Changes in the grants application system of the Estonian Research Council have increased the uncertainty of researchers; the competition for grant funding has increased. There has not been any significant rise in the base funding of science that should ensure the stability. The promised doubling of the doctoral grants actually did not happen. These changes will inevitably lead to a significant reduction in the scientific community and hinder the entry of talented young people into science. It is time for the concerned institutions to realise that maintaining and developing the scientific research competence of Estonia is a strategically vital task that has a direct impact on the health of the Estonian people and the Estonian economic development.

As a follow-up to this meeting, there was a meeting on October 13 with the Deputy Secretary General A. Aaviksoo from the Ministry of Social Affairs who shared the vision of the Ministry and offered possible solutions for implementing the Health Research, Development and Innovation Strategy in the near future. Unfortunately, these promises have, as previously, ended up as empty promises.

In conclusion, the main task of the Standing Committee on Medical Science and Health Strategy is to work for the sake of substantially greater funding of medical sciences. Unlike the developed science-oriented countries, Estonia belongs to the group of countries where the funding of medical and health research is not included in national priorities.

#### COUNCIL FOR ESTONIAN CENTRES OF EXCELLENCE IN RESEARCH

Set up in 2012

Chairman Andres Metspalu, Member of Academy

The annual working meeting of the Heads of the Estonian Centres of Excellence in Research took place in Tartu on 18 December 2017. In attendance were Andres Metspalu, Maarja Kruusmaa, Martti Raidal, Ülo Niinemets, Enn Lust, Tanel Tenson, Mare Kõiva, Urmas Nagel, Eero Vasar, Mait Metspalu, Jarek Kurnitski, Tiia Kurvits, Mihkel Läänelaid, Maris Väli-Täht.

Several issues concerning the centres of excellence were discussed and the activities for 2018 planned.

The centres of excellence have adapted to the new rules of reporting and funding, all the centres are working normally. Naturally, questions were

raised about the fate of the support provided for the centres of excellence after 2020. Despite the good work on the level of scientific excellence, there is still a need to improve the visibility of the centres of excellence (and science in whole) in the society at large.

Therefore, the centres of excellence plan to organise two major joint conferences in 2018, one in Tallinn and one in Tartu with the aim to reach the public and the media coverage. It should be done in a format where each centre of excellence introduces its activity, addressing primarily the public. Adequate media coverage is of importance as well.

A steering group, comprising Members of Academy was formed for preparing detailed specific plans: Martti Raidal, Ülo Niinemets and Andres Metspalu (ex officio).

# ACADEMY EVENTS

## CONFERENCES

On February 7, a commemorative conference marking the 90th anniversary of the birth of Raimund Hagelberg, a distinguished Member of the Estonian Academy of Sciences, was held at the University of Tartu Oeconomicum building. Tribute speeches were given by his former colleagues and students. The event was organised by Urmas Varblane, Head of the Division of Humanities and Social Sciences.

On February 27, a commemorative conference dedicated to the 100th anniversary of the birth of Ilmar Tammelo, an internationally renowned legal philosopher, was organised at the University of Tartu Narva College jointly with the Estonian Academy of Sciences. Among speakers were Tarmo Soomere, President of the Estonian Academy of Sciences; Kristina Kallas, Director of the University of Tartu Narva College; Member of the Academy Lauri Mälksoo, Peeter Järvelaid, Doctor of Law and editors of the magazine *Akadeemia* Toomas Kiho and Mart Orav.

On June 19, a commemorative conference dedicated to the 90th anniversary of the birth of Ilmar Öpik, a world renowned Member of the Estonian Academy of Sciences, took place at the Estonian Academy of Sciences. The conference was organised in collaboration with Tallinn University of Technology. The conference was opened by Tarmo Soomere, President of the Academy. Aadu Paist, Arvo Ots, Jaan Saar and Arvi Prikk gave papers at the conference. Ilmar Öpik was remembered by Mihkel Veiderma, Anto Raukas, Arvi Hamburg, Rein Talumaa, Aili Kogermann, Mati Kaare, Elsa Pajumaa and Andres Öpik.

On October 4, the fourth conference on science policy “Science as an Engine of Development for Estonia” was held at the Riigikogu Conference Hall. The discussion focused on increasing the common elements in science and public management. The aim was to find answers to the following questions:

How to reach a situation where the advice of scientists is asked and followed more than ever before in public governance?  
What are the mutual expectations of politicians/policymakers and scientists/research institutions?  
How can we jointly increase the social role and influence of science in decision making processes?

President of the Academy Tarmo Soomere opened the conference with a speech. The conference was organised by the Estonian Research Council, Cultural Affairs Committee of the Riigikogu, universities of Estonia, Estonian Academy of Sciences and Ministry of Education and Research.

On 9-10 October, an international conference on marine environment “From Small Scales to Large Scales – The Gulf of Finland Science Days 2017” was held at the Estonian Academy of Sciences. It was organised by the Estonian Academy of Sciences, Finnish Environment Institute (SYKE) and Estonian Marine Institute at the University of Tartu. This conference brought together specialists of marine science, environmental protection and environmental awareness from three countries around the Gulf of Finland – Finland, Estonia and Russia. The conference was opened by Tarmo Soomere, the President of the Academy. The former Minister of the Environment, the current Chairman of the Constitutional Committee of the Riigikogu, Marko Pomerants, gave a welcome address as well. During the joint plenary sessions 22 presentations were given, additional 24 presentations were divided between parallel sessions and 17 participants furnished a poster presentation. The work done in recent years and new opportunities for improving the state of marine environment, for stabilising the marine ecosystem and for ensuring offered services, as well as for making reasonable use of seafood, were discussed. It was acknowledged that success is based on trilateral cooperation, extensive data exchange and mutual transfer of competence. The closing speech of the conference was given by Mailis Reps, Minister of Education and Research. The organisation of the conference was supported by the Environmental Investment Centre.

October 11 – Academy House was the venue for a conference “Strengthening Europe’s Science Base” organised by the European Research Council (ERC). Keynote speech was given by Mart Saarma, Member of the Academy.

October 13 – Academy hosted a conference “New Approaches to Science for Policy in Europe” organised by SAPEA (Science Advice for Policy by European Academies), a project-based consortium within the European Scientific Advice Mechanism (SAM). The conferences on October 11 and

13 were organised as satellite events to the Estonian Presidency Research Policy Conference “European Research Excellence – Impact and Value for Society” that was held on October 12.

## SPEECH BY PRESIDENT OF FEDERAL REPUBLIC OF GERMANY

On August 23, Frank-Walter Steinmeier, President of the Federal Republic of Germany gave a speech “Germany and Estonia – a chequered history, a common future” in the Academy Hall. Tarmo Soomere, President of the Estonian Academy of Sciences and Ülle Madise, Chancellor of Justice made introductory addresses.

## SEMINARS

On June 27, a seminar “Prospects for Wood Chemistry in Estonia” took place in the Academy Hall. Among participants were strategic partners in the field of wood chemistry – entrepreneurs, state authorities, experts in relevant technologies, forestry and nature conservation specialists, and scientists of related fields. Opportunities and risks associated with increasing the value of the forest were discussed. The core topics of the seminar covered: the added value to wood as an opportunity to move forward in the global value chain; modern value-adding technologies in the wood industry, and the forest, nature and society in the strategic context. The seminar was opened by Tarmo Soomere, President of the Academy. Presentations included:

### **Wood as a resource**

Ando Leppiman, Ministry of Economic Affairs and Communications.  
An unused opportunity in the Estonian forest industry Margus Kohava,  
EST-FOR Invest OÜ

### **The environmental requirements for large-scale production**

Kaupo Heinma, Ministry of the Environment

### **Modern trends in pulp technology development and is “clean” process affordable**

Per Engstrand, Mid Sweden University

### **The environmental impact of a wood processing plant must be thoroughly evaluated**

Virve Sõber and Kuno Kasak, University of Tartu and Estonian Fund  
for Nature

## **The associated risks of a pulp mill to sustainable forest management**

Raul Rosenvald, Estonian University of Life Sciences

## **Organisation of silviculture and forest husbandry**

Mait Lang, Estonian University of Life Sciences and Tartu Observatory

## **Ecosystem services from forests, or forest as part of the landscape**

Ülo Mander, University of Tartu

## **Teaching wood chemistry at Tallinn University of Technology**

Tõnis Kanger, Tallinn University of Technology

On November 23, a follow-up seminar “Prospects for Wood Chemistry in Estonia II” took place in the Academy Hall. To summarise the problems raised at the seminar in June, the Board of the Academy had formed a committee, which among other conclusions noted that: “The applicable technology must meet the contemporary requirements. The goal is to target not only the production of wood pulp but also a wider range of bioproducts, which will allow the diversification of the added value chain and more purposeful use of the raw material. In this context, support for knowledge-intensive production, in particular the addition of a biotechnological block is extremely important.” This was exactly the topic of the presentations at the seminar. Secretary General Jaak Järv said the opening words and the following papers were presented:

### **Chemistry of Biomass: Biofuels and Bioplastics**

Sergey D. Varfolomeev, Chemistry Faculty, M. V. Lomonosov Moscow State University N.M.Emanuel Institute for Biochemical Physics, Russian Academy of Sciences

### **Possible alternative for Lignocellulosic Biomass Processing in Estonia: Beyond Conventional Forest Industry**

Peep Pitk, AS Graanul Invest

Project Celestial: Industrial Cell Factories for Future Bioeconomy

Mart Loog, Institute of Technology, University of Tartu.

## MEETINGS AND DISCUSSIONS

On March 14, a colloquium dedicated to Native Tongue Day took place at the Estonian National Museum (ERM). Among speakers were Mari Sarv, Senior Researcher at the Estonian Literary Museum; Tõnis Lukas, Director and Pille Runnel, Research Director of the Estonian National Museum. Members of the Academy delegation had an opportunity to visit ERM’s permanent exhibitions “Encounters” and “Echo of the Urals”. Kristel Rattus, Researcher-Curator of the museum along with researchers Indrek Jääts, Piret Koosa and Svetlana Karm were the tour guides.

On May 29, a Science Day took place at Võru State Gymnasium, where the Academy was represented by Mart Kalm and Anu Raud. Mart Kalm spoke on the topic “Are there any examples of good architecture in Võru” and Anu Raud shared thoughts on her textile art and view of life with the audience. The Science Day was organised by the Department of Education and Social Services at the Võru County Government in collaboration with the Estonian Academy of Sciences, the Union of Võru County Municipalities and Võru Gymnasium.

On June 12, the Division of Humanities and Social Sciences held a meeting in the village of Heimtali, at the museum founded by fellow member Anu Raud and at her homeplace on Kääriku farm stead. In connection with the approaching 100th anniversary of the Republic of Estonia, Members of Academy had an opportunity to participate in weaving a carpet and perpetuate their activity into the “Book of carpet striping”. Secretary General Jaak Järv was also attending the meeting.

On October 31, the Day of the Societies associated with the Academy was held at the University of Tartu Omicum building, where the associations presented overviews of their activities orally and/or with poster reports. Opening remarks and the summary were made by President of the Academy Tarmo Soomere. Oral presentations were made by Erki Tammiksaar, Marju Luts-Sootak, Urmas Kõljalg, Karl Pajusalu, Peeter Mürsepp, Andrus Ristkok, Kaido Reivelt and Anne Kahru. During the break, the audience could take a look at the poster reports.

On November 20, a Science Day took place at Võru Gymnasium. This time the focus was on psychological sciences: Member of the Academy Jüri Allik with his PhD students spoke in front of the students of upper secondary schools of Võru County. Dr.Kariina Laas spoke on the topic “Narcotics” and Dr.Astra Schults gave a presentation on the topic “Does language make human” The event was organised by the Department of Education and Social Services at the Võru County Government in collaboration with the Estonian Academy of Sciences, the Union of Võru County Municipalities and Võru Gymnasium.

# ACADEMY, MEDIA, SOCIETY

The Academy of Sciences is a partner in the EU financed Science Communication Programme TeaMe+ for the period 2016-2020. The aim of the programme is to create a positive social background for studying and working in STEM (science, technology, engineering and mathematics) and to encourage young people to choose a career in these fields. The total amount of the partnership agreement is 100,000 euros.

## SCIENCE IN 3 MINUTES

In 2017 the Estonian Academy of Sciences organised for the third time the contest of three-minute lectures for doctoral students and young scientists from public universities and research institutes. The event culminated with a gala night on 27 October 2017 in the Academy Hall. Young scientists chosen from 17 pre-competitions had to fit their research into an attractive presentation of exactly three minutes, while they were expected to reveal the content and relevance of their work to the widest possible audience. The panel selected eight winning lectures that were broadcast on the national television channel ETV at the end of the year and featured in the “The Three-Minute Challenge” show. In addition, the winners were rewarded with a half-year subscription of the Estonian popular science magazine *Horisont* (Horizon). The gala night was broadcast live by the web-based portal Novaator of the Estonian Public Broadcasting.

Panel: Indrek Allmann, Alar Karis, Laur Kaunissaar, Viktoria Ladõnskaja, Ingrid Peek, Birgit Sarrap, Tarmo Soomere (Chairman) and Hannes Tõnisson. The gala night was moderated by Ronald Väli (Laureate of the Three-Minute Lectures Contest in 2015).

Laureates (alphabetically):



Elisabeth Dorbek-Kolin (Estonian University of Life Sciences): “Cryptosporidiosis – an unknown enemy?”

Andrea Giudici (Tallinn University of Technology): “Pollution monitoring technology in the Gulf of Finland”

Elise Joonas (National Institute of Chemical Physics and Biophysics): “Micro-Algae vs. nanoparticles: is difference an advantage or does the toughest win?”

Tiina Laansalu (Institute of the Estonian Language): “Nomen est omen – what place names can tell us”

Oliver Laas (Tallinn University): “Virtuality = Reality?”

Fideelia-Signe Roots (Estonian Academy of Arts): “A female tractor driver – a poetic hero”

Janek Urvik (University of Tartu): “Impossibility of obtaining eternal life”

Madis Uemaa (Tallinn University of Technology): “On the verge of digital power networks”.

The winning clips aired on the “Science in 3 Minutes” show on the national television channel ETV from December 5 to December 28. In addition, on December 29 the television channel ETV2 also aired the “Three-Minute Challenge” show.

## SCIENCE BREAKFASTS AND AFTERNOONS

Since spring 2015 the Academy of Sciences has regularly invited representatives of the media, academic circles and various socio-political stakeholders to roundtable discussions. In a relaxed, academically free and inspiring atmosphere (with morning coffee or afternoon snacks), societal challenges and cooperation opportunities are discussed. The aim is to generate smart initiatives by holding a holistic view as wide as possible.

The meetings were supported by TeaMe+ and the European Regional Development Fund.

February 9 – meeting with media representatives that was organised in cooperation with the Estonian Association of Science Journalists. Tiit Kändler, who recently received the Tiiu Sild Memorial Lifetime Achievement Award for communication of science and technology, gave a speech on the topic “Viewing the world from the perspective of a science journalist”.

May 19 – meeting with media representatives took place in cooperation with the Estonian Association of Science Journalists. The talking point was which indicators should be used for evaluating the situation in science journalism.

June 8 – science afternoon where the discussion topic focused on sustainable science career models in Estonia.

August 16 – meeting devoted to the themes that had been covered at the 4th European Conference for Science Journalists on 26-30 June in Copenhagen.

November 2 – discussion over potential candidates for the Estonian Science Journalists’ Ökul Prize 2017.

November 24 – roundtable meeting between members of the Estonian Association of Science Journalists and the Estonian Young Academy of Sciences on the topic “Relations between scientists and journalists”.

December 21 – end-of-year event organised by the Estonian Association of Science Journalists to summarise the state of science journalism in 2017.

## POSTIMEES. (ACADEMY) OPINION. CULTURE

In 2016, through cooperation of the Academy with the daily newspaper Postimees, the weekend cultural annex of the daily titled “AK: Arvamus. Kultuur” (Opinion. Culture) started a column. Unlike traditional popularisation of science or giving a background on research findings and their meaning, these articles have found inspiration from newly published editorials about the significance of science for our world that have appeared in the most influential science journals of the world. Members of Academy interpret relations between science and society and explain how the hot

topics that have arisen in the world appear in the context of Estonia. 30 opinion articles altogether were published during 2017, namely:

January 21 – Olav Aarna “What do the PISA results and the climate warming have in common?” (Postimees 17 (7918), AK 411, 21 January 2017, p.10)

January 21 – feature story about Jaan Undusk “It is the expectation of an explosion that makes life an art” (Postimees 17 (7918), AK 411, 21 January 2017, pp.10-12)

January 28 – Peeter Saari “The next digital revolution will be made by quantum supremacy” (Postimees 23 (7924), AK 412, 28 January 2017, p.10)

February 4 – Raimund Ubar “About the fragility of truth in the dialogue between science and society” (Postimees 29 (7930), AK 413, 4 February 2017, p.7)

February 11 – Jaak Aaviksoo “When the truth is put up for vote” (Postimees 35 (7936), AK 414, 11 February 2017, p.7)

February 11 – Enn Tõugu “Machines are getting smarter, what’s going to happen next?” (Postimees 35 (7936), AK 414, 11 February 2017, p.10)

February 18 – Anto Raukas “About science and pseudoscience” (Postimees 41 (7942), AK 415, 18 February 2017, p.10)

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December 9 – Tarmo Soomere “The way we decide what good science is, is as important as the good science itself” (Postimees 288 (8189), AK 448, 9 December 2017, p.7)

December 16 – Raimund Ubar “Clearance sale on good science” (Postimees 294 (8195), AK 449, 16 December 2017, p.6)

Selected articles representing the column are included below.

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

Raimund Ubar

Postimees 29 (7930), AK 413, 4 February 2017, p.7

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

When assessing the expectations of the society more generally, the question would be what kind of truth really matters for the 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 talks about “the end of science” as the

practical revenue from science is more and more staying behind, compared to the spending on R&D, and the society is not at all happy about it.

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 for delimitation of the boundary between single and general. Engineers who are devoted to application are not claiming the fancy title “science”, although, for example, the project of a complex electronic system always includes both research, as well as development.

The truth of applied research is specific and indisputable – it is an application. But what is the truth of basic science? This is new knowledge. Basic research does not have a specific goal, it is not a project, but it is a journey to the unknown, driven by curiosity. The expectations of the society towards 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 on the scale of money.

So, now every scientist has to choose whether to risk and follow the curiosity, or go along a safer route with results guaranteed and thereby a good number of publications, high h-index and great salary as well. The ever-intensifying competition no longer allows anybody to take the risk, and so little by little basic science is also 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, represents a pyramid, where only the peak is wonderful and attractive. The rest of the pyramid is quite tedious, ordinary, lacking scandals and difficult to understand for ordinary people.

And here lies the chasm between the understandings of science by a scientist and ordinary people where there are big risks considering the modern “post-truth” society: blurring of truth, becoming old-fashioned, being taken over by half-truth or lie and succumbing to emotions. Making fact-based conclusions is turned upside down – it turns into upholstering arguments with facts. The more information noise the Internet produces, the more silent becomes the voice of the knowledgeable.

For science, two truths are on the balance: practical value from the science (the growth of welfare, health, environmental protection), and the answers to the questions asked by the society.

The truth is not always unambiguous; it may constantly change and develop. There are questions, which do not have any certain answers. In these cases, the science cannot give any specific recipes, and it is possible to give only general guidance. In that case the seed has to fall at least on the fertile soil. Fertility would mean here, that the one consulted by the scientists is sufficiently educated and is able to make their own decisions based on their own common sense and using the received instructions. In the short-term perspective, the cooperation between the scientists and the society would mean life-long continuing education for the older generation and the higher education for the younger generation altogether in the long-term perspective.

The life-long learning should also involve the leading strata of society (politicians) so that the discourse with the scientists would take place with an equal activity from the both sides. Education from the university should be otherwise relevant so that the diploma graduates could be able to enter the labour market without any problems in line with the needs of the 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>

#### ABOUT SCIENCE AND PSEUDOSCIENCE

Anto Raukas

Postimees 41 (7942), AK 415, 18 February 2017, p.10

*Bart Penders, Professor of Biomedicine and Society (and their interrelations) at Maastricht University had a word in the Nature of 19 January 2017. He investigates how new knowledge is born through collaboration of scientists, how its credibility is established and how other members of the society could be involved in the creation of knowledge and trust. According to Professor Penders, (dependence) relations between science and society are extremely delicate and closely intertwined. Both sides are constantly shaping each other – hopefully for better, but sometimes also for worse. Both have the inalienable right to express their opinion.*

Although all opinions are not equally reliable, science cannot impose its truth on anybody with power games. Therefore, scientists should not take up the role of censors, as Phil Williamson recommends (Nature, 8.12.2016). As indicated by Bart Penders, the society can be persuaded only through so-called symmetrical and open communication. Anto Raukas marks the role of the Academy of Sciences, the press and the national leaders in this context.

“Eesti Entsüklopeedia” (Estonian Encyclopedia) defines science as an activity, whose purpose is to acquire and apply cognitively and practically important new knowledge and to process, use and preserve the existing knowledge. Estonia is the homeland of highly advanced science. The more so, the proliferation of pseudoscience is astonishing. A conspicuous example of it was the creation of Nabala nature reserve where fantasies of the twig and pendulum people were preferred to geological survey. Supposedly there are eight underground rivers and six of them fall into karst Lake Paekna. The existence of any of such “rivers” has never been proven by geological surveys. Their loop-shaped watercourses run illogically and the so-called Lutsa underground “river” allegedly even flows uphill.

Despite the efforts of our journalists’ teacher and “grandmother” Marju Lauristin, a great number of journalists, who are incompetent or occasionally even hostile towards science, have reached the labour market. Scientists who have been in contact with the press know how difficult it is to get analysing articles on the pages of newspapers and how easily it happens with stories that are full of foolishness. Let’s just give a few examples. Last December, *Õhtuleht* (an evening daily) published a recipe about how to open the energy channels with crystals and plants at home during the full moon. For that purpose it was recommended to place a cinnamon stick, pink quartz and a Botswana agate around a red candle and perform the procedure in front of a family photo. In addition, it would be worth tying a red necktie around the left bed-foot in the head of a bed and burn a grey candle. It is practically impossible to conceal bigger stupidity in just a few sentences.

### **How to measure immeasurable?**

Another well-known clairvoyant confirmed that there will be much adultery in 2017. However, she does not define the terms “much” and “little” and does not explain how two-timing can be counted or measured in another trustworthy way. Therefore we will never know whether there has been more or less adultery in 2017 than in the previous year. It is easy to predict something that cannot be checked. Moreover, a lie will be forgotten quickly.

An opinion, that science was invented by God who hated human peace, belongs to Jean-Jacques Rousseau. Scientists are dangerous as world improvers and that is why dictators hate them as well. At the same time, it is a short-sighted policy. Let's take nearly 1,300 patents of Thomas Alva Edison and the effect of their use that was about 3.5 billion dollars already during his lifetime. Besides, the US dollar of that time was significantly more valuable than nowadays.

Science has also another important function – prevention of stupidities. Karl Rebane, a former president of the Academy of Sciences of the Estonian SSR stressed repeatedly that the most important task of the Academy was to prevent large-scale stupidities, and the Academy of that time was able to do it. Now, it has no longer proven successful. It is not clear where the bottleneck was, but a corresponding letter of the Academy of Sciences concerning the creation of Nabala nature reserve never reached the Prime Minister.

No small country can be successful in all the fields of science and solve all the problems confronting the world science. Therefore, a long time ago already, we have determined the key areas, that would be provided with material as well as human resources. Suchlike choices have always caused conflicts but these principles, agreed more than 15 years ago, do not give rise to disputes. Already the first Estonian research and development strategy for 2002-2006 expressed renewal of the knowledge base and growth in the competitiveness of companies as a general goal, and balanced development of the society, sustainable development of human and natural environment and science integrity as the basic strategic principles.

In particular I would like to emphasise the latter, since science is one of the most important constituents of culture and forms the foundations for a knowledge-based worldview. Even if a poor country cannot finance its science on a necessary level, maintaining science integrity and preventing proliferation of pseudoscience is within our powers. This must start from the very top of the state: the President, Government and Parliament of Estonia. The media must also transform – profit earning is important, but the value of truth should be much more appreciated.

See also: Phil Williamson. Take the time and effort to correct misinformation. Nature 540 (7633), 171, 8 December 2016.

## THE MESSAGE OF KALEVIPOEG<sup>2</sup>

Cornelius Hasselblatt, Foreign Member

Postimees 93 (7994), AK 424, 22 April 2017, p.5

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, however, who in 1817 in a footnote of *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 a *möllik* (silty mud).

Perhaps it may seem arbitrary to give such importance to a single footnote, yet in the same year of 1817 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 to 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 for collecting 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 popular among readers and secured him a place in the Estonian literary history. Friedrich Robert Faehlmann began his studies at the University of Tartu and Friedrich Reinhold Kreutzwald went to Rakvere Kreisschule (school of the circle or district). Franz Anton Schiefner, the translator of the Finnish epic *Kalevala* into German and the supporter of Kreutzwald in publishing Kalevipoeg, was born.

All this happened in 1817, and although you can find different noteworthy events for each year if you wish, I still dare say that precisely two hundred years ago it was a very important moment from the point of view of Estonian literature. And 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: Knüpffer 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.

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<sup>2</sup> This essay is based on Cornelius Hasselblatt's shortened speech, held at the General Assembly of the Estonian Academy of Sciences on 19 April 2017.

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 on a scale of world literature, it seems only appropriate and interesting to point out once again how everything began.

Although Kalevipoeg is a primeval and genuine Estonian thing in the sense that the word as a sign itself is firmly associated with Estonia, there is still need of emphasizing the international background for two reasons. First, the initiative to write the epic undoubtedly came from outside of Estonia, and second, in the first decades after it was published, the reception of the epic was much more intense and more significant abroad than in Estonian.

As far as the first point is concerned, it is not an exaggeration to say that without the Finnish “Kalevala”, “Kalevipoeg” would not simply have seen the light of day. It is hardly probable that a child of a *kreisschule* would have read Rosenplänter’s *Beiträge* and made conclusions of his own, although theoretically it cannot be ruled out. And maybe Kreutzwald, somewhat later, for example in 1824, indeed had made some notes for himself 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 is born in 1839, when two presentations of Kalevipoeg are held in the Learned Estonian Society: first it is Faehlmann who draws attention to Kalevipoeg’s folk legends, and half a year later, Georg Julius Schultz-Bertram gives 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” was published in Finland four years earlier. It is well known that the Finnish epic has 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 for the 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 bookstore 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 bookstore in Tartu. When Kreutzwald’s “Kalevipoeg” came out in 1857-1861 as a bilingual publication, however, its

normal reception in Estonia was almost impossible because also among the Baltic Germans, there was not enough interest and competence to appreciate the epic. Nobody bought this most expensive work that cost three and a half roubles, which today would equal to several hundreds of euros according to recalculation of the annual income. Although the Estonian language popular edition, published in 1862 was seven times less expensive for its price of half a rouble, it did not become a bestseller either, and its true reception by the Estonian readers began only in the students' reading circles of the 1870s. At that time, the foreign reception started practically already 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 would not be an unknown figure in Estonia (his letters to Kreutzwald in the period 1866-1875 were published in Estonian in 1961), but still not sufficiently made aware of in the cultural memory. Since 1838, Schott was actually professor of the Chinese, Tatar and East Asian languages, but also dealt with the Finno-Ugric languages, which at that time were not represented at the 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 the 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. (By the way, he was elected Honorary Member of the Learned Estonian Society already on 1 September 1843, thus 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 the financial support from Russia; its editor-in-chief was Adolf Erman, 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 already because it offers us, the Western European readers, something almost entirely new, and penetrates like a fresh, healing gust of wind into a bit musty atmosphere of the habitualness and dullness."

Thus, already in his first article about Estonia from 1841, Schott shows his motivation: he is fascinated by the exotic, he likes the non-everydayness, and he wants to inspire the readership that dealing with such things could be beneficial and invigorating. The reason for that was the content of the very same 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 something entirely new in Western Europe and that fascinated also Jacob Grimm, for example.

In the same spirit, Schott published more than 50 articles about the Estonian folklore and literature in the German language in 1841-1880, while in Estonia the reception of “Kalevipoeg” was only beginning to awake little by little. However, Schott wrote already 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 about this. And once the part with the first tales of “Kalevipoeg” had been published, Schott published right away 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 just like it had been, i.e. the same as sixteen years earlier, when Schott wrote about a fresh gust of wind. This time he writes: “The folk legends of the Estonian people are a gallery of noble images surrounded by a mourning veil. Their keynote is melancholy [...], but not at all powerless longing for the lost, happy time of independence. [...]. After 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 of 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 a primeval and genuine Estonian thing, 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 to help.

There is another factor in the game that could be called the advantage of the disadvantage. In general, the Finns were in a better situation than the Estonians because they 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. And although the 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 way out was presenting 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, but he used the clearest and the most convincing formulation. Moreover, he dealt more intensely with “Kalevipoeg” than the others and he published a monograph about Kreutzwald’s epic already in 1863. This was followed by paraphrases and adaptations as early as in the 1870s, when, be it repeated, 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 one of the Estonians should put it down disdainfully. They would 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 is still the same. 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 just a perfect ambassador of one culture!

## FOR A QUALITY LEAP IN INDUSTRY, THE DATA MUST BE RELEASED

Jaak Vilo

Postimees 93 (7994), AK 424, 22 April 2017, p.7

How to reach wise decisions in industry and make the new smart solutions attractive, asks Jaak Vilo, Professor of Bioinformatics at the University of Tartu.

The flagships of science are usually discoveries from the nature, human health, physics, chemistry, and other similar fields of science. Data collection, their interconnection and analysis are often part of the daily work in making scientific discoveries but unfortunately it is not yet the case in industry and the production processes.

At the same time, however, many branches of industry have already switched over to the data collection and analysis in real time with the help of sensors. For example, the aircraft, ship and vehicle engines can measure their current situation with tens of parameters like the fuel consumption, temperature or vibration. The data will be sent to the manufacturer who can estimate the probability of damages, the need for maintenance and replacement of components, and much more, based on these data.

Unfortunately, many big industries are still not able to use the opportunities that the data science could offer, since there are no out-of-the-box solutions that can be applied fast and conveniently. Yet, the modern smart manufacturing is no longer mass production, but each product is different from the others to some degree. Such production should, however, be strongly optimised – collecting and sending to the production line must be effective, the right components must be in the right place at the right time, the supply chains must function like clockwork. Optimisation can take place in real time, considering even the weather forecast or traffic congestions. Quality improvement, decrease of errors and optimal utilisation of production lines are certainly the key issues of profitability.

Therefore, the production reorganisation is going on in the whole world – mainly toward specialisation and decentralisation where cooperation with competitors or different kinds of plants with narrow specialisation might be also necessary. But this type of optimisation anticipates willingness to cooperate, where the data are mobile and compatible and there cannot be any more closed, isolated “silos”, the content of which cannot be used by another consumer.

Although the technological maturity to develop new solutions is there, the companies everywhere are rather conservative – their concerns are discussed in-house and safe solutions are preferred when making a choice. Therefore, the problems and topics do not reach the scientists or respectively specialised companies who could be able to offer solutions.

### **Industry seeks for certain solutions**

And so, openness and appropriate cooperation platforms are necessary for innovation. The universities have people who are familiar with modern methods of data analysis and artificial intelligence, and have seen what they can do in the fields of science. At the same time, industry needs answers to the questions what the correct way of installing the sensors is, or how to use the received data quickly. When these two sides are brought together, it would be possible to collect and analyse data with the joint projects and offer new more efficient solutions.

It is necessary to handle several big tasks in order to contribute to the growth of innovation. A strategic approach is needed, which will start with monitoring the existing systems that are equipped with sensors, analysing the bottlenecks and identification of new needs, and will end with improvement of data collection, use and sharing.

In general, the companies do not have experience in that area and hence they are not able to assess whether the databases are sufficient, and they are afraid that the data volumes might be too big for analysis. The quality and systematic approach are naturally necessary for an accurate analysis, but the measured data can be packed and organised in different ways also so that nothing essential will get lost. It is not always necessary to have compact data, for example, the temperature of the plant does not change in seconds and on account of such data compactness the data volumes can be downsized.

Smart prediction models are also necessary that may give information of how the quality may change when the machine changes, or during other changes of the production process. Hereby the reaction of the prediction models to unusual situations must be analysed separately. We need to know what happens when there will be a gap in the data or when the sensors are faulty. Such errors can prove to be very expensive, especially when unique, one-off products are produced.

In order to achieve all this, the plants must be connected with the inspection processes. Currently, it is extremely complicated to make the used systems, which focus very much on isolated and single-type activities, compatible and arrange data exchange between them. However, the data of different systems must be connected and the information received in real time used for the control of processes for obtaining better production results.

### **Everyone has to contribute**

Achieving this requires commitment and contribution of the parties. Currently, the United States and Germany stand out with regard to the initiative, and the European Union has made investments for the development of the future plants and the field of Industry 4.0.

A good example of a domain from where to start such reorganisation is energy, where there are solutions, which allow optimising the entire life cycle of the wind turbines to their dismantling and material recycling. If we wish to change the health service more sustainable, we probably need absolutely different way of thinking and the alignment of all significant databases.

The companies should wish changes and be ready for them, which in turn demands changes in management practices and a desire to introduce new technologies and smart solutions.

Networks of all the parties would help the institution of the necessary changes. Three strategic parties – industry, state and academia could find common ways for the formulation and analysis of the problems and seeking funding through these networks. Possible innovative solutions could be tested, the pilot projects carried out and open cooperation exercised in the format of the cooperation centres.

Herewith, for the involvement of different types of organisations and making the contact, it is necessary to ensure openness and trust without which the companies would not risk to share their data with these who have the knowledge of data analysis.

It is equally important to support the promotion of smart manufacturing with politics. Although the industries must institutionalise their own changes, the states can help overcome the risky chasms between the parties who follow different logic, by supporting the risk investments and favouring cooperation between different sectors. The companies, state and universities as well as research institutions can this way change the future production more flexible, efficient and high quality.

See also: Andrew Kusiak. *Smart manufacturing must embrace big data*. Nature 544(7648), 6 April 2017, doi:10.1038/544023a. <https://www.nature.com/news/smart-manufacturing-must-embrace-big-data-1.21760>

#### A HIDDEN GOLDMINE – ARCHIVES

Urmas Kõljalg

Postimees 104 (8005), AK 426, 6 May 2017, p.9

*Urmas Kõljalg writes that the nature archives become the treasury of knowledge with vital importance in the globally changing world.*

At this time when the world changes faster and faster and the wildlife have to cope under ever-increasing pressure, it is extremely important to possess knowledge on a long enough time line for understanding changes and making essential decisions. That means, we have to know facts on how the biodiversity has increased or decreased in the course of history or why some species have died out – always for the purposes that life could continue in good health and entirety also in the future.

Thanks to the centuries-long work of the previous generations of scientists, we fortunately have a decent treasury of sources from where we can gain such knowledge. Some of them have preserved as publications, others in life science collections or the nature archives. Historically it has been usual that the publications were deposited in the libraries; the herborised leaves of plants, stuffed animals, needled insects and the biological samples until DNA were kept in the natural history museums.

For some reason or other, the need for the physical preservation of the printed matter has not been questioned until the digital era, but in the case of natural history collections, a considerable pressure has existed to destroy the collections for almost half a century already. Kurt Vonnegut splendidly perceived the mentality of destruction in his 1959 novel “The Sirens of Titan” by describing the world where the human race that has destroyed its own history, sums up the years after the death of Jesus Christ as follows,

*“In the year Ten Million, according to Koradubian, there would be a tremendous house-cleaning. All records relating to the period between the death of Christ and the year One Million A.D. would be hauled to dumps and burned. This would be done, said Koradubian, because museums and archives would be crowding the living right off the earth. The million-year period to which the burned junk related would be summed up in history books in one sentence...”*

In fact, it must be admitted that by 1959, already hundreds of millions of stuffed animals, mushrooms, plants and other creatures had been preserved in the scientific collections of nature museums. Currently, there are approximately 2 billion prepared organisms only in the collections in Europe that represent more than 80% of the species described by science, including the already extinct ones.

Storing a growing number of physical samples certainly requires ever more space and money, wherefore many institutions have started to look for a new owner for the collections or even destroy them. It is an extremely serious problem that substantively destroys the knowledge, collected by researchers without the possibility of restoring it. As we cannot travel back in time and collect samples of specific species or soil from a certain place, such kind of destruction robs us of opportunities to assess the speed and extent of global changes that have taken place, and on this basis make essential conclusions about present processes.

But science itself turned out to be the saviour of the collections, and due to a fast leap in the molecular biology and the digital technologies that took place some thirty years ago, the natural archives have become gold mines, figuratively speaking.

By the end of the last century it was clear that we can separate DNA also from a very old but well preserved biological tissue and determine the genome of that species. The most outstanding example is our own extinct sister species, *Homo neanderthalensis*, whose genome has been sequenced by now just due to the material stored in the collections.

The majority of the two billion biological samples that are stored in the European collections can be analysed by genetic, biochemical or other methods, in order to answer globally important questions related to, for example, climate changes. For the time being the development has gone so far that the collections have become a currency, the destruction of which no serious research institution would even think about. Another saviour of the collections is the digitisation of archives, and neither Kurt Vonnegut nor his character Winston Niles Rumfoord had a clue about such possibilities.

The management and analysis of billions of organisms stored in the collections and in the related huge databases would not be possible without the web-based digital archives. During the last couple of decades, several digital archive systems have been developed and Estonia is definitely in the forefront (see e.g. <https://plutof.ut.ee>; <http://www.gbif.org>).

The natural archives can be reasonably used only if the wealth contained therein can be easily searched and analysed. Currently, we are only at the beginning of the digitisation road – an estimate of 10% of all nature archives have been digitised – but even this is sufficient to understand the value and relevance of the facts, stored in the nature archives for investigating the global changes.

The universities and scientific institutions who seriously consider destroying these scientific facts have run their course. Paraphrasing Kurt Vonnegut, “In 2020, all the research institutions that have destroyed the nature archives in their possession and the facts stored therein, will be liquidated”.

Nature| Editorial. Risky in the jar. Natural-history specimens face destruction unless museums can pool their collections. *Nature* 54 (7649), 137-138, 13 April 2017, doi: 10.1038/544137b.

See also: <https://www.nature.com/news/natural-history-collections-face-fight-for-survival-1.21805>

## SIX SMALL STEPS

Tarmo Soomere

Postimees 228 (8129), AK 438, 30 September 2017, p.6

*How wide is the basis of the newest technology and how many theoretical studies, seemingly impractical in every way, are cemented therein? Tarmo Soomere, President of the Estonian Academy of Sciences writes that a recent analysis of correlations between patents and scientific articles surprisingly shows that practically all of the creative production in world science 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 an inconceivably large data volume is extremely difficult. Understandably, it becomes increasingly more complicated to find amid the immense amount of data the right ideas that would allow rapid manufacturing of some awesome 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 can be heard and seen that the majority of the scientific articles and especially theoretical researches are totally useless. 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 studies 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 protecting the technologies in the industry rely on earlier scientific work.

Mohammad Ahmadpoor and Benjamin Jones\* checked how 4.8 million patents granted 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 technological development 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 recent 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.

\* 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>.

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 way or another on the scientific research results of the last 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 per cent is already directly or indirectly used in the U.S. patents during the last 50 years.

As new articles are added faster and faster, there is reason to believe that the remaining 20 per cent that has not yet been used are, for the most part, just too new. WoS 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 protect 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 nano studies, 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 funding 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% of the research and development funding is provided by the state budget, from where it mainly moves to the universities and scientific institutes. 40% 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 two thirds of the funding of science and the contribution of the state would be one third. This analysis shows that reaching this level 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 lag. Only one third of that difference is caused by a different profile of the universities (in our case, also by an obligation to maintain the research 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.

#### THE REVOLUTION IN GEOLOGY AND ITS MANIFESTATIONS IN ESTONIA

Dimitri Kaljo

Postimees 264 (8165), AK 444, 11 November 2017, p.9

*Dimitri Kaljo interprets how the greatest revolution of the 20th century in earth sciences found support in Estonia and what kind of revolution is currently gaining momentum in our domestic geology.*

In early October, the Geological Society of London celebrated the 50th anniversary of formulating the new concept of plate tectonics – a theory explaining the causes for the evolution and changes in the Earth's crust and its parts. Prior comments about the event had appeared in the editorial of *Nature*, a world's flagship of science journalism. The emergence of plate tectonics during a decade changed profoundly the understanding of scientists of the geological structure and development of our planet. The concept hitherto of almost unchanging stationary continents was replaced by the knowledge that the Earth's crust was formed of large (mostly the size of a continent or bigger) dynamic plates that drifted slowly on a relatively liquid substance of the mantle.

This change from a fixed worldview to a mobile one can be boldly considered a revolution (according to the definition in “Estonian Encyclopedia”, a revolution is a fast and drastic change of status or situation) that principally put several global deep geological phenomena, like earthquakes and volcanism and the related processes, like climate changes and biodiversity, in a new light. Indirect impact of the change of geological outlook clearly extends to the local level also, including the circumstances concerning the extraction of mineral resources, and water supply.

Today we know that the Earth’s crust consists of six large and a number of smaller continents that have changed over the time. The mechanisms for the emergence of the new Earth’s crust and the wakes in the mantle that provoke the movement of the plates, generally on the surface of the earth as well as in relation to each other, have become clear. Currently the measured speed of movement is up to 16 cm a year and we know that the collision of the plates causes the rise of mountain ranges and the volcanic activity that certainly means big changes in the living conditions of the biosphere.

A good example is our onetime home paleo-continent Baltica that was located in the temperate climate zone of the southern hemisphere 500 million years ago, 100 million years later entered the area of tropical climate near the Equator and joined the large Laurasia plate. Over the latest million years we have survived the glaciers of the Pleistocene great ice age and the subsequent recurring climate warming and cooling, including also the “little ice age” with particularly cold periods of time between 1570-1630 and 1675-1715.

In connection with the ever growing impact of human beings on the nature, the present time (approximately the latest 10 000 years) is classified as the era known with the name of Anthropocene but the researchers are far from unanimity in their understanding about the extent of the human impact on the global warming.

As a matter of fact, the multitude of opinions can be expected. This was the case with the plate tectonics, the 50th anniversary of which Nature celebrated four years before the Geological Society of London. Actually, it could be celebrated even earlier since one of the main drives of the theory was the hypothesis of drifting continents that was formulated by the German professor of meteorology and geophysics Alfred Wegener already in 1912 in one of his presentations and a book published in 1915. A. Wegener was also a lecturer at the University of Tartu for a short time and examined the Kaali meteorite crater.

Wegener's theory received lots of support at that time. Among others, there was also Armin Öpik, Professor of Geology at the University of Tartu who went to a drifting research expedition to Greenland in 1937 with Karl Orviku, his assistant and a soon-to-be Member of Estonian Academy of Sciences. In 1939 he published the edition "Paleontoloogia, Arktikauuringud ja mandrite triiv" (Petrifactology, Arctic Researches and continental drift) where he presented the data collected during the expedition, "... that may be considered the verification of the correctness of the theory of continental drift..." (quoted by Armin Öpik – D.K.).

Despite the support, the theory of continental drift was not generally accepted until the technological progress after WW II enabled to perform deep drillings of the ocean bottom from the ships. Rift zones of mid-ocean ridges of the Atlantic and Pacific Ocean were discovered – areas with specific geomagnetic features where the separation of the plates and the emergence of the oceanic Earth's crust from the molten magma that has risen to the ocean bottom along the deep cleavage, takes place. In addition, the so-called subduction was discovered that occurs as a result of collision of the plates where one plate plunges under the other and melts up again there.

All these discoveries served as the basis for energetic interpretation and the boom of new ideas that took the plate tectonics practically to the status of prevailing scientific concept in about a few decades, and the transferences of its impact were extremely fertile in many branches of geology.

As far as I remember, the contemporary colleagues of that revolution in Estonia were all supporters of "mobilism". Hopefully such kind of thinking, prone to changes, also continues now when we have a local but deeply meaningful revolutionary change in the field of geology. The connection with the facts described above is only notional, but the impact on the development of Estonia is immediate and may also give negative results in case of false actions.

At the initiative of the Geological Society of Estonia, with the support of Marko Pomerants, former Minister of the Environment, and on assignment of the Government of Estonia, a draft legislation "General principles of Earth's crust policy until 2050" was born recently and enacted in the Parliament of Estonia in June this year. The first more serious executive steps like launching the new Estonian Geological Service remain to be taken in 2018 and later. It is a very important mental change indeed – a leap from the situation where a large part of applied geology was reduced to "pariah" status, to a new reality where it is rather seen as a job done

in the interest of the country and its people. This is a great achievement for progress that can be compared with the coming of plate tectonics.

However, it is too early to rejoice yet. From here, it is necessary to go calmly forward, consider the needs and opportunities of geology in every way and look for reasonable policy. We have legally a mental and political basis for success in the area, but there is still a lack of material resources, and more importantly, people. *Inter alia*, there is not enough competence either. It is possible to teach people, it cannot be done quickly – so even more consideration is required instead of shouting hastily “Mission accomplished!”

Big scientific discoveries as well as revolutions in thinking have proved that the enlightenment is preceded by long-time guesswork about the meaning of the new concepts and sometimes even getting stuck on the dead-end road. Science as a whole is certainly moving in the right direction despite the political uncertainty, and even global insecurity.

Nature | News and Views. *50 & 100 Years Ago*. Nature 551(7679), 176, 9 November 2017, doi: 10.1038/551176a. <https://www.nature.com/nature/journal/v551/n7679/index.html>

# SPEECHES AT THE GENERAL ASSEMBLIES

## GENERAL ASSEMBLY ON 19 APRIL 2017

### OPENING ADDRESS

President Tarmo Soomere

Dear colleagues and guests! We have perceived the change in the Academy's image already in 2015 and it has persistently continued. The society has been ready for this in every way, and it seems that several social strata have even been waiting for a consolidated message from science. Last year – by tradition already – we invited opinion leaders outside of the Academy to the General Assembly Meetings.

It so happened that the presentation by Siim Kallas at our spring General Assembly was his first official speech as a candidate for the President of the Republic. It was not intended, but good things just simply happen like this. His message – the wisdom is not merely information, the conversion of knowledge into smart decisions also requires deep culture and excellent background knowledge. This is a good reflection of the internal efforts of the Academy. At our winter General Assembly, Gunnar Okk showed us where we had much room for improvement, and outlined some of the goals that might seem contradictory, but that would be certainly worth pursuing. The Academy might consider 2015 as the year when the Estonian society noticed the importance of knowledge and the knowledge-based development. 2016 was a little different, especially outside of Estonia. In many parts of the world that year brought along a truly cold shower that crystallised into a belief about the arrival of the post-truth era or even an era of untruth. Marju Lepajõe has called that new formality nicely as the era of taking the gossip at its face value, which is absolutely true.

The Academy has seriously gone against the stream during the whole previous year. One of our tasks is to offer independent and professional support

to our country. We initiated brainstorming sessions before the Research and Development Council (RDC) meetings in order to receive from there a consolidated input of academia. For instance, one of the outputs brought to the RDC's table was an argument about how important was engineering education provided by top researchers. This is qualitatively better than the textbook-based education and simultaneously the link of the value chain of science where the input is realised fastest as a measurable benefit. Activity towards scientific advice was somewhat formalised when the Ministry of Education and Research delegated the President of the Academy as the representative of Estonia in the European Science Advisers' Forum. In essence, the Academy is an assembly of opinion leaders. This imposes on us an obligation that is not written in the law but what is nevertheless a fundamental task for open content creation and confidence building; an obligation to build a bridge between different counterparties and increase the common ground between them.

Unlike political parties, the Academy of Sciences neither has nor should have one programme, set in stone and approved by majority vote. Therefore it is logical from all perspectives that the academic and the Academy's value system are open to changes in the society. On the other hand, it is equally logical as an imperative that the basic values of the Academy and the particular nature of the value system of the scientific landscape are not only available for the society in case of need, but also talked through and written in a clear way. One and a half years ago, the Auditor General showed us unmercifully that we had a lot of room for improvement in that respect. Since last September, we have started to fill that gap in a different way, in cooperation with the Saturday Supplement of Postimees daily called "Arvamus. Kultuur" (Opinion. Culture). Members of Academy seek inspiration from the subject matter of the articles of the editorial offices of the world's leading scientific journals and try to interpret these things for Estonia. Last year, 10 opinion articles were published under that heading, this year 11 were added and more would come in succession. Around the world, it is extremely unusual, if not unique that a wide-ranging daily newspaper regularly covers the issues of top science in order to explain the relevance of science to the society.

We took two important steps to fill the postgraduate scientific education with content, primarily to help the young become good researchers. These steps were taken in particular towards consolidating the voice of young scientists and scholars and their better liaising with the society. The first step was taken right at the beginning of the year, on 6 January 2016 – the conference of young scientists, working and studying outside of Estonia. We hope to change this into a tradition, but more important is the fact

that as the result of the follow-up developments of this pilot project, a ceremonial foundation meeting of the Estonian Young Academy of Sciences will be held at the end of May this year.

The second step was a bit more glamorous. The contest of three-minute lectures has already become part of the image of the Academy that can be described as a gate to the exciting and attractive world of science. Entering through this gate is not easy; it is possible only by way of serious training. Many things are learnt – how to express complicated ideas concisely and simply, but also how to make an appearance in front of big audience and TV cameras in a convincing way. Two new moments were noteworthy compared to 2015. Estonian Television decided to produce an overview programme about the whole process of the three-minute lectures. A programme titled “A Three Minute Challenge” was broadcasted before Christmas last year and collecting 47,000 viewers attained quite a good place in the ETV viewing top of the pops. The second moment relates to the implementation of good science for the sake of society. It is often like a quality real estate – everyone is talking about it, but no one has seen it. The Academy certainly does not aim to make money through selling the content created by us, but we think it is important to show an example of how it is possible to materialise such a content. Just last week, the book “Science in Three Minutes” was made public. This is a joint project of Argo Publishing House, Estonian Public Broadcasting and the Estonian Academy of Sciences, a collection including 32 brief lectures that made it into the final round of the three minute lectures during the last two years. This is a living proof that where there is a will, it is possible to commercialise the reflection of good science in cooperation with three different parties – academia, private entrepreneurship and national media channel.

These were the nicest moments of last year. Today is a new year and we have a long day ahead of us. Traditionally, it begins with scientific presentations, as is appropriate for academic meetings. The two presenters are traditionally Laureates of the National Lifetime Achievement Award. One nuance has been added to the tradition, which we started a year and a half ago. Namely, we are absolutely sure that our Foreign Members are, on the one hand, an integral part of our Academy and, on the other, they are the ambassadors of Estonian science. The stronger their connection with the researchers working in Estonia, the greater is the message of the whole Estonian scientific community and the Academy both domestically as well as abroad.

## THE MESSAGE OF KALEVIPOEG Foreign Member Cornelius Hasselblatt

Based on the shortened speech, the author wrote an essay that appeared in the opinion column of the daily Postimees (Postimees 93 (7994), AK 424, 22 April 2017, p.5). The full text is presented in the chapter “Academy, Media, Society” on pages 63-67.

## ACTIVITIES OF THE ACADEMY IN 2016 President Tarmo Soomere

The year was a long one. Events, successes and – to be completely honest – also some disappointments start to blur in the flow of information, and in the avalanche of new books, it is perhaps difficult to find time to remember the recent history. Four months is not a long period to look back in historical sense and it is definitely too short to make fundamental conclusions, based on one year. But last year, several things that were considered important during the election of the new Board in 2014 were realised. As a reminder, there were four underlying strands of work – to become more visible in society; bear responsibility with dignity in the scientific landscape, develop and represent it as a whole; fulfil our role and functions in Estonia; and represent Estonian science in the international arena.

I mentioned our most important achievements briefly in my opening speech, but in a slightly different wording. We were able to establish part of the framework necessary for giving effective science-based advice to the country: informal brainstorming sessions on the one hand and appointment of the President of the Academy as the representative of Estonia in the pan-EU network of government science advisers on the other hand. We deepened the dialogue with society and reached a level where Members of Academy address the relevance of science in a column of a daily newspaper. I think that we filled an important gap on the development path of scientists – particularly in the context of engaging them with the society – by establishing the Estonian Young Academy of Sciences. We got an experience of how good science can be commercialised through cooperation with a private publishing house and national media.

A contemporary personal academy is first of all as strong as its members. Although I personally do not respect bibliometrics or believe in numerology, several Members of Academy excelled and increased their visibility in the whole world last year. Not to mention that the journal Science placed the

results of the research team headed by the Member of Academy Richard Villems among the 10 most ground-breaking scientific achievements. If I calculated correctly, four articles with participation of Estonian scientists appeared in the same issue of Nature – this has never happened before. Three Members of Academy – Ülo Niinemets, Martin Zobel and Andres Metspalu<sup>3</sup> – reached among the most influential scientists in the world according to the heavily criticised Thomson Reuters indicators. These are remarkable achievements and a good basis for moving forward.

If we compare ourselves with others, as we all love to do, our three sister academies complained at the Baltic Conference on Intellectual Cooperation three weeks ago that their members have a peculiar habit not to mention their membership in the Academy when speaking in public – whenever possible, when it is not directly asked or forced. No wonder that the media in these countries takes it as a clear signal. If a person is ashamed of the membership of the Academy, then so be it, the university where he/she works will be mentioned. We have overcome that in Estonia. Even if the Member of Academy takes it for granted that the reporter knows that he/she is a Member of Academy, but the reporter forgets it, the editor will often add the relevant information. If the editor forgets and the printed version has already been published, the title is often added in the online version afterwards. I think that this is a very important step in changing our own attitude.

Of course we see the humour in all kinds of rankings. Maybe it was a joke, maybe not, but Eesti Päevaleht and Delfi compiled a list of 24 most influential scientists and educators that included 9 Members of Academy. This is quite good percentage; some of them had quite a high rank in the general list, too. They were seconded by Arvo Pärt among the cultural figures – true, on the eighth place, which does not reflect his influence in the world at all. But the viewpoints of the world and Estonia are different as we all know.

We tried to talk publicly with the heads of state, both in cooperation with the Estonian Research Council, the Ministry of Education and Research and Universities Estonia through organising the third research policy conference “Science as an Engine of Development for Estonia”, as well as deep and intense discussion of the so-called report of Raasuke in this hall. We do not expect that something will happen right away as the result of this, but we take it as wearing away the stone drop by drop. Eventually there will be a change in mentality in that circle as well.

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3 This list for 2016 was supplemented by Urmas Kõljalg in 2017; see p.22.

When we talk about ourselves in the Estonian information field, we have reached a situation where we must confess with shame that in the following years we will be unable to maintain the current level. It started with a live interview of a live programme of Estonian television and ended with texts by three Members of Academy on the 31 of December in three newspapers. The broadcast of the Estonian Independence Day gala concert and reception was literally framed with long interviews with Members of Academy. Jointly written texts by the Members of Academy were most noticed. It is a symbolic fact that when a couple of us put together our thoughts, hands and pens, the other opinion leaders will analyse how substantive the message is and how many contexts are together in one text. This is also done by the media specialists. It happened last year more than once, especially with jointly written texts.

For the second consecutive year, information about Laureates of the national science awards appeared in the media under the brand of the Academy. Even there, we have probably reached the physical acceptance limit of the readers-listeners. The cultural weekly newspaper *Sirp* decided to increase the volume and invested 6 full pages in it. Of course, the text was not written only by a couple of people but all the members of the prize committee helped with the wording and looked for additional information. Last year, the book about the National Awards of the Republic of Estonia was published for the second time, connecting all the categories: culture, sports and science and the Wiedemann Language Prize.

It is clear that on the whole Members of Academy have no problems expressing their thoughts virtually anywhere. Last year it happened more often than in previous years. There were weekends when the publications were essentially overwhelmed with the texts written by Members of Academy. However, it is noteworthy that something important in quality was added to the quantitative increase – a systematic approach. An opinion piece is a specific genre and similarly to writing a typical scientific article, it requires certain practising. The Members of Academy coped with it quite easily and thus, in cooperation with *Postimees*, a series of different stories were published. Together they give readers a good overview about how the Members of Academy think, as well as in what way it would be or it would have been correct to make the conclusions. As a practical result, it can be seen that plenty of trivial questions have vanished from the halls where I have had to present the Academy since the end of last year. Therefore, it is not only a compact flow of information we provide for the audience, but also an explicit transfer of competence to a relatively wide readership. The Academy is no longer a stranger, and the landscape of

academic values is not only easily available, but it has also been clearly explained.

We are also moving towards reasonable consolidation and efficiency. For a long time, there were two parallel competitions of scientific papers by young scientists. One of them was organised by the Estonian Research Council on behalf of the Estonian Ministry of Education and Research, and the second one was organised by us. There were two juries and a countless number of works were submitted to both of them. It was not reasonable. Last year, the idea of merging the competitions and the prize funds that had been in the air already for more than ten years was implemented. Of course, keeping in mind that both parties remained visible. We solved this through establishing special prizes of the President of the Academy of Sciences. The choice of words is interesting since they are called  $\pi$ -prizes, meaning that we may know things very precisely, but we will never know the exact value of  $\pi$ . A special prize in the amount of  $1,000 \times \pi$  (approximately 3,000 euros, mathematicians know better) will be given for the most elegant student research paper and an award of  $500 \times \pi$  for an unconventional student research paper – these are given for doctoral or master's theses. A prize of  $250 \times \pi$  is given to an auspicious scintillating spark. Jaan Aarik did great work in that joint jury panel as the coordinator and representative of the Academy.

We are definitely continuing with traditional scientific seminars, but we have mostly replaced them with science afternoons and science mornings, where we have largely focused on discussions with magazine editors and the television and radio presenters. In response to colleague Jaak Aaviksoo's remark that the Estonian Public Broadcasting overlooked a serious mistake: this year we have not been able to carry out these events for three months. As soon as we adjourned, things went downhill and therefore we have to continue. If there is no constant pressure, continuous notification, things tend to go out of hand. These are seminar-like events, a firework of brief 5-10-minute presentations. Some participants liked the format and set of ideas of these events so much that Postimees decided to use the format. So were born the so-called rendezvous of Postimees where the number of the Members of Academy among the listeners is unusually high. Among the speakers there is exclusively if not a Member of Academy, then a top scientist. We are only happy about these developments since the information field of Postimees and the Estonian media extends far beyond the best live broadcast from our hall.

We are continuously developing foreign contacts, playing the role of ambassadors of science. We established new direct contacts in the

Anglo-American countries with the National Academy of Sciences in the United States, Royal Society of Canada and Australian Academy of Science. In the Orient, we restored and updated contacts with the National Academy of Sciences of the Republic of Kazakhstan and Azerbaijan National Academy of Sciences. We are maintaining regular contacts – for example, representing Lindau forums in Estonia. To a certain extent, it seems that we are even more recognised abroad than in Estonia. For instance, Toomas Hendrik Ilves delivered one of our messages at the 6th World Congress of the Finno-Ugric peoples. The idea was to find opportunities for linguists of the Finno-Ugric languages writing in Russian to reach the global academic community more effectively. The aim is to collect the best works written in Russian, help translate them into English and publish them in our magazine *Linguistica Uralica*. It is remarkable that our colleague Ene Ergma was invited to speak at the 2nd Conference of the International Network for Government Science Advisers in Brussels about the complicity of relationship between scientists, society and politicians.

In addition, the daily organisation of work has been constantly under the microscope. We are already used to holding some of the Board meetings outside of Tallinn. Last year, we started to organise things in such a way that if the agenda did not require serious face-to-face interaction, we undertook to conduct the Board meetings through telepresence, saving a lot of time and resources.

Every week, the Management Board of the Academy gathers for brainstorming sessions. Within a couple of hours we form a joint position on the forthcoming questions and check among ourselves whether the new ideas work. No wonder that the ideas given to the Office for realisation receive attention and address a wide circle of people. The diary on the website of the Academy and the Facebook page managed by our staff have become effective tools. A remarkable point about the number of views and readers of our Facebook page – last December 12,700 people read an article posted by Anu Raud. The number of readers is still increasing.

Last year we complained that our undertakings had not lead to an increased material support, but this year we are a little bit happier. Our budget increased over a long time. The percentage of increase is not high, but it allows us to look more confidently to the future and actually start to grow the analytical competence. One of our achievements was receiving support from the Minister for the magazine *Horisont* (Horizon), the trademark of which we currently own. That amount of money is not enough to ensure reasonable functioning of the magazine, but it still covers a considerable

part of the costs. I will interpret all this as a signal that the state has not only noticed and tolerated our activities but also accepted and maybe even encouraged us a little bit.

Estonian Academy Publishers has undergone many changes. Open access to the journals has essentially existed for some time. It is not clear how the publication fee to the foreign authors will work exactly, specifically for the authors who are not supported from the money of the Estonian tax payer. But it has been introduced. It is important that the copyrights of older publications were clarified. The majority of our older publications are now available for everyone.

A minor detail, but still – Estonian young female scientists now have an opportunity to win the L’Oreal-UNESCO fellowship. The decisions made last year were realised this year: the first fellowship of 6,000 euro will soon be awarded to one Estonian female scientist. It is also an important sign indicating that a private enterprise or industry regards science as its own and important. We hope that this mindset will spread wider.

Everything did not go as we hoped. The forecasting part of the Estonian Development Fund went its own way. They are close to us, right here, in the Commander’s House and two members of their Advisory Board are the Members of Academy. The Institute for Advanced Study is – diplomatically speaking – still in the start-up phase. There are already certain sums from the RITA projects set aside for it. In addition, several realistic ideas are in the air, one of which is organising work sessions within the framework of the European Union future technologies network FutureICT 2.0. We hoped that expanding the Research Professor philosophy towards a theme-based professorship will be welcomed. It was, but we have still not found the financial support. Everyone we have talked to regards the idea very reasonable and, for example, in the research career model as an important bridge between the scientific landscape and public service – but until now, nobody has been eager to give money. The Ministry of the Environment is on the verge of breaking up in the context of establishing a new geological centre. In a sense, we had a cold shower last year, when the new research grant system prepared by the Estonian Research Council was disclosed. It questions the need for the Researcher-Professorship as an institution as a whole. We will continue talking about this topic.

We have talked about the elections of new Members of Academy in some contexts today. The elections gave a very contradictory signal, showing in some ways our strengths and weaknesses. Those characteristics can also be called academic straightforwardness, academic stubbornness and

inability to agree. In practical terms, this means that we can announce only three vacancies when electing Foreign Members this year, which will certainly mean a challenge for the Board when planning the elections and most probably internal disputes between the Divisions. I am very pleased that Toomas Asser raised a question about the current structure of the Academy. Does it reflect and represent Estonian science landscape adequately? These are extremely topical and important issues. I view the near future with great interest.

Strands of work for the future. In addition to existing publications, we definitely need something contemporary that is understandable and digestible for an active student, high school graduate or even a middle level official who does not have a Master's degree and the relevant skills to find simple truths from a complicated text. After all, our current yearbooks and other publications are mostly targeted to a demanding and sophisticated reader who is also a forgiving reader and whom we assume to be familiar with the scientific landscape and its values, as well as the organisation of research. We cannot expect this from everyone. It is a challenge not only for our Office, but for the entire Academy.

By now, the areas, challenges and borders within the framework of which the Academy can contribute are more or less becoming clear. Due to the changing society we are always in a situation where we need to adjust our statutory documents. Estonian Academy of Sciences Act, our Statutes and other documents have been prepared very carefully and professionally and so far, we have mainly made some cosmetic changes there. While last year we revisited the Statutes of the Estonian Academy Publishers, today we are reviewing the Statutes of the Academy. As a logical continuation, the Statutes of the Academy Divisions will follow. A more serious challenge is formulating our development paths and realistic goals, in other words, reviewing the Development Plan. Its amendment has been suspended for some time due to changes in the Board, but it will probably continue in the coming weeks.

I would like to add that several topics were not included in this overview purely due to lack of time. We have managed to do and achieve ever so much and all this cannot be covered in a twenty-minute speech.

## CLOSING REMARKS

President Tarmo Soomere

How conservatively we look at the future? We view the future with hope. Today, we have already talked about some strands of work we would definitely like to continue. We, as everyone has emphasised, certainly need a stronger voice of the Academy as a whole, perhaps also intervention, sometimes maybe even brutal intervention, when the media channels start to shatter the pillars of truth, not perceiving the risks.

What we will certainly try to do, is create more contemporary information materials that are attractive for as many social groups as possible and that could be in some way a different version of our yearbook. We have quite many good examples. These include the last yearbook of our “competitor”, Estonian Research Council. It is exciting, attractive, colourful, interesting to take in hand. Why should we definitely do this? It is totally logical that we will also convey the messages of the Estonian Young Academy of Sciences and aim at its target group.

Another keyword that is becoming increasingly necessary, is professional science-based advice. Currently, it is also recommended by Brussels. In a credible country scientific advice must exist; it is one of the supports or even the pillar of the development of the society. Small changes in our Statutes, the Act and the statutes of the divisions are kind of administrative questions. I do not think that it is just a replacement activity. We must have regulatory documents to guide us and although they may sometimes steal time from us, it is good to work with orderly documents. However, it is much more important to formulate some realistic goals that we could actually achieve, in other words, rewrite the Development Plan.

If we were to ask what the Members of this Academy could do to strengthen the Academy as a whole, there would certainly be solutions. As mentioned above, a contemporary personal academy is exactly as strong as its members. Acting as an institution adds a little, but not so much. There are solutions, if not good ones, then at least something to think about.

A Member’s allowance is extremely small. The Members and the Board of the Academy are often asked sharply for what is it actually paid for. What is it? Is it, for example, a special pension, which is improper to pay any more? A few weeks ago, I dared to raise this subject at the plenary session of artistic associations (a commemoration of the historical April plenary), reflecting that it should be considered as a contribution to scientific work – if not a guarantee of independence, then at least a support in case they

lost their job, etc., so that they could continue their work. According to the law, we currently take it as a contribution to the work of the Members of Academy, so that they could carry out their research and publish. According to the current position on research integrity, expressed in the guidelines of the Estonian Research Council, all sources of support must be indicated at publishing. By law, the Member's allowance is one of these. Former President of the Academy Richard Villems has recommended to follow this principle already years ago – to mark the Estonian Academy of Sciences as the second or third affiliation to one's publications.

I understand that in doing so we will face some rather painful issues. We encounter the baseline funding formulas, which are supposedly created together with scientists and taking their views into account. If a Member of Academy adds a second affiliation, it may happen that the subdivision where he/she works loses half of the money for that publication. Of course, this is a colloquialism that the subdivision loses half of the money, since it does not reduce the amount of allocations for baseline funding from the state budget. The amount remains in the budget of the university as before, so the changes are rather marginal and the specific university gets it back on account of the publications by the colleagues of the Member of Academy. But if we could show in the present day sickly indicator-driven society what proportion of publications or references of Estonian science is generated by Members of this Academy, it could be a strong argument for our officials who love the indicators. Perhaps that could increase the Member's allowance to somewhere near the minimum wage. Currently we do not dare to set bigger targets, but this should be realistic if everyone contributes to the best of abilities.

One interesting development from last week. Motivated by the richness of content of the opinion pieces by the Members of Academy, the editorial board of *Postimees* asked us if we could help answer questions arising in their everyday work. The leaders of the editorial unit said that the articles by the Members of Academy had answered questions they had not dared to ask. So far, we have answered the questions that we ourselves have thought out. The questions from the readers of the editorial board of *Postimees* are much simpler, but it appears that they are much more difficult to answer.

With 2,000-3,000 characters you must explain interestingly and attractively whether a healthy person can think himself/herself ill, or *vice versa*, whether a sick person can think an illness away. How is it possible that when we slide over the display of a smartphone, icons appear and things change? How does this twist happen, is it witchcraft? Where does our

water come from historically? *Et cetera, et cetera*. Why some people prefer yellow and the others green? These are the questions that people ask. These are not scientific questions in the classic sense of the word, but rather the type of questions – more specifically filtered in that way that they have been misused by apologists of pseudoscience who have given readers false answers. Comments by scientists could find a very wide readership here, says the editorial board of Postimees.

The daily Postimees would gladly open a new column where namely the Members of our Academy could explain such things. The flow of questions seems to be infinite. Through this, we can emphasise our concerns and the fact that science and the science based thinking is also possible in the case when the question is not an extremely complicated one. Maybe we cannot answer all the questions, or do not have enough competence in the Academy, but all 80 of us together should be able to answer one question a week, after all.

## GENERAL ASSEMBLY ON 6 DECEMBER 2017

### SUMMARY OF THE ACTIVITIES IN 2017

President Tarmo Soomere

Dear colleagues and guests! If we tried to characterise a year just in one or two words, then the Academy could call 2017 the year of partial materialisation of our dreams. Many undertakings, the success of which was not at all certain three years ago, have come true. It was quite difficult to choose a traditional number, for example three important milestones that would reflect this year. However, we did manage to choose them.

The first keyword is institutional: the Estonian Young Academy of Sciences was established. It is not our clone. Rather, it is a good partner that, in the eyes of many, including the President of the Republic of Estonia, has proven to be even more meaningful than our classical Academy. So we are a little bit jealous of their success story. But we are glad that we have had the opportunity to give them a boost.

The second keyword is the growing influence of workshop debates. In particular, I bear in mind the two rounds of the seminar “Perspectives of Estonian wood chemistry” and the related advising of national authorities. We are beginning to get used to the fact that the activities

and statements of the Academy regularly make the headlines. But perhaps it is unusual for us that they have begun to attract such a wide spectrum of interested people and are broadly reflected in a meaningful and far-reaching debate.

The third keyword is international prize. The first Endel Lippmaa Memorial Lecture has been delivered and a corresponding memorial medal handed over. The medal has cast Endel Lippmaa's initials in titanium in the truest sense of the word. The lecturer was Nobel Laureate Kurt Wüthrich. A very important aspect that many (partly also the Academy) do not know is that this event was largely supported by private capital.

In addition to the aforementioned, there are several more patterns to reflect this year. For instance, after a long while we can be happy about the tone of the rhetoric of the Riigikogu: if the Academy says something, it must be taken seriously. This was Rainer Vakra's stance as the Chairman of the Environmental Committee of the Riigikogu.

The whole of Estonia invested a lot of work and effort in the Presidency of the EU Council. It affected the Academy a bit less than the officialdom of the ministries. But we also had a lot more to do than in previous years. The most high-profile event in the Hall of the Academy was the speech of Frank-Walter Steinmeier, the President of the Federal Republic of Germany. It was more an academic lecture due to its typical characteristics.

A more personal and pleasant aspect for the Academy was that the Members of the Academy were recognized and many recognitions were granted by the Academy. Thus, the first L'Oréal-UNESCO fellowship was awarded to a young Estonian female scientist. The jury was ravished by the high level of the applications. The winner was Els Heinsalu, who also became the President of the Estonian Young Academy of Sciences. The prize of 6,000 euros is not an astronomical amount but it reflects the tendency that – just as in the case of Lippmaa Lecture – private entrepreneurship and industry are starting to regard science as important. In 2019 the number of L'Oréal fellowships should increase; the number will become clear in the course of negotiations. The fact that science prizes are coming to the Academy is quite common, and it is not surprising at all that both of the National Lifetime Achievement Awards went to Members of our Academy – Gennadi Vainikko and Enn Tõugu. But then, the number of annual prizes given to the Members of Academy this year was below average – only two – Richard Villems in chemistry and molecular biology, and Lauri Mälksoo in social sciences. They were seconded by Andres Metspalu who received the Baltic Assembly Prize for Science. Quite recently, there

was another pleasant announcement in the context of the Academy: our dear colleague Ene Ergma was awarded the Tiiu Sild Memorial Lifetime Achievement Award for long-standing and systematic communication of research and technology.

The fact that Members of this Academy write books is also quite common. Anto Raukas published two; and the book by Enn Tõugu is three times thicker inside than any book of Anto Raukas individually. Hando Runnel has been the locomotive for the book series Eesti Mõttelugu (The Story of Estonian Thought) for a long time. Today again we are presenting another book from this series that was actually released in spring. The book Teekond Hispaania (A Journey over Spain) written by our fellow Jaan Undusk was named the best travel book of the year.

There are even more motifs that hopefully will last for a while at least – the reflections of national science, culture and sports awards, as well as the Wiedemann Language Prize, were published together in one book for the third year already in a row. We have managed to convince our partners that a frequent reflection of achievements and actions of such outstanding people is important for the sustainability of the Estonian nation and culture. We have reached a point where the reflections of the prizes of different areas are more or less equally in-depth, and the book fills up a space of considerable two and a half centimetres wide on the bookshelf.

The series of three-minute lectures is a continuing success story. There we are trying to integrate seemingly opposing aspects: the training of young people, elements of competitiveness, a bit of glamour and visibility of science. This year the winning lectures of the first two years were immortalised as a book. It is a small step, but nevertheless a breakthrough. We have shown that the content created by the Academy can be commercialised. We are glad that people are willing to pay for the things we create.

We will continue the column in Postimees daily that reflects not so much the popular science but rather the relevance of science for society. This is where the strengths and weaknesses of the Academy, and sometimes even pride, become apparent. These texts are of interest to many people, according to the clicks as the Web administrators of Postimees say. At the same time, it seems that we are still unable to reflect and cover many topics that are important for science, the science community and society. When it comes to sensitive and urgent issues, our response time is still a

little too long. Perhaps it cannot be reduced much, but nevertheless, there seems to be room for improvement.

We have reached near the centre of the cultural landscape, as demonstrated by the Member of Academy Engelbrecht's appearance on Plekktrumm, which in itself is purely a culture TV programme. It is a symbolic fact that scientists' thoughts are already an integral part of Estonian culture. Arvo Pärt became the first musician to receive the Ratzinger Prize – a recognition that is sometimes called the Nobel Prize in theology, given out since 2011.

Our foreign relations have expanded both to the East and West. Contacts have been established with relatively young Academies of Central America – these are Academies of real scientists, not Academies of young scientists, but of young nations who aim to make science relevant in their countries. We have renewed our relations with countries in the East, such as the Azerbaijan National Academy of Sciences.

We regularly host international academic consortia workshops. Thus, in May this year, the meeting of the European Academies Science Advisory Council (EASAC) took place in Tallinn. On 13 October, a symposium called “New Approaches to Science for Policy in Europe” was held by SAPEA in this auditorium, which in some ways is important and relevant to the topics of today. We have two guests today: Maive Rute, Deputy Director General at EU Joint Research Centre (JRC), and Tea Danilov, Head of Foresight Centre at the Parliament of Estonia. A common theme in both presentations is how to convert the competence of the Academies into the advice that we give to the state and its authorities. Because generally our customer is not a private entrepreneur, an industry or even universities – the customer of the Academy is the state.

#### THE EUROPEAN COMMISSION'S SCIENCE AND KNOWLEDGE SERVICE

Maive Rute, Deputy Director General at EU Joint Research Centre  
(JRC)

I would like to follow up the topics and thoughts that President Tarmo Soomere just highlighted: the connecting points and intersections of science, society and politics. My presentation is a continuation of the SAPEA conference, which took place on October 13 right in this building.

How to better direct scientific inputs and evidence towards governing the state? Looking at how the society accepts the scientific evidence, it is not easy. For example, the big debate around the climate warming. Initially, there was a wide spectre of scientific opinions, but now a large number of scientists have reached a common understanding: approximately 97% of climate scientists are convinced that anthropogenic impact in climate warming absolutely exists. In this regard, there is a common scientific opinion. However, there are still 3% of scientists who disagree. But what is the public opinion?

According to a survey held in the USA, less than half of Americans were informed that the scientists shared a common opinion, but more than half believed that there was still much confusion and no common scientific opinion. We can disapprove this and wonder how they do not understand. Unfortunately, a policymaker or a head of state must consider the reality, where the majority of the electorate does not believe that the climate warming has anthropogenic causes. Why is it so? One of the reasons is the press. Following their best practices, the press seeks opinions from those 3% disagreeing scientists and amplifies these dissenting views. An ordinary person who reads and follows the press gets the impression that there is no common position.

The climate warming has definitely been the topic that has received a lot of attention and raised social debates. But this list could be continued by several other scientifically complex subjects, which are difficult to figure out without relevant professional education. Shaping the state policies is difficult, because we face very complex problems where things intertwine. We need a discussion, a debate. The data alone is not necessarily unambiguous. The available information may not reach the society, the voters and the policymakers adequately.

In addition, we encounter a situation we are all familiar with, where there is such a huge amount of data, scientific results and the results of studies that people just cannot handle. I am sure you know it perfectly from your daily work. Some time ago, it was at least thinkable to read the most important publications in the specialised field, but today ... My colleagues have found that 2.5 to 3 million scientific publications are published each year. People are physically incapable to cope with this amount. To date, we have long ago surpassed the volume of knowledge that has been collected for centuries and centuries. That moment was somewhere in 2009, when the collection of knowledge of earlier centuries equalised to what we produce today in a year or two. Nearly 30,000 publications – journals and different portals – publish scientific articles. On the one hand, it is

good news that we have more information than ever before – there is certainly a lot of information on the basis of which to form our opinions and strategies. On the other hand, we are totally up to the eyes in data, and it is very difficult to distinguish between what is truly adequate and what is not. Among this flood of information, there are obviously articles, seeking sensation that are less critical or are clearly biased.

I hope some help will come from supercomputers and maybe from artificial intelligence. To comfort myself, I looked up the following fact. In 2011 IBM launched a supercomputer Watson that analysed and processed human language. Watson was able to look through about one million books per second. But already in 2016 even cooler and stronger supercomputers were developed that were capable of processing a thousand times more material. Maybe in future we are able to use even more powerful computers in data processing. In the meantime, we need specialised people who, using a computer can help synthesise the information volume and bring out the most essential.

The situation of science itself adds question marks for the public sector and public opinion. Can we say that science is in a crisis in some sense? Maybe the audience thinks the situation is not that bad. Why do I ask? In the vast information flow, there are naturally all kinds of data that are not quite adequate. I can see it often from the perspective of the European Commission, no matter what area of activity it is. We can be sure that there is always some faction who has scientific analysis of impacts under their arm – and miraculously it is favourable and suitable just for them. Unfortunately, this is the situation today. Whether we talk about social policy or energetics – in every field, there is a specific interest group who has their own evidence in their back pocket. Therefore, it is difficult to be the wizard who puts together and compares all these studies to identify who actually has an adequate overview.

In addition, there are questions about science itself and here too, there is a need for debate. Are all the results published with big flourish really true and adequate? Last year, an extremely interesting analysis was published in the journal *Nature*. 1,500 scientists tried to achieve the same scientific results, published earlier by some other scientist. And – surprise-surprise – 70% of them were not able to achieve the earlier scientific result. There might be objective reasons for that – maybe the data was not the same, maybe the conditions had changed, but still – 70% of cases did not manage to reach the earlier published scientific results. For me, it is particularly remarkable that the same researchers were asked to repeat their own published results. And 50% of them failed to achieve their own previously

published scientific results. If that kind of information reaches the public, we can imagine that it will not have a positive impact on the reputation and credibility of scientific results. Although, I repeat: there are certainly objective reasons. Especially in biology or some similar discipline where objective reasons can be found, why repeating the same scientific result is not easy.

The numbers differed between fields of science. The most difficult was to repeat the results in chemistry: 90% failed and 60% were not able to achieve their own results again. In biology, this ratio was 80 and 60, in physics and engineering 70 and 50, and in medicine 70 and 60. If you have not read that article, I suggest you do that, it is extremely exciting. The article presents these numbers to generate discussion, but I think this could also feed into a more thorough analysis. Of course, there have been articles that stress the impact of financing on the objectivity of the results. One sensational finding is filtered from the whole data volume and it is amplified. Again, the result is that people will start to question the reliability of scientists.

Uncertainty and the trouble of searching the truth is built into science. This is natural. The same uncertainty exists also in the state policymaking. If we look at the cycle of policymaking or state governing, the theoretical model is beautiful and round: you look for problems in the society, find the data, gather the best evidence on how this problem should be addressed; then discuss it with all the parties and make a new law or a corresponding communication that will be approved in the government and the parliament. This is how it should be. But the reality is obviously much more multi-faceted and, especially at the European level, extremely complex. There is a huge amount of reactions, and the mutual exchanges of information are not linear. Influences come from business, civil sphere, from all kinds of interest groups, public sector organisations and also from the political level. Therefore, the actual formation of policies is much more complicated and associated with quite a lot of uncertainty and ambiguity. When science has certain built-in and natural uncertainties – but this is how finding the truth and knowledge works – , then the state policy and the European policy also have their own insecurities. All this together creates a situation where finding the dialogue between science and governing the state is complicated.

Of course, the objective and the main interest of science is to obtain a better understanding of the world, look for facts, evidence, understand how life functions. Science is primarily focused on a problem and it is searching, researching and discovering, moving towards finding the truth, towards understanding. At the same time, the state governing and the policies are

aimed rather at the management, decision making and actions, wishing to obtain clear inputs – a *yes* or *no*. A major and versatile scientific debate may interest someone intellectually, but it does not help in decision making that looks for evidence and direct opportunities for justifying the decisions.

Naturally, all policymaking depends on context and values. However, it does not necessarily help the mutual understanding. Governing the state cannot allow any mistakes and wrong decisions. Public opinion would not forgive that. At the same time, it is understandable that for science a negative result is also an achievement. Today, we are in a situation where such circumstances should be understood. If we want to give scientific inputs to policies, we need to understand how the state functions. Politicians must often take decisions in uncertain situations where facts are not necessarily known, where there are value conflicts and the time is short. Yesterday, I had an opportunity to talk at the round table organised by the Estonian Research Council where the budget policy specialists of the Ministry of Finance gave the last coalition negotiations for forming the government as an example. They had exactly two weeks to draw up completely unprecedented plans, including all the information what that could mean for the state and the budget. You may have been dealing with searching for some kind of evidence for years but then, at one point, you have two weeks to prepare the new policy justification. Often, there is very little time for thinking things through, as well as making calculations and predictions.

A number of alternative facts does not make the situation easier. We can see that in the sense of public opinion and the availability of information, things have become more complicated in almost every area of activity. It is an old truth that there are real, alternative and uncomfortable facts. But the problem has been magnified because of the social media effect where sensational or weird facts spread very quickly and, unfortunately, people take them at face value. Interestingly enough, believing in experts and accepting expert opinions has decreased in the whole western world. The studies conducted last year and at the beginning of this year, e.g. the study of the Pew Center (<http://www.pewresearch.org/>) showed an interesting observation. In the past, scientists and academic opinion were a solid authority and people believed in them, but now the opinion of a friend or “a person like me” seems to have an equal weight. This is kind of a new phenomenon that the weight of an expert opinion has decreased and the opinion of a neighbour, amplified in the social media has gained weight. The companies and people, like the Manager of Cambridge Analytica Alexander Nix, have given additional reasons for that. When analysing the shaping of public opinion that led to Brexit (also the

elections of president Trump), it became evident that in both cases the company Cambridge Analytica from Great Britain played an important role. It gathered information about people from the social media and used it for sending psychologically oriented messages. The result speaks for itself.

This kind of psychological targeting or digital psychometrics are new methods that have been used previously in marketing to some extent, but not at such an individual level like today. Nowadays, Facebook data show very clearly what topics we have liked for a hundred times, and based on this information, the system predicts our preferences and decisions better than even our spouses. That was a very interesting analysis! A few days ago I read a study that analysed whether a person would say *no* or *yes* about some topic, based on Facebook and Twitter. Then the result of the algorithm was compared with the opinion of the spouse or friends about the likely decision. The algorithms were stronger in any case! In short, based on Twitter and Facebook our psychological profile is more adequate than the one our friends and spouses are aware of. These methods are very effective, but certainly also extremely dangerous if they are not used for a good purpose.

Hence my request for you all today in this hall. We are in a situation where facts do not speak for themselves anymore. We need people like you who would present facts, steer the public opinion in the correct direction and help promote and communicate the truth, so that the half-truths and downright lies would not be magnified via digital media.

At the same time, we find that the earlier linear deficit model based on lack of knowledge – we, scientists, have information, they, policymakers, do not; if we give that information to them somehow, then everything is OK – does not certainly work anymore today. It is necessary that scientists find opportunities to shape the joint information field in stronger cooperation with the public sector and help formulate policies based on science and evidence. I am very pleased that during the Estonian Presidency, these facts were actually emphasised. At a scientific conference in Tallinn, a great document titled “Tallinn Call for Action” was published. It invites scientists to cooperate more with the state and the policymakers and find opportunities to provide the policymakers with actual evidence. Therefore, facts do not speak for themselves. We need a much closer cooperation model, a different cooperation model than we have today. Hoping that when we produce another fine glossy brochure and give it to someone who even has not asked for it, will change nothing.

At the Joint Research Centre where I work, we made a small map for the European Commission to understand who would give inputs to policymaking in one way or another. We now have the Scientific Advice Mechanism at the European level, also SAPEA, who brings together more than a hundred Academies and scientific associations. There is no single prophet and that is very good. The real solution lies in an ecosystem where the scientific input or any other input comes from different competence levels. For example, an adequate reflection of public opinion, not only over magnifying small factions and single groups, is also important for policymaking. We need to be aware of this ecosystem and contribute as much as we can to make it work; so that the necessary and proper scientific information would not get lost, but would actually reach the right people, at the right time and in the right format.

How can we shape this process and involve others? A system like SAM (Scientific Advice Mechanism) works for the European Commission. It is not the only input and contact place, but one amongst others and it is possible to get scientifically analysed information through it. We have a close cooperation with SAM, we are involved and provide support in preparing the reports. But our role is to consolidate, synthesise, analyse information from all possible sources and synthesise it in turn, so that it would reach the colleagues who deal with the relevant policymaking at the right time and in a distilled way. The so-called sense making means that all information from the whole world must be gathered so that the best knowledge, information pieces and practices could reach the ones who search for the best solutions for making public policies. We consider it very important to play the role of a synthesiser and data gatherer. None of our colleagues, whether active in energetics or employment policy, may not, on the one hand, have such training to actually analyse different inputs, and on the other hand, we often just do not have time for this. So, our role is the harvesting and distilling honey. Our Joint Research Centre is active in a very large range of policy, we cooperate practically with all Directorate Generals.

In the context of Estonia it would mean that Estonian scientists would give input to all the ministries. My concern is that this scientific input to policymaking would somehow be reduced only to an input of science and innovation policy. But we are still talking about the fact that all national policies and not only the scientific policy need scientific input. This is certainly the thing I wish to underline today. For example, the seminar on wood chemistry perspectives – how to better combine such discussions with what is happening in the political landscape? For me, that seminar on wood chemistry perspectives hit the bull's-eye since we are currently

dealing with bioeconomy, i.e. shaping a new strategy of economy based on bioresources and wood chemistry is also part of it. Therefore, sometimes the question is how to use the ongoing work in the best way to receive broader resonance and more visibility.

Our Joint Research Centre itself is a relatively big research institution. We have over 3,000 employees and about 70% of them are researchers and the rest are engaged in all kinds of support functions. The budget exceeds 400 million euros per year. But I would like to emphasise 62 millions in particular. In addition to the directly received 386 million euros we namely earn additional resources, which is quite exceptional since we are a branch of the European Commission. If we try to imagine it in the Estonian context, we are like a ministry that earns more money from the market – a relatively peculiar combination. We have over 1,400 scientific publications a year, but large part of our work also goes to the input of policymaking. We have over 40 labs and more than 100 possible models. And we run all possible models in economy, energetics, biology, etc.

An important message to you is that we are about to open the entire infrastructure for the researchers of the Member States. With certain regularity, we offer things like Call for Proposal of Interest on our website. We are looking for people who would like to come and use our laboratories and databases. Of course, we follow the Open Science principles – many of our databases are actually available for use today. Looking at the scientific level, we have top-class achievements and average ones, but I am happy to note that we are nevertheless a scientifically adequate institution, and we do have science that belongs to the top of the world. So don't be afraid, it is worth cooperating with us!

I would also like to refer to the practical solutions on how we cooperate with policymakers.

For example, we have three important Knowledge Centres: the Knowledge Centre on Migration and Demography, the Knowledge Centre for Territorial Policies and the Disaster Risk Management Knowledge Centre. The idea is to overcome barriers that arise in any organisation. But the research required for policymaking must be transversal, it must be able to take inputs from everywhere. That's why we have established these centres that centralise necessary information from our own house. We will add to that a network of practitioners, i.e. generate a group of people who practically work on migration and demographics topics. Scientists, employees of relevant ministries or Directorate-Generals and often people outside the house, like OECD, work together. This network starts to analyse data and

see what is really needed. This is not only a form of collecting knowledge and information, but also a very important place for assembling people.

We bring necessary tools to these competence centres. Data mining is imperative in almost all areas, but it is not yet fully understood, and there is also a huge lack of competent people. For our part, we provide all the Directorate-Generals with quality data mining know-how. These are relatively new things and in high demand – we have to redouble them since there is a high demand for business analysis, various indicator scoreboards and micro-economic analysis. It is very much needed in the European Commission as well. I recommend providing such tools and that kind of help as much as possible. Ministries are certainly ready to buy it.

In addition, we investigate what skills are needed to develop scientific methods and concepts. We do it both ways: what skills are necessary for scientists and what skills are required for ministries and policymakers; what are the scientific analysis methods, how to use the databases, etc.

I have a call for an action to you. One example of how we promote science for policymakers: in cooperation with the European Parliament, we initiated an event series called Science Meets Parliament. I am sure that in Estonia, it can be done as well. The point is that, within the European Parliament, the Members have their own topics to analyse. For example, a person is dealing with the reduction of vehicle emissions. This is a complex and technically difficult area that is hard to understand without professional training. Then, we provide the Members of the Parliament with a list of scientists who could help. The Members can select two or three scientists whom they would like to meet and talk to. These are not necessarily only our scientists, we also offer scientists from the Member States. We have used this scheme for a couple of years and we are doing very well. The Members of the Parliament can discuss the file they are currently analysing with the scientist. Afterwards, we organise a scientific conference where we thank everyone for their effort. At the same time, this set of topics becomes more visible. Maybe we should review here the site, maybe something can be done with the Estonian Parliament?

And another small challenge. A network of practitioners called Evidence for Policy Community (<http://europa.eu/!jj73DJ>) can be found online and in Twitter (#EU4facts). If there are people among you who would like to chip in and see what topics are discussed, you are very welcome to join. This is an open network, through which we share all kinds of information. And finally: our website EU Science Hub (<https://ec.europa>).

eu/jrc/en) – if you have the time to dig, you will find all the information about us. Advance warning: take your time, the amount of materials is huge. But with the help of keywords and the index you will find more or less everything.

# ACKNOWLEDGEMENTS TO MEMBERS OF THE ACADEMY AND FROM THE ACADEMY

## NATIONAL SCIENCE PRIZE

Based on nominations from the National Science Prize Committee, the Government of the Republic of Estonia by Order No.44 of 10 February 2017 conferred

SCIENCE PRIZE FOR  
OUTSTANDING  
ACHIEVEMENTS  
IN RESEARCH AND  
DEVELOPMENT  
Gennadi Vainikko

“...mathematics was one of my favourite subjects beside physics, music and physical education. I was bewildered by mathematics, particularly for the reason that all the self-explanatory phenomena (as they appeared to me) could be talked about in such a distinctly beautiful language ...”

Eesti Vabariigi preemiad (National Awards of the Republic of Estonia), 2017



SCIENCE PRIZE FOR OUTSTANDING ACHIEVEMENTS  
IN RESEARCH AND DEVELOPMENT

Enn Tõugu



“... I have been involved in research chiefly owing to my lively interest towards science and my scientific studies have been conducted in a manner that is best characterised by one of the catchphrases of the present day – enthusiasm-based. I have to admit that although my contentment with the results is by no means absolute, but I am truly pleased with a good few aspects in my professional life: working for a long time in an enjoyable company on interesting problems and, nevertheless, I must have made a certain contribution of my own into our aggregate reservoir of expert knowledge ...”

Eesti Vabariigi preemiad (National Awards of the Republic of Estonia), 2017

ANNUAL AWARD IN CHEMISTRY AND MOLECULAR  
BIOLOGY

Richard Villems, Mait Metspalu (research team leader), Toomas Kivisild,  
Luca Pagani, Monika Karmin, Lauri Saag



for series of studies “The essence and evolution of genetic diversity in human populations”.

ANNUAL AWARD IN SOCIAL SCIENCES  
Lauri Mälksoo



for series of studies “Russian approaches to international law and human rights”.

## ENDEL LIPPMAA MEMORIAL LECTURE AND MEDAL

Endel Lippmaa (15.09.1930-30.07.2015) was a distinguished Member of the Estonian Academy of Sciences and an influential figure in Estonian research and politics. On a worldwide scale, he still stands among the best known Estonian scientists of all time. By virtue of his legendary precision, versatility and expertise he made historic contributions towards the restoration of independence and building of open society in Estonia. Traces of his influence on the development of our country could be detected over a long period of time.

The Estonian Academy of Sciences established the Endel Lippmaa Memorial Lecture Series and Memorial Medal to pay homage to its dignified member. These awards were devised by the Academy to promote the diffusion of crowning research achievements and new ideas and, likewise, to recognise and acclaim the mission of scientists towards societal development. Thus, the Endel Lippmaa Memorial Lecture award is conferred on a prominent figure in science or public life, whose ideas have left a significant impact on the advancement of research or society and, moreover, whose activities of frontline research and serving the society are intertwined.

On 12 September, the Academy Hall hosted the first lecture in the Endel Lippmaa Memorial Lecture series given by Nobel Laureate Kurt Wüthrich (Nobel Prize in Chemistry 2002). The lecture was preceded by the conferral of the Endel Lippmaa Memorial Medal on Professor Wüthrich.

The medal was designed and executed in titanium by the metal artist/blacksmith Risto Tali.



A special fund was established under the auspices of the Estonian Academy of Sciences to manage financial resources required for organising the Endel Lippmaa Memorial Lectures in a dignified manner. The contributions are used to cover the expenses for the Endel Lippmaa Memorial Lectures and accompanying activities.

A fundraising board, including Riivo Sinijärv (Chair), Tiit Vähi, Enn Õunpuu, Jaak Järv and Margus Lopp, has endeavored to attract private money.

## RESEARCH PAPER PRIZES FOR UNIVERSITY STUDENTS

Since 2016 the Academy's Student Research Paper Contest has been merged with the National Contest for University Students organised by the Estonian Research Council. The representative of the Estonian Academy of Sciences on the Appraisal Panel of the National Research Paper Contest for University Students was Jaan Aarik. A new Appraisal Sub-Panel was formed to determine the best papers and nominate candidates for the special prizes awarded by President of the Estonian Academy of Sciences – the  $\pi$ -prizes. The sub-panel included Jaan Aarik (Chairman), Mati Karelson, Agu Laisk, Andres Metspalu, Lauri Mälksoo, Tõnu-Andrus Tannberg, Jaan Undusk, Gennadi Vainikko and Urmas Varblane. The laureates were announced at a prize award ceremony that was held on the premises of the Ministry of Education and Research Tartu Office at Munga 18.

Proceeding from the propositions of the sub-panel, President of the Estonian Academy of Sciences Tarmo Soomere decided to award the  $\pi$ -prizes as follows:

- Special Prize for the Most Elegant Paper ( $\pi \times 1000$  euro – 3141.59 euro) to Rauni Lillemets for his PhD thesis “Generating systems of sets and sequences” (University of Tartu, supervised by Member of the Academy Eve Oja and Dr. Aleksei Lissitsin);
- Special Prize for an Unconventional Paper ( $\pi \times 500$  euro – 1570.80 euro) to Liisa Eero for her Master's thesis “Quantitative analysis of paper using ATR-FT-IR spectroscopic method” (University of Tartu, supervised by Dr. Signe Vahur and Professor Ivo Leito);
- Special Prize for Auspicious Scintillating Sparks ( $\pi \times 250$  euro – 785.40 euro) to Oliver Paukson for his Bachelor's thesis “Between sanity and bloodshed: hegemonic masculinity ascribed to MMA fighters” (Tallinn University, supervised by Peeter Vihma, MA).

Also, several papers that had been commended by the sub-panel were acknowledged with Letters of Appreciation:

Bruno Strandberg for his elegant PhD thesis “Threshold  $\pi$ -*photoproduction* and Compton scattering on the deuteron” (University of Glasgow, supervised by Dr. John R.M. Annand);

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

Kaisa Ling for her elegant Master’s thesis “In search of a Neo-Baroque image” (University of Tartu, supervised by Professor Jüri Talvet);

Pikne Kama for his unconventional PhD 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 for her unconventional Master’s thesis “Cooling ceramic container for fruit and vegetables” (Estonian Academy of Arts, supervised by Heikki Zoova, MA);

Tanel Uibokand and KaurVahtrik for their auspicious Bachelor’s theses “Technological properties and areas of application of processed biomass” (Tallinn University of Technology, supervised by Professor Toomas Pihl).

Letters of Appreciation were also granted to supervisors of the prize winning papers.

Pikne Kama, one of the recipients of the Letter of Appreciation, presented his paper at the ceremony.

## ESTONIAN SCIENCE COMMUNICATION AWARD

The Estonian Science Communication Award is an annual state award that has been granted since 2006 for science communication activities aimed at the Estonian general public. Its primary focus is on acknowledging popularisers of science in Estonia and attracting more attention towards activities that introduce and foster research and technology in the society. Funded by the Ministry of Education and Research, the prizes are jointly awarded by the ministry, the Estonian Academy of Sciences and the Estonian Research Council. The competition was held for the twelfth year in 2017.

Due to the abundance of prize-worthy candidates, the Appraisal Panel (chaired by Member of the Academy Jakob Kübarsepp) made a decision to raise the total number of prizes destined for this year from the traditional 11 to 13.

The Tiiu Sild Memorial Lifetime Achievement Award for long-time systematic communication of science and technology was conferred on astrophysicist, Member of the Estonian Academy **Ene Ergma**, who is a vivid example of the possibility that a scientist may achieve success in other areas of activity beside research as well. During the last fifty years Ene Ergma has given an impressive number of public speeches and interviews, but also lectures on astrophysics at various schools and elsewhere, participated in high level visits and receptions of foreign delegations. Ene Ergma's political career is embellished with a significant achievement, both for Estonian economy and science – Estonia's accession to the European Space Agency.

Grand Prize in the category “Best researcher, journalist, teacher communicating science and technology” was awarded to **Arvo Tuvikene**, an ichthyologist who has continuously written articles about different aspects concerning fisheries, fish behaviour and the quality of fish as human food to various journals and book series for a very long time.

In the category “Activities/series of activities communicating science and technology”

- Grand Prize was awarded to a project introducing high schoolers to biotechnology “The Travelling Bioclass” and Professor Ants Kurg;
- Motivation Prize was conferred on Formula Student Team Tallinn, a non-profit organisation that popularises engineering science, captain of the team Indrek Petjärv.

Eesti 2.0, a non-profit organisation that inspires the next generation of Estonians to choose a future in technology, manager Ede Schank Tamkivi.

In the category “Science and technology communication via audiovisual and electronic media”

- Grand Prize was awarded to the Estonian Public Broadcasting science news portal “Novaator” and Executive Editor of the portal, science journalist Marju Himma-Kadakas;
- Motivation Prize was conferred on the Estonian popular science journal Horisont (Horizon) for its digitisation project making full-text journal articles publicly accessible, leader Ulvar Käärt.

In the category “Science and technology communication via printed media”

- Grand Prize was awarded to Mare Mürsepp and Heli Lukner for publishing the children’s reader on science and technology “Füübits”;
- Motivation Prize was conferred on Argo Publishers for publishing a series of popular science books “Elav teadus” (living science), Managing Director Lea Adamson.

Four Motivation Prizes were awarded in the category “Best new science and technology communication initiative”:

- open workspace and engineering workshops of the non-profit organisation SPARK Makerlab;
- hobby groups for children organized by Tallinn University Academy of Nature;
- “Mobile Workshops” introducing young people to work practices and tools of the metal and wood sector;
- University of Tartu Youth Academy piloted Investigation Lab.

The total amount of the competition’s prize money in 2017 was 21,500 euro, whereof the Lifetime Achievement Award was worth 6,500 euro accompanied by Stanislav Netchvolodov’s brass tabletop sculpture “The Möbius strip”. Every prize recipient is entitled to use the Nationally Recognised Science Communicator logo image, which is a prestigious token of quality and reliability in this area.

Results of the competition were announced and prizes were handed over during the science communication conference “Anname teadushuvile võimaluse II” (Let’s give science interest a chance, 2) held on November 22 in a waiting pavilion of the Baltic Railway Station.

## L'ORÉAL-UNESCO BALTIC FELLOWSHIP

Founded in 1998, the L'Oréal-UNESCO “For Women in Science” partnership was created to recognise and promote talented women in science, to reduce gender inequality, to inspire the next generation of women. Since the launch of the programme, more than 2500 women researchers from over 110 countries have received support for building their career.

For the first time, outstanding Estonian female researchers had an opportunity to join the programme in 2017: one fellowship of 6000 euro was awarded to a PhD under the age of 40 working in Estonia in the field of life and environmental sciences or physical sciences. Estonian candidates submitted 23 applications. The applications were evaluated by a five-member jury established by the Estonian Academy of Sciences, including: Members of the Academy Ergo Nõmmiste and Ain-Elmar Kaasik, Academy Research Professors Anne Kahru, Malle Krunks and Tiina Nõges.

Estonian winner of the fellowship was Els Heinsalu (in the photo, with husband and children), Senior Researcher at the National Institute of Chemical Physics and Biophysics, who studies linguistic and ecological



systems. These systems, at first glance, appear to be quite dissimilar in the eyes of a bystander, but their underlying mathematical models are relatively homogeneous. By adapting instruments, methods and models that have been devised in one of the areas, it is possible to solve problems of the other. Alongside her successful career in research Els is a mother of four children, an effective populariser of science and one of the founding members of the Estonian Young Academy of Sciences.

The Estonian, Latvian and Lithuanian winners were announced at the official ceremony that was held on May 26, 2017 at the Latvian Academy of Sciences in Riga.

#### PRESIDENT TARMO SOOMERE'S SPEECH AT THE AWARD CEREMONY OF THE L'ORÉAL-UNESCO BALTIC FELLOWSHIPS

Dear President of Latvia, Your Excellences, distinguished guests, ladies and gentlemen:

It has become a cliché to speak about science as the driver of society or even about science-led economy. As in many other fields of societal life, these words are almost losing their meaning and becoming buzzwords. On days such as today it is instructive to take a look back and remember how driving the society actually works. It is convenient to do so by matching our doings with words of giants on whose shoulders we stand.

Peter Drucker (1909–2005) was one of the greatest thinkers of the 20th century. He mostly explored how humans are organised across the business, government and non-profit sectors of society. This is exactly relevant to scientific landscape and even more directly related to production by private enterprises. Perhaps the most well-known contribution from him that changed the world was coining the word “knowledge worker”. This term was designed to denote the workers whose main capital is knowledge. Many people have this quality today, from engineers and scientists to public accountants, lawyers, etc. – in other words, including everybody, whose line of work requires one to “think for a living”.

Peter Drucker told golden words about the power of knowledge by saying that knowledge is the source of wealth. He also added how it should be handled or used, with respect to two categories. If knowledge is applied to

tasks we already know, it becomes productivity. Alternatively, if knowledge is applied to tasks that are new, it becomes innovation.

Many thinkers have stressed that fundamental research into increasing our knowledge is essential if we really want to secure the future. Perhaps the one who most notably did so was the late president of Israel Shimon Peres. He told that there was no way to escape poverty without science and there was no way to achieve peace without science. Helmut Schwarz, a foreign member of the Estonian Academy of Sciences, a former colleague and one of the former teachers of Angela Merkel, has told that without science we are unlikely to be able to construct a future that is worth of living.

Today's laureates have all provided an excellent contribution to this sort of future that is worth living.

The competition for the awards by L'Oréal was organised in Estonia for the first time this year. Even though we think we have many good scientists, it was a surprise for many and even a shock for some how many brilliant female scientists are working in our country.

The jury did not disclose how exactly they organised the procedure but they did tell that they faced a major challenge. It was relatively easy to shortlist six best nominees out of 23 applications, much more puzzling to reduce that list to three sparkling scientists, and particularly demanding to select the winner. The jury routinely went through the common scientometric indicators such as the number of published papers, their citations and Hirsch index. As these aspects are known to be deceptive often enough, the jury also looked at the career trajectories of the nominees, from their graduation from universities over previous recognitions up to their visibility in society today.

The laureate from Estonia, Mrs. Els Heinsalu, started her scientific career from theoretical physics, an area that is commonly driven by community of male physicists. Her PhD thesis was graded as "summa cum laude", that is, among the absolutely best in the field. The laureate wandered then over several areas of physics and mathematics, contributing inter alia to studies of dark matter in the Universe and into search for the Higgs boson or the onset of mass in our Universe. The most beloved area for her seems to be stochastic motions, from the well-known Brownian motion to stochastic dispersion. The resulting agglomeration of knowledge about physics and mathematics was next applied to the dynamics of language.

I can only guess that this essential and unexpected societal dimension of her research may have imposed the jury. In this context it is appropriate to remind that Estonian language is among the smallest languages of high-level science in the world and thus the issues of sustainability of our language are highly nontrivial.

Additionally to several recognitions, Mrs. Els Heinsalu was nominated as a founding member of the Estonian Young Academy of Sciences, to be formally launched on 31 May 2017. It is remarkable that she shows excellent performance on scientific landscape and at the same time is the mother of a large family with four small children.

Perhaps the strongest argument for the jury, however, was that she is today clearly a well-established, mature scientist. She has stepped far out of the shadow of her supervisor and drives research following her own ideas. This is not usual for many scientists of her generation and even more unusual for female scientists. It is well known that there exists a clear, transparent but extremely persistent glass ceiling for female scientists. This glass ceiling prevents many brilliant young people from achieving the results and positions they deserve.

Even though the principle “every person counts” is true for the entire world, it is much more important for small communities such as Estonian. Every expert counts here by an order of magnitude more. We cannot afford to lose any talents. It is our common imperative to build conditions that favour advancement of every single talented scientist.

From this viewpoint I am particularly glad that global enterprises such as L'Oréal are investing already many years into efforts that motivate to penetrate through this glass ceiling that hinders the growth of approximately one half of scientists. Their efforts serve as brilliant evidence of good will of many from private sector. Additionally to the clearly defined material benefit for female scientists, this initiative is a strong reminder for the public sector and particularly for the entire academic community that there are ways to perform better than we have done until now.

## NATIONAL CONTEST OF YOUNG SCIENTISTS

The annual Young Scientists' Festival was organised by the Estonian Research Council on 27-28 April 2017 in the Glass Hall of Tallinn Song Festival Grounds. The final judging round of the National Contest of Young Scientists and the award ceremony are the main events of the festival. The awardees of national and special prizes were selected from among the poster presentations of the best projects that had been chosen in the qualifying round. The Estonian Academy of Sciences awarded its special prizes to the following contestants:

- Hartvig Tooming (Tallinn French School) for the project “The effects of dark energy on estimating the mass of galaxy clusters by using the Virial Theorem method” - a future-oriented novel investigation that may change our understanding about the structure of the Universe;
- Britha Kuldsaar (Saaremaa Co-educational Gymnasium) for the project “Vaccination - opinions for and against expressed by residents of Kuressaare” - a study on a socially influential topic combined with practical implications;
- Sixten Alex Luik and Richard Annilo (Hugo Treffner Gymnasium) for the project “Investigation of memory by virtual reality tools” – an interdisciplinary treatise distinguished by its fresh look and exhaustive exploration of scientific literature;
- Karel Külm, Ädu Arvisto and Mattias Aksli (Hugo Treffner Gymnasium) for the project “A model schoolhouse of Hugo Treffner Gymnasium at Hobuse 2, Tartu” - an admirable example of multidisciplinary teamwork entwined with fine craftsmanship, devoted to the school the contestants attend.

The jury of the Academy was composed of three Members of the Academy: Secretary General Jaak Järv, Jüri Engelbrecht and Ain-Elmar Kaasik and three founding members of the Estonian Young Academy of Sciences: Ester Oras (University of Tartu), Ringa Raudla (Tallinn University of Technology) and Katrin Tiidenberg (Tallinn University).

# PUBLICATIONS OF THE ACADEMY

Books published by the Academy in 2017:

- “Estonian Academy of Sciences Year Book” XXII (49) in Estonian and English.
- “*Eesti Vabariigi preemiad 2017*” (Awards of the Republic of Estonia) – compiled articles presenting recipients of the Science, Culture and Sports Awards and the F.J. Wiedemann Language Prize through brief biographical sketches and reflections of their major achievements – brought together into one book.

Electronic versions of all the publications are available at [www.akadeemia.ee](http://www.akadeemia.ee).

# INTERNATIONAL SCIENTIFIC RELATIONS

The Estonian Academy of Sciences represents Estonia in several international scientific organisations bringing together science policy makers and researchers with high level of excellence on trans-disciplinary issues.

The European Academies' Science Advisory Council (EASAC; [www.easac.eu](http://www.easac.eu)) unites the national science academies of the EU member states, enabling their collaboration in building science into EU policy. The Estonian Academy of Sciences is a member since 2004. Margus Lopp represents Estonia on the EASAC Council. EASAC's work of providing independent science-based advice for policy-makers is divided into three programmes: Biosciences, Energy and Environment. Each of these is run by a Steering Panel. Chairman of the Academy Committee on Marine Sciences, President of the Academy Tarmo Soomere continues as a member of the Environment Steering Panel. He also acts as a liaison between the Panel and the European Marine Board (EMB; [www.marineboard.eu](http://www.marineboard.eu)), working towards harmonisation of their activities and better communication between them. Enn Lust represents the Academy on the Energy Steering Panel.

Expert groups consisting of nominees by the academies analyse the topics (incl. EU document drafts) that have been scoped and recommended by the panels. The resulting reports forecast trends and potential implications of these trends on the society, aiming to incline policy-makers towards evidence-based decisions. All reports are available at <http://www.easac.eu/home/reports-and-statements.html>. The Academy communicates the reports to the Estonian policy-makers and stakeholders. EASAC Council had selected Tallinn as the venue of its meeting in May 2017 and consequently the Academy hosted the meeting. To advance national interests and objectives, more Estonian experts should participate in the working groups. Regrettably the Academy cannot afford to subsidise such assignments due to a restricted budget.

The European Federation of Academies of Sciences and Humanities (ALL European Academies, ALLEA; [www.allea.org](http://www.allea.org)) brings together scientific academies from more than 40 European countries. Estonian Academy of Sciences is a founding member from 1994. ALLEA focuses on key issues

of science strategy and policy (incl. research integrity, different autonomy facets of research institutions, intellectual property rights, open access to research data and digitisation problems, science education, etc.). ALLEA's policy work is assisted by several permanent working groups and *ad hoc* task forces. Raivo Uibo is a Member in ALLEA Permanent Working Group on Science and Ethics. In March 2017, ALLEA released a revised version of the European Code of Conduct for Research Integrity. The revision addresses emerging challenges emanating from technological developments, open science, citizen science and social media; among other areas revision is motivated by current developments in the European research funding and regulatory landscape, changing institutional responsibilities, and evolving review procedures. The Academy arranged the Code to be translated into Estonian and made the translation available on its website.

EASAC and ALLEA together with their partner organisations (*Academia Europaea*, FEAM and EuroCASE) signed a Memorandum of Understanding to pull together timely, independent and evidence-based scientific expertise for the highest policy level in Europe. For this purpose, the consortium initiated a project *Science Advice for Policy by European Academies* (SAPEA) that won a funding within Horizon 2020 and is a part of the European Commission Scientific Advice Mechanism (SAM).

The Academy is a member in two organisations that emerged as independent entities from under the European Science Foundation umbrella – European Marine Board (EMB; [www.marineboard.eu](http://www.marineboard.eu)) and European Polar Board (EPB; [www.europeanpolarboard.org](http://www.europeanpolarboard.org)). National activities and membership in those Boards are coordinated by Academy Committees on Marine Sciences and Polar Research respectively. EMB is an independent non-governmental advisory body whose primary mission is to advance cooperation in marine sciences across Europe and to bridge the gap between science and policy. The priority goals include designing marine science-policy agenda by identifying new challenges and opportunities, consolidating efforts into collective actions and translating proactive competencies into practice in order to bring European marine research to the forefront of the marine science arena worldwide. EMB provides a platform for its 33 member organisations to develop common research priorities and strategies, both at national and EU level. President of the Academy Tarmo Soomere was one of the eight EMB founding directors and continued as Vice-Chair until the end of his second term in April 2017.

Mandated by four Estonian institutions holding natural science collections (University of Tartu, Estonian University of Life Sciences, Tallinn University of Technology and Estonian Museum of Natural History), the Academy has

entered the Consortium of European Taxonomic Facilities (CETAF; [www.cetaf.org](http://www.cetaf.org)). The Academy Committee on Phylogeny and Taxonomy (chaired by Urmas Kõljalg) is responsible for coordination of national activities.

The *Union Académique Internationale* (UAI; [www.uai-iaa.org](http://www.uai-iaa.org)) unites academies engaged in the so-called soft sciences, mostly the humanities. Jaan Undusk is the delegate of the Academy in the UAI.

The Academy takes part in the work of several other worldwide scientific organisations, for instance in the International Council for Science (ICSU; [www.icsu.org](http://www.icsu.org)), a global partnership of science academies IAP ([www.internationalacademies.net](http://www.internationalacademies.net)), etc. In 2017, ICSU member organisations held debates over the forthcoming merger with the International Social Science Council (ISSC; <http://www.worldsocialscience.org>), on the mission and strategy of the emerging new international organization for the social and natural sciences. In May, the Latvian Academy of Sciences hosted the annual meeting of the European ICSU members in Riga. The participants, while supporting the merger as such and key strategy elements and priorities drafted so far, focused on the core values of the new Council and drafted a statement for the ICSU secretariat to note. Secretary General Jaak Järv attended the meeting.

Several Members of the Academy belong to the membership of other national and international science academies and participate in their work.

The Academy continued supporting the contacts of the Estonian scientific community with international scientific unions, whose mission is to provide a forum, synergy, strategy and voice in their areas of knowledge. The Academy gives priority to ICSU member organisations. By means of a targeted allocation from the Ministry of Education and Research, the Academy organised payment of membership dues and supplied the Ministry with a review on the activities of respective national committees and contact points (see the list in Appendix 2). Cooperation activities exercised under the auspices of scientific unions are intertwined with collaborative projects within EU FPs. The first-mentioned component quite frequently helps to create the environment and preconditions for constructive preparation of a collaborative research project. Vigorous activities of Estonian representatives in European and worldwide scientific organisations lead to greater visibility and effective image building. On the other hand, they secure the Estonian research community with a gateway to decision-making processes at the European level and, likewise, give them access to international discussion forums with scientific approaches to issues vital for Estonia.

The Estonian Academy of Sciences, similarly to many other European academies, provides support to international mobility of researchers by running a scientific exchange programme.

Bilateral cooperation agreements (full list of partners is presented in Appendix 3) serve as the formal basis for exchange of scientists. In 2017, agreements were renewed with two partners: the Royal Swedish Academy of Letters, History and Antiquities and the Czech Academy of Sciences. The scientific exchange programme is run on the traditional cost-sharing principle: living expenses of visiting researchers in the host country are covered by the receiving party. Reciprocal visits within bilaterally accepted joint projects are given preference over individual research; the sending Academy selects the visitors to be nominated to the host Academy, as a rule. In 2017, the Estonian Academy of Sciences, together with the corresponding partner academies, announced a call for Estonian-Czech and Estonian-Bulgarian joint research projects, intended to be carried out in 2018-2020. The lists of the jointly selected projects will be made available on the Academy website.

The quantitative dimension of the exchanges displayed a modest decrease by comparison with the previous year. General figures are the following. Estonian scientists and scholars made 57 (2016 – 72) study and conference visits in 2017, using a total of 448 (453) days. The total expenditure to cover the living costs of visitors was 20,180 EUR. The number of hosted researchers was 61 (64); the visitors worked at Estonian universities and research institutions for 375 (393) days in total. The average daily expenses were 53.81 (2016 – 51.86) EUR. Larger Estonian universities upheld their position as the most frequent users of the exchange scheme in both directions (outbound from Estonia – inbound to Estonia): the share of the University of Tartu constituted about a third of the visits, that of Tallinn University of Technology – a fifth.

Although the list of cooperation agreements currently includes 34 partner organisations (as of January 1, 2018), the exchange programme was in fact employed with about a dozen partners; the largest volume of visits was reached with Polish, Hungarian and Czech partners. At this point we should take into account the fact that the opportunities for researchers to apply for travel grants have significantly multiplied (FPs, programmes co-funded by EU structural funds, national mobility grants, etc.) by now.

The Academy encourages direct contacts of young researchers with top actors in the world of science. For that purpose the Academy has signed a trilateral co-operation agreement with the Council for the

## Lindau Nobel Laureate Meetings and the Foundation Lindau Nobel Prizewinners Meeting.

The mission of annual meetings that take place in the small town of Lindau (Germany) is to educate, inspire and connect. It is a unique opportunity for young talents all over the world (numbering around 500) to meet the older generation, *crème de la crème* of the academia – Nobel Laureates (about twenty-thirty every year). In June 2017, the Academy nominated PhD Gert Preegel (Tallinn University of Technology) to the 67th Lindau Nobel Laureate Meeting (Chemistry). In August 2017, the organisers of the 6th Lindau Meeting on Economic Sciences accepted two doctoral students of the Faculty of Economics, University of Tartu – Tarmo Puolokainen and Kärt Rõigas. In autumn 2017, the Academy organised the national competition for 2018 meeting in physiology and medicine and nominated the best candidates for evaluation by the selection panel of the organisers in Lindau.

The negotiations that the Estonian Academy of Sciences and the Estonian National Commission for UNESCO held with the SIA L'ORÉAL Baltic, resulted in signing a trilateral Memorandum of Understanding in January 2017. The created partnership enabled Estonia to participate in the L'ORÉAL Baltic Fellowship Programme “For Women in Science” – an international programme that had been founded in 1998, to recognise and promote talented women in science, to reduce gender inequality, to inspire the next generation of women. Since 2017, outstanding Estonian applicants have an opportunity to join the programme: one fellowship of 6000 EUR is awarded annually to a PhD under the age of 40 working in Estonia in the field of life and environmental sciences or physical sciences or engineering. The Estonian applications are evaluated by a jury established by the Academy. The very first awardee was Els Heinsalu (Institute of Chemical Physics and Biophysics); for more details, see pp.114-115.

Representatives of the Academy traditionally visited other academies – the full list would be long. In March, the Academy delegation took part in the XV Baltic Conference on Intellectual Cooperation “The Future of Teacher Education in the Baltic Region: Towards Research Based Teacher Education”, hosted by the Finnish Academy of Science and Letters in Helsinki. In July, President Tarmo Soomere had a number of meetings with the leaders of National Academies of Sciences (in Nicaragua, Costa Rica and Florida). Academy representatives attended (as key speakers) many international scientific and science policy conferences and had meetings with delegations that visited Academy, e.g. Ms Sonia Ortega, Head of the European Office of the US National Science Foundation, delegation of the Shanghai Academy of Social Sciences, delegation of the

European Molecular Biology Laboratory. Academy Committee on the Marine Sciences, supported by the Estonian Environmental Investment Centre, acted as a co-organiser of the Gulf of Finland trilateral cooperation conference “From Small Scales to Large Scales” in October, etc.

Estonia is a natural part of the European Research Area. Under these conditions it is reasonable to lay emphasis on cooperation with the European Union institutions and on active participation in EU initiatives, programmes and projects.

Ministry of Education and Research has delegated President Tarmo Soomere as the Estonian representative in the pan-EU network of government science advisers. This is an informal network consisting of members who have been nominated by the EU member countries and represent science advice structures of variable degree of formalisation. The network works together with the seven members of the SAM High-Level Group of Science Advisers whose mission is to provide high quality scientific advice on specific policy issues to the European Commission. T. Soomere attended the European Science Advisers Forum (ESAF) - 3rd Meeting (Amsterdam, June 2017) and was a co-speaker on the topic of global digitisation and its repercussions for democratic societies with a presentation “Handling digital avalanche: I-country and Big Data”.

During the Estonian Presidency of the Council of the European Union, the Academy residence had the honour of being a venue of several high-level events, for example European Research Council conference “Strengthening Europe’s Science Base” (with Member of the Academy Mart Saarma as a key-note speaker), SAPEA symposium “Crossing Boundaries: New Approaches to Science for Policy in Europe”, etc.

The European Union strives to provide researchers with advantageous career opportunities, including support services for those relocating to another country. Together with the Estonian Research Council as the national coordinator and other partners (public universities and scientific institutions), the Academy participates in the EURAXESS network. EURAXESS – Researchers in Motion is an initiative of the European Commission, founded to advise mobile researchers, doctoral students and their family members on administrative and practical issues. Service centres offer information on a broad range of queries, e.g. visas, residence and work permits, research vacancies, social insurance, availability of medical aid, daily life utilities, etc. The European Commission assembles the network members for European meetings, trainings and conferences, attended among others by the foreign relations staff of the Academy. For greater detail, visit [euraxess.ee](http://euraxess.ee).

## ANNIVERSARIES



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Valdek Kulbach

Valdek Kulbach was born on 6 April 1927 to a farmer's family in the rural area close to Narva, Ida-Viru County. He began his education at Narva Elementary School No.1, graduated from Nõmme Gymnasium in 1945 and enrolled at Tallinn University of Technology. His final choice from among available options for further study was hugely encouraged by Professor Ottomar Maddison, whose lectures he had been attending during his senior year of high school. Valdek Kulbach graduated from Tallinn University of Technology in 1951 with a diploma in construction and civil engineering. He continued with postgraduate study in the Hydro Engineering Faculty of Leningrad Polytechnic Institute (present-day St.Petersburg State Polytechnic University), earning his Candidate of Sciences (equivalent to PhD) degree with a thesis about the effect of filtration on the stability of sand slopes in 1955. His Doctor of Sciences degree was earned in 1973

at Tallinn University of Technology with a dissertation “Calculations for saddle shaped hanging structures of deformable contour”.

Between 1948 and 1952 Valdek Kulbach was employed with the design office Eesti Projekt as an Engineer, Senior Engineer and Head of Building Group. Since 1955 his academic career has been associated with Tallinn University of Technology, where he started as an Assistant and progressed to Senior Lecturer, Associate Professor and Professor. His other positions at the university include: Vice Dean of the Faculty for Evening Studies and Dean of the Faculty for Extension Studies (1963-1975), Head of the Chair of Building Structures (1975-1990), Dean of the Faculty of Civil Engineering (1994-1995). Valdek Kulbach was Professor of Steel Structures at the Department of Structural Design from 1990 until he became *Professor Emeritus* in 1998.

In 1986 Valdek Kulbach was elected a Member of the Estonian Academy of Sciences in the area of mechanical engineering.

The areas of engineering that Valdek Kulbach has studied more thoroughly include: performance analysis of steel structures, filtration and slope stability problems, temperature stresses, calculation of cable structures. Alongside his strictly academic activities, Professor Kulbach has been directly involved in condition assessment of various buildings, bridges, reservoirs and mast structures, as well as in preparing strength criteria proposals and designing technologically complicated infrastructure facilities (railway, highway and pedestrian bridges in Tartu, Pärnu, Narva and elsewhere, acoustic screens for the song festival tribunes in Tallinn and Tartu, and the Saaremaa Bridge).

Valdek Kulbach has taken part in the work of several scientific organisations and professional associations in Estonia and abroad (1955-2010), provided technical expertise and consultancy to multiple design offices and building enterprises, prepared design standards commissioned by the Estonian Standards Board, etc. He has supervised numerous graduate, post-graduate and doctoral students and been an opponent and reviewer of plentiful dissertations. His publications enfold over 150 scholarly articles, several monographs and specialty textbooks.

Professor Kulbach's work has been recognised with several inventor's certificates and industrial exhibition medals. His professional awards include the State Prize of the Estonian SSR (1970), National Science Prize (1995) and Engineer of the Year title (2000). In 1999 Valdek Kulbach was honoured with the Estonian state decoration Order of the White Star, 4th class and

in 2008 with the National Science Prize for outstanding achievements in research and development – Lifetime Achievement Award.

Valdek Kulbach in his own words has mentioned that his favourite form of relaxation is to perform engineering tasks. He also enjoys stamp collecting and moderate-intensity physical activities, e.g. skiing and swimming.

## Huno Rätsep



Huno Rätsep was born on 28 December 1927 in Tartu. In 1946 he graduated from Tartu Secondary School No.1 and in 1951 from the University of Tartu majoring in Estonian philology. After taking the post-graduate course in Finno-Ugric languages he defended his dissertation for the Candidate of Sciences (equivalent to PhD) degree in philology on the topic “Infinite forms in Finno-Ugric languages” in 1954. In 1975 he defended his Doctoral dissertation “Structure of simple sentences in the Estonian language: verb-centred sentence patterns”. In 1978 it was published also as the monograph “Types of simple sentences in the Estonian language”. For that work Huno Rätsep was awarded the State Prize in 1980.

In 1954 Huno Rätsep started working at the University of Tartu, Department of the Estonian Language, where he devoted himself to studying the history of the Estonian language. In the 1960s, he started to give lectures and seminars on structural linguistics and generative grammar. In 1965, under the leadership of Huno Rätsep, a group of generative grammar was instituted at the Department of the Estonian Language, attracting younger teaching staff, post-graduate and undergraduate students. Those researchers later evolved into the Research Group of Computational Linguistics and the Language Technology Group. Huno Rätsep worked at the Department of the Estonian Language for over forty years, almost twenty of which (1975–1999) as Head of the Department. He was awarded

Professorship in 1977. Since 1994 Huno Rätsep is *Professor Emeritus* at the University of Tartu.

In 1981 Huno Rätsep was elected Member of the Estonian Academy of Sciences in the field of the Estonian language.

Huno Rätsep has extensive linguistic interests. He has introduced new linguistic trends, while also being interested in the history of language. He has written about the syntax, morphology and vocabulary of the Estonian language and published both diachronic and synchronic approaches. He has supervised a dozen of theses, as well as delivered lectures on the history and syntax of the Estonian language in Finnish and Swedish universities.

In 1982-1989 Huno Rätsep was the Chairman of the Mother Tongue Society. He is a member of the editorial board of the journal *Linguistica Uralica*, and an Honorary Member of the Mother Tongue Society, the Learned Estonian Society, the Finno-Ugric Society (Helsinki) and Johannes Aavik Society.

In 1998 Huno Rätsep was acknowledged with the F. J. Wiedemann Language Prize and in 2010 the Paul Ariste Medal of the Estonian Academy of Sciences. In 2001 he was awarded the Estonian state decoration Order of the White Star, 4th class.

Foreign Member  
Endel Tulving



Endel Tulving was born on 26 May 1927 in Petseri to a judge's family. His studies at Treffner Gymnasium in Tartu were interrupted due to war events. His education continued as a refugee at Geislingen Estonian Gymnasium in Germany. After emigration to Canada, he proceeded to study psychology at Toronto University, which he graduated from in 1954. Further studies took him to Harvard University, where in 1957 he obtained his PhD in experimental psychology. A year earlier, Endel Tulving had started his pedagogic career at Toronto University, where he ascended the academic career ladder from Lecturer to Professor (starting from 1965). He was simultaneously holding Professorship at Yale University (1970-1975) and California University (1994-1998). He also worked six years (1974-1980) as Dean of the Department of Psychology at Toronto University. In 1985 Endel Tulving was elected University Professor of Toronto University – an acknowledgement bestowed on a very limited number of individuals. After becoming *Professor Emeritus* in 1992 he committed himself to research at Rotman Research Institute at Baycrest Centre, as Head of the Cognitive Neuroscience Sector.

In 1960 Endel Tulving pioneered the research into processes, enabling to restore memories and extract information from memory. 40 years back he published an article, whose message – there is no single memory – triggered revolution in the area of memory research. Discoveries made by him and concepts created by him revolutionised the understanding how human memory works. The trajectory depicting the progress of the

researcher's thinking is best characterised by the following key-words: episodic memory, specificity of coding, priming, HERA and chronesthesia. Endel Tulving differentiates between at least two memory systems: episodic memory helps keep in mind personally experienced events, semantic (meaningful) memory, however, retains facts and knowledge of the world. He has also described one type of memory, presently known as priming, i.e. subliminal memory. Autobiographic memory – chronesthesia, presuming the capacity of perception and cognisance of time is, upon his assertion, unique to the human culture. Endel Tulving has authored several books and over 200 scientific articles. He has been an editorial board member of several scholarly journals. "Journal of Verbal Learning and Verbal Behavior" has become under his editorship one of the most influential titles worldwide in the area of psychology.

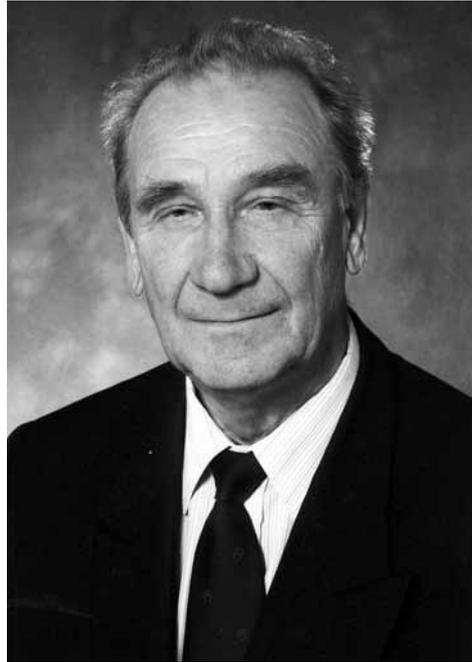
Being a memory researcher who has significantly changed and formed the present day image of psychology, Endel Tulving has, by advice and means, effectively helped his colleagues in Estonia. He has delivered lectures in Tartu and organised scientific events in Tallinn. In 1997 Tallinn for once became the capital of world memory research, when a memory research conference initiated by him brought to Estonia a significant part of top scientists in that field. Endel Tulving is Honorary Doctor of the University of Tartu (1989) and founder of the University of Tartu Toronto Foundation. In 2002 he was elected a Foreign Member of the Estonian Academy of Sciences.

The list of academic recognitions bestowed on Endel Tulving is awe-inspiring. He is a Foreign Member of several academies in the USA and Europe, Fellow of the Royal Societies of Canada and London, Honorary Doctor of numerous universities. His honours and awards include the Howard Crosby Warren Medal (1982), Prize of the American Association of Psychologists (1983), Golden Medal of the American Union of Psychology (1994), Gairdner Prize (2005). In 2000 he was awarded the Estonian state decoration Order of White Star, 2nd class. In 2009 he earned his most prestigious distinction – the Pasteur-Weizmann/Servier prize which, in terms of value, is deemed comparable to the Nobel Prize by the scientific community.

The best known and most highly cited scientist of Estonian descent, Endel Tulving is a witty and outspoken man, asserting that he has always considered standing up for the very elementary truths as the work of his life.

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Hans K uuts



Hans K uuts was born on 20 December 1932 to a family of farmers in Suurmetsa village, Mooste parish, P lva Conty. In 1951 he graduated from Tartu Secondary School No.1 and in 1956 from the Department of Agronomy at the Estonian Academy of Agriculture (nowadays Estonian University of Life Sciences). Thereafter he worked as an agronomist on a collective farm at Erum e near Elva until 1958.

A dream of many years was fulfilled for Hans K uuts in 1958 when he was invited to work at J geva Plant Breeding Station as a Junior Researcher in barley breeding. In 1964 he became Head of the Breeding Department and in 1973 Head of the Plant Breeding Station (since 1992, J geva Plant Breeding Institute), working in that position until 1998. He continued there as a Senior Researcher until 2013.

In 1968 Hans K uuts defended his dissertation for the Candidate of Sciences (equivalent to PhD) degree in agriculture on the topic “The best barley varieties for Estonian conditions and the influence of nitrogen fertilisers to barley yield and quality” at the Estonian Academy of Agriculture.

During the years 1968-1970 he had work practice at Sval f Plant Breeding Institute in Sweden where he gained excellent theoretical and practical experience in barley breeding, and established many valuable contacts.

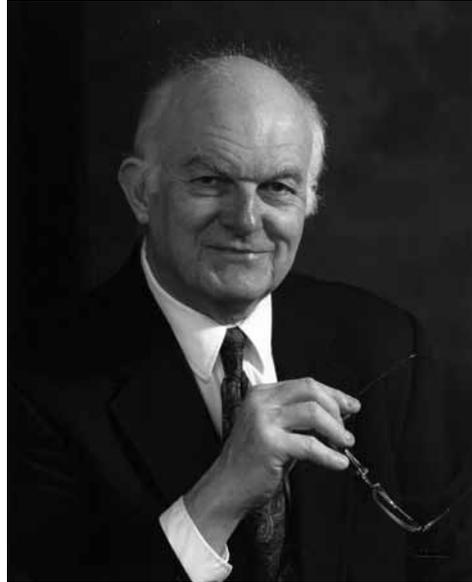
The main scientific contribution of Hans K  uts has been in the breeding of new barley varieties, growing the breeder's seed and developments in agricultural engineering of varieties. He is the main author of seven barley varieties and a co-author of two barley, six oat and two wheat varieties. In 1987 Hans K  uts was granted the State Prize for plant breeding, the National Science Prize in bio- and environmental sciences in 1999 and the Lifetime Achievement Award by the Estonian Academic Agricultural Society in 2002.

In 1994 Hans K  uts was elected Member of the Estonian Academy of Sciences in agriculture.

Hans K  uts has been a member of the European Association for Research on Plant Breeding (EUCARPIA) since 1973. He has worked in the organising committees of international symposiums on barley genetics and breeding (1981-2000) and oat genetics and breeding (1989-1994). Since 1988 he is Foreign Member of the Research Council of Sval  f Plant Breeding Institute and since 1994 Foreign Member of the Finnish Breeding Centre Boreal. During the years 1992-1995 Hans K  uts was Head of the Chair of Plant Breeding at the Estonian Academy of Agriculture and Professor Emeritus since 1995. In 1997 he was awarded the Estonian state decoration Order of Merit of the National Coat of Arms, 5th class. He is a bearer of the Order of the J  geva County Coat of Arms since 2006.

A farmer to the core, Hans K  uts succeeded both as a researcher and a manager. During his term as the Head of the J  geva Plant Breeding Institute (since 2013, the Estonian Crop Research Institute), the institute evolved into one of the best equipped agricultural research institutions that succeeded in plant breeding, erecting many necessary buildings, rejuvenating the scientific personnel and much more. As a token of thanks to the honourable agricultural researcher and breeder, a bench in the name of Hans K  uts was unveiled in front of the institute building in J  geva this year.

Foreign Member  
Alar Toomre



Alar Toomre was born on 5 February 1937 in Rakvere. In 1944 he fled with his family to Germany, whence they emigrated to the United States of America in 1949. First they settled in the State of Ohio, afterwards in the city of Hempstead on Long Island, where he graduated from high school.

At the age of sixteen A.Toomre enrolled at Massachusetts Institute of Technology (MIT) with an intention to become an aviation engineer. He received an undergraduate degree in aeronautical engineering and physics from MIT in 1957. His studies proceeded on a Marshall Scholarship at the University of Manchester in the UK, where he obtained a PhD in fluid mechanics in 1960.

After completing his PhD, Alar Toomre returned to the USA and took appointment as a C.L.E.Moore instructor at MIT (1960-1962). He then spent a year at the Institute for Advanced Study in Princeton and returned again to MIT, where he became Assistant Professor at the mathematics faculty. Toomre was promoted to Associate Professor of Mathematics in 1965 and to Professor of Applied Mathematics in 1970. Since 2010, he has been *Professor Emeritus* at MIT.

Professor Toomre's research interests lie in astrophysics and stellar dynamics. His studies are primarily focused on the dynamics of galaxies. In 1964, he devised a local gravitational stability criterion for differentially rotating disks that came to be known as the Toomre's stability criterion. Independent of Grigori Kuzmin's research findings, he conceived the

galactic disk mass distribution model, currently known under the name of Kuzmin/Toomre disk. In some ways Toomre's studies are a development of Kuzmin's research by means of applying new up-to-date methods (numerical simulation) and exploring the evolution of galaxies conjointly with their current structure. He has made an influential contribution to introducing the English language audience with Kuzmin's articles.

A large part of Toomre's research is dedicated to spiral and elliptical galaxies as well as mergers of galaxies. He was a pioneer in the study of the mechanism of galactic collisions. Toomre conducted the first computer simulations of galaxy mergers in the 1970s with his brother Jüri Toomre. He identified that peculiar galaxies, e.g. Antennae Galaxies and the Mice are interacting (colliding) galaxies. The process of collision evolution is known as the Toomre sequence. He further suggested that elliptical galaxies are the remnants of the major mergers of spiral galaxies. With these studies, Alar Toomre laid the basis for a modern theory of galactic evolution claiming that all giant galaxies have evolved through dwarf galaxy mergers.

Alar Toomre's stability criterion and theory of galactic evolution have found a consistently growing usage as shown by gradually increasing number of citations for his major scientific works (according to the NASA Astrophysics Data System the total number of citations for his publications currently exceeds 7000). By nature, he prefers to work as an individual researcher and takes time to ponder over fundamental problems. The overall number of titles published by him is relatively small, most of them appear as solo articles.

Professor Toomre has served on numerous administrative committees at MIT and elsewhere. He is a Fellow of the American Academy of Arts and Sciences, Member of the National Academy of Sciences (US), American Astronomical Society, American Philosophical Society, Estonian Learned Society in America and International Astronomical Union.

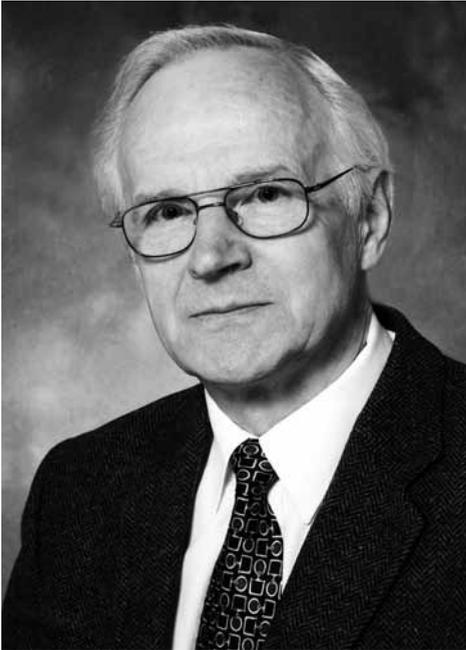
Close relations between Alar Toomre and his colleagues in Estonia were established in 1967, after he had made the acquaintance of Jaan Einasto. In 1977, he participated with a paper in an international conference in Tallinn. He also visited Tartu Observatory in Tõravere on several occasions. His visits to Estonia have become pretty frequent since the early 1990s. In 2007, A. Toomre was a member of the organising committee for an international conference in St. Peterburg marking the 90th anniversary of the birth of Grigori Kuzmin. He also moderated one of the sessions dedicated to Kuzmin's works as well as the general discussion.

In 2012, the Estonian Academy of Sciences elected him its Foreign Member in the area of applied mathematics.

Alar Toomre's contributions to science have gained prestigious acknowledgements from colleagues. He has been a Guggenheim fellow (1969-1970), Fairchild fellow (1975) and MacArthur fellow (1984-1989), the latter of which is popularly known as the "Genius Grant". In 1993, the American Astronomical Society presented him with the Dirk Brouwer Award, which recognises outstanding contributions to the field of dynamical astronomy. In 2014, he received the Magellanic Premium Medal from the American Philosophical Society for his work in numerical galaxy simulations.

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Olav Aarna



Olav Aarna was born on 4 November 1942 in Tallinn. His father Agu Aarna was a chemical engineer, later Member of the Estonian Academy of Sciences and Rector of Tallinn University of Technology. In 1960 he graduated from Nõmme Gymnasium and in 1965 from Tallinn University of Technology, majoring in automatics and telemechanics.

In parallel with his studies, Olav Aarna worked as an assembling and regulating operator in the radio manufacturing plant Punane RET.

In 1965 Olav Aarna started working at Tallinn University of Technology (TUT), where informatics became his primary field of study. His major area of research was the control and mathematical modelling of continuous technological processes (particularly in chemical industry). While working at the Department of Automatics, he passed through the stages of an academic career path from assistant to Head of the Department (1983-1991).

In 1971 he defended his dissertation for the Candidate of Sciences (equivalent to PhD) degree in technology on the topic “Mathematical modelling of complex chemical-technological systems (on the example of oil shale gasoline)” at TUT and in 1986 his Doctoral dissertation “Models and methods of assessment of the state of continuous technological processes” at Kharkov Institute of Radioelectronics. He was awarded

Professorship in 1987. Olav Aarna was elected a Member of the Estonian Academy of Sciences in 1990.

Olav Aarna was Rector of Tallinn University of Technology during the years 1991-2000 and Rector of the Estonian Business School (EBS) during 2000-2003. He was a member of the 10th composition of the Parliament of Estonia (2003-2007) and Chairman of the Cultural Affairs Committee. From 2007 onward Olav Aarna has worked at EBS as a Professor, during 2014-2017 as Vice Rector for Research and Development. In 2011-2014 he also served on the Management Board of the Estonian Qualifications Authority Foundation. Since 2007 he has been *Professor Emeritus* of TUT.

The most outstanding research results of Olav Aarna belong to the series of studies on models and methods of evaluating the state of continuous technological processes from the period 1975-1985. Since 1990 he has been closely involved in reforming the Estonian education and research system, whereby he has proven himself as one of the most influential proponents of education and innovation policy at the beginning of the 21st century.

Olav Aarna is a member of numerous scientific organisations in Estonia and abroad. In 1991 he was elected a Foreign Member of the Swedish Academy of Engineering Sciences in Finland, in 1996 Honorary Doctor of Tampere University of Technology and in 2003 Foreign Member of the Royal Swedish Academy of Engineering Sciences. He has been granted the Medal of the Estonian Academy of Sciences, the Medal of Helsinki University of Technology, the Estonian state decoration Order of the National Coat of Arms, 4th class. He was bestowed the title of *Grand Commandeur de l'Ordre de l'Honneur* of Greece in 1999.

In his spare time, Olav Aarna is a passionate traveller, preferring the cool Nordic countries. His favourite sports are cross-country skiing and roller skating. Coming from a music-loving home, he has cherished a lifelong love for music.



Haldur Õim was born on 22 January 1942 in Helme parish, Valga County. He graduated from Tõrva Gymnasium in 1960. His clear-cut intention to study literature led him to enrol at the University of Tartu. Mainly at the instigation of Huno Rätsep, who was then Associate Professor at the Chair of the Estonian Language, he took a keen interest towards new directions in language science – generative grammar and mathematical linguistics. He had an opportunity to study mathematical and structural linguistics under an individually tailored programme, which enabled him to delve into the linguistic theory while still an undergraduate. Haldur Õim graduated from the university in 1965 and five years later defended his thesis for the Candidate of Sciences (equivalent to PhD) degree in philology on the topic “Semantic structure of Estonian phrases related to the concept of person”. In 1983 he earned his Doctor of Sciences degree in Estonian and General Linguistics with a dissertation “Theory of understanding semantics and language”.

After completing his PhD degree, Haldur Õim joined the Laboratory of Criminology (later Laboratory of Artificial Intellect) in the Faculty of Law, where on his initiative the Research Group of Modelling in Language Comprehension was established by the end of the 1970s. It further evolved into the Research Group of Computational Linguistics. In 1977 Haldur Õim became Senior Lecturer at the Chair of the Estonian Language, obtained Professorship in 1983 and was elected the first Professor of General Linguistics at the University of Tartu in 1992. From 1981 to 1992

he taught the Estonian language at the University of Helsinki: first as Lecturer, then Associate Professor and Professor. Between 1991 and 1992 he was a Visiting Professor at the Institute for Computational Linguistics at the University of Koblenz-Landau in Germany. During the period from 1992 to 2004 Haldur Õim was affiliated with the University of Tartu as Head of the Department of the Estonian and Finno-Ugric Languages and Professor. He has been *Professor Emeritus* since 2007.

In 1994 the Estonian Academy of Sciences elected Haldur Õim to its membership in the area of the humanities and social sciences.

The major areas studied by Professor Õim lie with semantics, cognitive linguistics and computational linguistics (lexicons). He belongs among the founders of Estonian computational linguistics and has originated several schools of theoretical linguistics. Likewise, he has been an extraordinarily prolific writer of popular science texts. A large part of his theoretical articles have served as an essential study material for several generations of linguistics students over an extensive period of time. Haldur Õim is the author of more than three hundred scholarly publications and has been the supervisor of ten MSc and nine PhD dissertations. He has served in the Estonian Language Council (2007-2011) and is currently a member of the Mother Tongue Society, Association of Computational Linguistics, International Association of Cognitive Linguistics, as well as the editorial board of the journal “Keel and Kirjandus” (Language and Literature).

The achievements of Professor Õim have been acknowledged with the Estonian state decoration Order of the White Star, 4th class in 2001 and the F.J.Wiedemann Language Prize in 2005.

Haldur Õim enjoys listening to early music and wandering around mushroom-rich forests in summer.

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Foreign Member

Jaan Laane



Jaan Laane was born on 20 June 1942 in Paide. As a two-year-old he lived through an escape with his parents from a war-torn Estonia to Germany. The family moved on to the United States of America in 1949. Jaan Laane graduated from the University of Illinois in 1964 with a BSc degree in chemistry and excellent academic laurels: Highest Distinction in Chemistry, Kendall Award (Outstanding Senior in Chemistry) and Highest University Honors (Bronze Tablet). He undertook PhD study as a National Science Foundation and Woodrow Wilson Fellow at Massachusetts Institute of Technology. His major interest lay in synthesis of organosilicon compounds and oscillation spectra. In 1967 he received his PhD degree and the Kodak Award as the top graduate student.

Between 1964 and 1968 Jaan Laane worked as a Visiting Research Fellow at Los Alamos Research Laboratory. His academic career has thenceforth been associated with Texas A&M University (promoted to Full Professor in 1976), where he has occasionally fulfilled administrative functions as well – Chairman of the Division of Physical and Nuclear Chemistry, Associate Dean of Science (graduate studies), Chairman of the Academic Council, etc. His organisational abilities were solidly proven in the process of establishing the Texas A&M University campus in Japan. He has held visiting professorships around the world: Waseda University (Japan), University of Valladolid (Spain), Universities of Bayreuth and Ulm

(Germany), University of Cracow (Poland), etc. Professor Laane's laboratory has hosted dozens of postdocs and visiting professors; furthermore, 39 PhD and 5 MSc degrees have been attained under his supervision. He is a long-time editor of the "Journal of Molecular Structure" (since 1994) and has become an editorial board member of three more afterwards. The number of publications authored by him amounts to 322 titles, among them three books and 14 invited book chapters. Last but not least, he has given about 400 conference presentations, including plenary and invited talks.

The studies of Jaan Laane have made a significant contribution into experimental and theoretical oscillation spectroscopy. His major research directions involve spectroscopic methods applied to investigation of the molecular structure, and Raman difference spectroscopy. A considerable number of new silicon organic and other cyclical compounds have been synthesised in his laboratory along with diligent analysis of their oscillation spectra. What's more, Professor Laane was a pioneer of respective computer programs. He has served consulting to several influential institutions and companies (National Institute for Petroleum and Energy Research, Union Carbide, Petrotex, etc.) and has been involved in numerous scientific organisations, incl. American Chemical Society (ACS), American Physical Society (APS), Coblenz Union, American Association for the Advancement of Science (AAAS).

Personal contacts between Jaan Laane and his Estonian colleagues at the Institute of Physics, University of Tartu were mainly established during the International Conferences on Raman Spectroscopy. In the 1990s Estonian scientists could seize on the opportunity offered by him to conduct collaborative research in his laboratory. As an outcome of their joint projects, about a dozen articles were published and another dozen papers delivered at spectroscopy conferences. Professor Laane has been a frequent visitor to Estonia – speaking at conferences, giving seminars, etc.

The worldwide scientific community has recognised Jaan Laane on several occasions. Among other acknowledgements he has received the Humboldt Senior Scientist Award (1979) and Ellis R. Lippincott Award (2005). He was elected a Foreign Member by the Estonian Academy of Sciences in 1995 and gained an honorary doctorate from the University of Tartu in 2000.



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Foreign Member  
Matti Saarnisto

Matti Saarnisto was born on 11 November 1942 in Pietarsaari, Finland. In 1970 he defended his PhD thesis *cum laude* in geology and palaeontology at the University of Helsinki. Thereafter, he worked as a Visiting Postdoctoral Researcher at Brock University in Canada (1971-1973) and at Cambridge University in England (1973-1974).

In 1975 Matti Saarnisto proceeded to work as Associate Professor of Quaternary Geology at the University of Oulu. He continued his academic career by delivering lectures at the University of Helsinki as Docent of Physical Geography (1979-1991) and, further, as Professor of Geology and Palaeontology (1991-1992). Since 1988 until his retirement in 2006, he was affiliated with the Geological Survey of Finland (GTK) in subsequent positions of Senior Research Scientist (1988-1990), Acting Research Professor (1991), Professor (1992-2006), Head of the Department of Quaternary Geology (1992-1996) and Director for Research (1996-2006).

In the course of numerous expeditions Matti Saarnisto has participated in field studies to the Arctic regions of Canada, northern part of Fennoscandia (incl. Kola Peninsula), Siberia (Wrangel Island) and elsewhere. He is the author of over 200 research publications and has written articles for wider readership as well. His research is mainly involved with the Quaternary environments – glacial geology, stratigraphy, palaeohydrology, glacial isostasy, biostratigraphy, chronology, laminated sediments, etc. Among other topics, he has dedicated particular attention to studying the

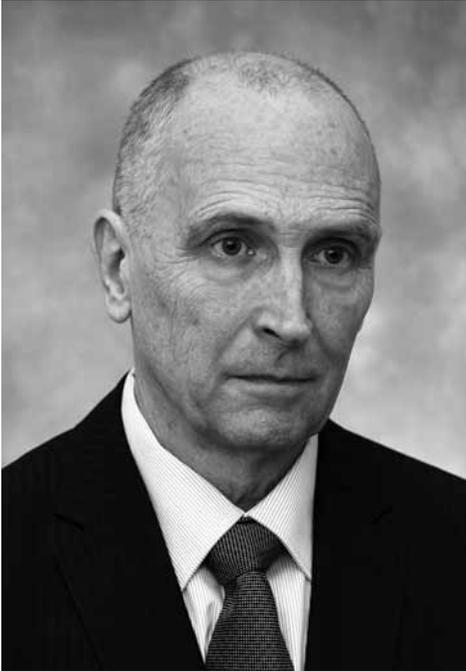
geology of the Baltic Sea, Saimaa Lakeland, glacial period in the Nordic region, as well as the palaeogeography and environmental conditions within Holocene. Some 15 PhD dissertations have been defended under his supervision.

Matti Saarnisto has been a Member of the Finnish Academy of Science and Letters since 1995 and served as Secretary General of this academy during 2000-2009. He has been a longtime Chairman of the Geological Society of Finland and a member of the Finnish National Committee for Polar Research. A widely recognised expert in his area of knowledge, he has taken part in the work of numerous international scientific organisations, steering committees, expert panels, working groups and editorial boards of scholarly journals.

His long-standing close collaboration with Estonian colleagues dates back to 1983, when Matti Saarnisto participated in a joint project between the Estonian and Finnish academies under the title “Evolution of the Baltic Sea and the Effects of Glaciers on the Formation of Quaternary Sediments”. Latterly he was the coordinator on the part of Finland in another joint project initiated by the academies in 1990 – “Geological History of the Eastern Baltic Sea”. He has also investigated lake sediments in Estonia. In 1989 he joined the Geological Society of Estonia as a foreign member.

The Estonian Academy of Sciences elected Matti Saarnisto its Foreign Member in 2008.

Jakob Kübarsepp



Jakob Kübarsepp was born on 9 February 1947 in Tallinn and graduated from Tallinn Secondary School of Science in 1965. He enrolled at Tallinn University of Technology (TUT) and completed his undergraduate studies in 1970 with the qualifications of a mechanical engineer specialising in precision engineering. In 1975 he undertook postgraduate studies at TUT Chair of Metals Technology and earned his Candidate of Engineering Sciences (equivalent to PhD) degree at Moscow Mendeleev Institute of Fine Chemical Technologies in 1979 with the thesis “Technology and qualities of titanium carbide based steel bonded cermets”. In 1992 Jakob Kübarsepp obtained a doctorate in engineering from Tallinn University of Technology.

In 2011 the Estonian Academy of Sciences elected Jakob Kübarsepp to its membership in the area of materials engineering. He has been heading the Academy Division of Informatics and Engineering since 2015.

During 1970 and 1975 Jakob Kübarsepp was employed as a Designer and Leading Designer with the Special Design Office of the Estonian Academy of Sciences. His further professional activities are associated with Tallinn University of Technology, where he progressed along a career path of increasing responsibility. His positions include: Junior and Senior Researcher at the Laboratory of Powder Metallurgy (1975-1985), Teaching Assistant and Assistant Professor at the Chair of Metals Processing

(1985-1992), Associate Professor at the Department of Materials Engineering (1992-1997). In 1997 he became Professor of Metals Processing. From 2000 to 2011 Jakob Kübarsepp served two consecutive terms as TUT Vice-Rector for Academic Affairs and has been in this office again since 2014. Owing to his active involvement in Estonian higher education environment, he has been chosen to represent the NGO Estonian Rectors' Conference in numerous working groups. Likewise, he has fulfilled other managerial functions, e.g., Member of the Steering Council for the Internationalisation of Estonian Higher Education and Research (2008-2011), Chairman of the BALTECH (Baltic Sea region university consortium for science and technology) Council (since 2004), Head of the Evaluation Panel at the Estonian Higher Education Quality Agency (2012-2013).

The major topics investigated by Jakob Kübarsepp appertain to powder metallurgy and composite materials, particularly ceramic and metal composites as well as wear resistance in powder route materials. In recent years he has chiefly focused on tool materials and their application for deformation processing of metals. Another topical area of interest lies in processing techniques of high-specific-strength and wear-resistant materials. Jakob Kübarsepp has authored or co-authored more than two hundred scholarly publications, including one monograph, several higher education textbooks, vocabularies and inventions. Six doctoral PhD and nine MSc dissertations have been defended under his supervision.

Professor Kübarsepp has been closely involved in the development process and transfer of knowledge from science to technology. It was largely by virtue of his personal initiative and contribution that the Laboratory of Powder Metallurgy at TUT has achieved regular upgrading of its infrastructure. Modernisation has enabled the lab to develop and manage collaborative relationships with companies and research institutions at home and abroad. Jakob Kübarsepp has been granted the professional degree of Estonian Chartered Engineer (1998, 2005, 2015) and European Engineer (2001). For his achievements towards advancement of higher education in Estonia he has been acknowledged with the Estonian state decoration Order of the White Star, 4th class (2006) and the Badge of Merit of the Ministry of Education and Research (2007). He has received the National Science Award twice – as a research team member in the area of engineering (1985) and as the head of team (2005).

In his busy schedule Jakob Kübarsepp strives to spare at least a few precious moments for his favourite pastime activities: sports, reading of military history books and visiting the theatre.



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Andres Öpik

Andres Öpik was born on 4 May 1947 in Tallinn and graduated from Tallinn Secondary School of Science in 1965. Beside the regular curriculum, the students were enabled an opportunity to take a supplementary training course at Hans Pöögelmann Electrotechnical Factory giving the qualifications of semiconductor device assembler. The programme combined practical learning with theoretical basics of several scientific disciplines, including semiconductor physics. It turned out to be a decisive factor for him to choose specialised electronic materials technology as his major area of study at a later time. Andres Öpik graduated from Tallinn University of Technology in 1970 and earned his Candidate of Sciences (equivalent to PhD) degree in chemistry in 1980 with a thesis “Studies on the defect structure of copper and indium alloyed CdSe”. From 1983 to 1984 he proceeded with his postdoctoral studies at the University of Helsinki.

The Estonian Academy of Sciences elected Andres Öpik to its membership in the area of engineering in 2013.

The professional career of Andres Öpik has been associated with Tallinn University of Technology since 1970. He worked as an Engineer, Assistant, Senior Lecturer and Associate Professor at the Chair of Physical Chemistry in the Department of Materials Science, Faculty of Chemistry until 1992. For the period 1991-2002 he was Dean of that Faculty and, thereafter, Dean of the Faculty of Chemistry and Materials Technology (up to 2014). From 1992 onward he has been Professor of Physical Chemistry, currently in

the Department of Materials and Environmental Technology, School of Engineering.

The research interests of Andres Õpik lie in investigating, preparing and applying the properties of molecularly cloned polymer materials. In recognition of outstanding research achievements he has been bestowed the National Science Award as a member of a research team twice: in 1985 and in 2006. The latter was awarded for investigating new materials and structures for solar cells to a four-member team headed by Professor Enn Mellikov, Member of the Estonian Academy of Sciences.

Andres Õpik has taken an active part in various activities pertaining to research organisation and administration. He has been a member of the Estonian Higher Education Quality Assessment Council (2003-2011), Director of the graduate schools “New Processes and Production Technologies” and “Functional Materials and Technologies” (2005-2009, 2010-2014), Council Member of TUT (2005-2014), expert for the Estonian Science Foundation (2005-2011) and the Estonian Scientific Competence Council (2006-2011). At present, he also sits on the Board of the Estonian Academy of Sciences (since 2014) and the Governors Board of TUT (since 2015).

Among his academic colleagues Professor Õpik is known as a talented and reliable educator. He has supervised eight PhD theses and authored over 200 scholarly publications, including several higher education textbooks. He has been acknowledged with the Distinguished Service Medal *Mente et Manu* by Tallinn University of Technology (2007) and the Estonian state decoration Order of the White Star, 4th class by President of the Republic of Estonia (2006).

He likes to spend his leisure time in nature and takes particular joy in cross-country skiing, brisk walking and fishing. Tennis has been his longtime favourite among sports – he has previously been a top level player and has belonged to the Estonian national tennis team.

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<sup>4</sup> Research institutions and universities are referred to by their current names.

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# ESTONIAN ACADEMY PUBLISHERS

Established in 1994

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Director: Ülo Niine, Tel: +372 645 4504,

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Estonian Academy Publishers continued in 2017 regularly issuing seven scientific journals, peer-reviewed and indexed and abstracted in international review publications and databases. All journals have an international editorial board. In the Estonian Research Information System administered by the Estonian Research Council, all journals have been placed in the category 1.1.

The Publishers' mission has been to maintain a high standard as regards the contents of journals, their typographic performance, and their timely release both electronically and in hard copy.

In 2017 the journals were issued in the following volume:

Title	Number of issues per year	Total volume in pages	Format of journal
Acta Historica Tallinnensia	1	146	168 × 240
Estonian Journal of Archaeology	2	216	168 × 240
Estonian Journal of Earth Sciences	4	276	210 × 285
Linguistica Uralica	4	320	168 × 260
Oil Shale	4	390	168 × 255
Proceedings of the Estonian Academy of Sciences	4	516	210 × 285
Trames	4	402	168 × 240
<b>Total</b>	23	2266	

Full texts of articles that have appeared in all journals since 2006, also information on journals are freely available on the Publishers' website [www.kirj.ee](http://www.kirj.ee). Full texts are distributed also by well-known electronic publishers and portals EBSCO, C.E.E.O.L., The Gale Group Inc., ProQuest LLC, H. W. Wilson (merged with EBSCO), Digital Publication with the Leading Asian Distributor (Airiti Inc.) and Join CNKI Scholar (China). The Publishers produce the following electronic versions of the articles: pdf-files, sgml-files of two types, xml-files of three types and a special file for the electronic library C.E.E.O.L.

Articles of earlier vintages of our journals have been digitised and uploaded in Internet through mediation of Google. Respective links have been made from the Publishers' website. Academic Library of Tallinn University has digitised the publications of the Estonian Academy of Sciences of the period 1945-1991. All digitised issues are publicly available in the Web.

All scientific articles of the journals have been supplied with the doi-indexes (Digital Object Identifiers). Crossref statistics shows that the rate of search for articles by doi increases steadily, in some months it tops eight thousand cases. Such availability of full texts increases readership and rate of citation.

The articles published in journals are reflected in scores of international re-view journals, scientific websites and databases. Here are some most authoritative ones.

All seven journals issued by the Publishers have been included in Elsevier BV Bibliographic Database SCOPUS® that is used in many countries as the benchmark of efficiency of research. Six journals are reflected in the database of Thomson Reuters Web of Science® Core Collection that is often used as the basic source of bibliometric information for research evaluation:

- Acta Historica Tallinnensia
- Estonian Journal of Archaeology
- Estonian Journal of Earth Sciences
- Proceedings of the Estonian Academy of Sciences
- Oil Shale (incl Current Contents®)
- Trames. A Journal of the Humanities and Social Sciences

Two journals are in the database ERIH:

- Estonian Journal of Archaeology
- Linguistica Uralica

Special issues are used as an internationally recognised way to publish the materials of international conferences. They provide an opportunity to document, in a compact way, the results of research in certain problems related to Estonia. In 2017 one special (topical) issue of a journal was published:

Proceedings of the Estonian Academy of Sciences 66/4: Special issue on functional materials and nanotechnologies (FM&NT-2017). Guest editors: Ergo Nõmmiste, Marco Kirm and Toomas Plank.

In 2017, in total 178 pieces of writing were released in 23 issues of seven journals, of them 160 scientific articles and 18 short pieces of writing. All journals in hard copy appeared under schedule. The electronic version appeared on average one month prior to the date set for the hard copy.

The number of authors totalled 527, of whom 169 were Estonian authors and 358 foreign authors. The majority of articles appeared in English, except the journal *Linguistica Uralica*: there were 11 contributions in English (38% of the volume), 26 in Russian (56% of the volume), and 3 in German (6% of the volume). Since the majority of authors of this journal are linguists of Russia's Finno-Ugric peoples, the prevalence of the Russian language is natural. Articles of *Acta Historica Tallinnensia* appear either in Estonian (with comprehensive summaries in English) or in another language (with summaries in Estonian).

Besides journals, four more publications were released:

- *Emakeele Seltsi aastaraamat 61* (The Yearbook of the Estonian Mother Tongue Society), Editor-in-Chief Mati Ereht. Format 143 x 215, volume 312 pp., hard cover. Full text of the book is also available on the Publishers' website
- *Eesti retrospektiivne rahvusbibliograafia. Estonian Retrospective National Bibliography. Estnische retrospektive Nationalbibliographie. Eesti raamat välismaal 1944-2010 (1). Estonian Books Abroad 1944-2010 (1). Das Estnische Buch im Ausland 1944-2010 (1)*, compiled by Anne Valmas †. Format 168 x 240, volume 650 pp., hard cover.
- *Eesti retrospektiivne rahvusbibliograafia. Estonian Retrospective National Bibliography. Estnische retrospektive Nationalbibliographie. Eesti raamat välismaal 1944-2010 (2). Estonian Books Abroad 1944-2010 (2). Das Estnische Buch im Ausland 1944-2010 (2)*, compiled by Anne Valmas †. Format 168 x 240, volume 650 pp., hard cover.
- *Varjust valgusse: Erihoiust väliseesti kirjanduse keskuseks (1974-2017)*. Author Anne Valmas †. Format 168 x 240, 48 pp., paperback.

# UNDER AND TUGLAS LITERATURE CENTRE OF THE ESTONIAN ACADEMY OF SCIENCES

Founded in 1993 (the Affiliate Museum in Nõmme, formerly named the Friedebert Tuglas House Museum, was founded in 1971)

Personnel: 17, including 12 researchers

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Under and Tuglas Literature Centre of the Estonian Academy of Sciences (Literature Centre) is an institution of research and development of the Estonian Academy of Sciences. Its mission is to study Estonian literary culture from the historical and theoretical perspective, within the context of the historically multilingual Baltic literary space and world literature, as well as to promote cultural and literary thought in line with global modern trends (discourse analysis, rhetorical and narratological models of culture, postcolonial theory and the theory of cultural transfer, the 'entangled history' approach, memory and gender studies). In addition to fiction and theatrical texts, the Centre's research covers numerous formats of historiographical, philosophical, publicistic and scholarly expression in the Estonian and German languages to the extent that they used to play a decisive role in the Baltic literary space in earlier times, together with the texts that proved to be important within the European history of ideas and have influenced mentality on a wider scale as well as locally, in the Baltic States. Within the scope of theoretical background research, the Pan-European history of certain underlying concepts and mindsets is studied (tradition of antithetic thinking, concept of infinity, decadence, soliloquy-style writing, grotesque).

Within its development activities, the Literature Centre publishes original studies and source materials of Estonian national literature and written word in Humanities, maintains a collection of books and art of historical value, and organises conferences, exhibitions and other events of cultural importance. The Museum Department of Literature Centre in Nõmme administrates the legacy of the writer and Member of Academy Friedebert Tuglas and other collections (including the book and art collection of Friedebert Tuglas; the book and art collection which formerly belonged to Artur Adson and Marie Under, and which arrived in Estonia in 1996; the art collection of the Foundation for Estonian Arts and Letters; and the book and art collection of Paul Reets) as well as the house and the adjoining garden, which is of high dendrological value. It also organises lecture tours and hosts researchers and visitors.

The major areas of research of the Literature Centre:

- Estonian literature and culture in the 20th century (including the works of F. Tuglas, M. Under and A. Adson),
- Older Estonian and Baltic German literary culture in the 13th to 19th centuries and the role of the German and Latin culture of the Baltics in the formation of modern Estonian culture,
- Mechanisms of cultural identity in Estonian literary culture (autogenesis, cultural transfer and entanglement),
- Baltic literary space and literary relations between Estonia, Latvia and Finland,
- Underlying rhetorical and discourse studies for the description of European and Estonian culture,
- Drama and theatre research.

Since 2014, the Literature Centre has been addressing the institutional research topic 'Entangled literatures: Discursive history of literary culture in Estonia' (2014-2019, Principal Investigator Jaan Undusk). Within the scope of the research topic, the Literature Centre is studying the emergence and development of Estonian literary culture, which is viewed as a historically entangled process involving national, status-related, cultural, colonial and other stimuli for action (*histoire croisée*), in which various criss-cross patterns, resistances and inertias play a significant role. The character of research is discourse-based: *inter alia*, such areas of discourse important in historically multi-lingual Baltic society, such as history, religion, language, environment, etc., are used as the basis for analysis. In collaboration with an international body of authors, the history of literary culture of the 13th to 19th centuries in Estonia (and Latvia) is being rewritten as a whole to include the rich German component. Modernity is viewed as a way of life formed in a tense relationship with national aspirations and emphasising

emancipation, which highlighted the decadent, the nouveau riche, the artist and other symbolic figures; tropes related to the above (autonomy, time, infinity) are also addressed. Post-Soviet fiction, theatre and cinema are studied as factors of the memory culture of recent history.

In 2017, the Literature Centre also started the coordination of a new research project (2016-2019, Principal Investigator Kristi Viiding, Senior Researcher Thomas Hoffmann) that focuses on the Latin correspondence of syndic David Hilchen – one of the central humanists of Livonia and a key figure in law and education in Riga in the early modern period – which to date has been unexplored and never printed. The single humanist written corpus of North-Eastern Europe to have preserved in greater volume is the basis for studying the development of written legal argumentation and its reception in court procedures and private relationships of the early modern period; the reception of antiquity in its diversity; humanist education models; confessional and military conflicts in the region; and social networking patterns among leading European humanists.

The Museum Department of Literature Centre continued the implementation of the research project ‘Intellectual legacy of Friedebert Tuglas, Marie Under, Artur Adson and their fellow thinkers in the spatial-temporal context’ (2014-2018, Project Leader Elle-Mari Talivee) within the national programme ‘Estonian Language and Cultural Memory II’. The project aims to transfer the heritage of the Tuglases, Under and Adson, which is at the Literature Centre’s disposal, as a historical and cultural legacy of the Estonian nation to the general public by means of the preparation and printing of academically edited publications, organisation of art exhibitions, conferences, seminars and cultural events as well as the work of museum educators. One of the most significant goals of the project is the completion of the ‘Collected Works’ series of Friedebert Tuglas, edited textual-critically and supplemented with scholarly prefaces and commentaries; in 2017, the Literature Centre focused on the publication of Tuglas’ monograph *Ado Grenzstein’s Departure* in the 14th volume of the collected works.

The programme of Museum Department ‘The scientific collections of the Under and Tuglas Literature Centre (Collections of Cultural History)’, which aims to maintain and organise the Literature Centre’s collections of scientific-cultural value as well as to describe them in the Museum Information System MuIS, continued to receive funding in 2017. This year, 1,446 photos from the albums belonging to the collection of Tuglas as well as 75 manuscripts from the collections of Tuglas, Under, Adson and Reets were described in the MuIS. The project ‘Development of the Museum of the

Under and Tuglas Literature Centre into a modern international research centre' (2015-2020, Project Leader E.-M. Talivee) within the programme 'Institutional Development Program for Research and Development. Institutions and Higher Education Institutions' (ASTRA) financed by the European Regional Development Fund continued. The project implies the organisation of international science events and exhibitions to introduce the Literature Centre's collections as well as the improvement of the conditions of use of the collections and their availability to both Estonian universities and researchers and the international research community alike. In 2017, we focused on digitisation (the description of digital collection was performed by Kri Marie Vaik, Ilona Rosenvald and Urve Sulg). Digital copies were created in collaboration with the Digitisation Centre of the Academic Library of Tallinn University, which digitised 7,766 photographs and post cards from the collections of Tuglas, Under, Adson and Reets, and 11,105 pages of manuscripts and clippings from the collections of F. Tuglas and P. Reets. In addition, the Museum Department digitised 11 manuscripts, 50 letters, 94 small print items and 208 preserved documents from the above.

The Literature Centre issued several important scholarly publications in 2017. The Centre's employees published a total of 29 research articles in Estonian and 18 articles in other languages. A total of 22 research reviews, abstracts and other short writings were published. In cooperation with Kumu Art Museum, the Literature Centre published a bilingual, Estonian and English, scholarly catalogue entitled *Children of the Flowers of Evil. Estonian Decadent Art* (compiled by Mirjam Hinrikus, Lola Annabel Kass and Liis Pählapuu), which addresses the searches of creators in the early 20th century and their reactions to the modernising world (article by M. Hinrikus, preface by J. Undusk). The publication was a part of the eponymous exhibition in Kumu (curator L. A. Kass) and the related conference 'End Games and Emotions. The Sense of Ending in Modern Literature and Art', the background to which was explained by J. Undusk and M. Hinrikus in issue 36 of the culture newspaper *Sirp*.

E.-M. Talivee's doctoral thesis *Writing the City: The Urban Landscape in Estonian Prose, 1877-1903*, which focuses on the deepening of the urban image in the fiction of the relevant period, was published in electronic format. Cities in fiction are also addressed in the publication *Literary Second Cities* issued by Palgrave Macmillan, in which E.-M. Talivee's chapter *Narva: A Literary Border Town* focuses on how the border town destroyed in the war is depicted in Soviet time and present-day Estonian prose and it draws comparisons with the artistic language of architecture. Contemporary 'Estonian Russian' culture is the basis of Eneken

Laanes' and Daniele Monticelli's article *Battling Around the Exception: A Stateless 'Russian' Writer and His Translation in Today's Estonia* in the publication *Translation in Russian Contexts: Culture, Politics, Identity* issued by Routledge, which addresses the linguistic and cultural boundaries of Estonian literature through the exceptional status of writer Andrei Ivanov. The same publishing house also published the volume *Food Culture and Politics in the Baltic States* (edited by Diana Mincyte and Ulrike Plath); in the article *Exploring Modern Foodways: History, Nature and Culture in the Baltic States* D. Mincyte and U. Plath study the food culture of the Baltic States in its temporal, spatial and cultural diversity.

2017 also saw the publication of a range of high-quality research articles by Literature Centre employees on the early written word. For instance, the publication *Kulturwirkungen der Reformation in den Metropolen des Ostseeraums* issued by W. de Gruyter contains K. Viiding's article *Das Verhältnis der Reformation und des Humanismus in Est- und Livland im 16. Jahrhundert*, which analyses the relationship between Humanism and the Reformation. In his article *Die Geburt der estnischen Poetik aus der deutschen* (published by Winter publishing house in the volume *Baltisch-deutsche Kulturbeziehungen vom 16. bis 19. Jahrhundert. Medien – Institutionen – Akteure*), Martin Klöker was stating a hypothesis that the author of first secular verse in the Estonian language, Reiner Brockmann, could have compiled the first Estonian *Poetics* in the 1630s, following the example of Martin Opitz' *Buch der Deutschen Poeterey*, and Klöker attempted to reconstruct it on the basis of Brockmann's poems. J. Undusk published an overview of the professional and personal life of Eduard von Stackelberg, a leading politician among the Estonian Knighthood at the turn of the 20th century.

The year also saw numerous articles on history and remembering for those who read in Estonian. For example, the articles of Eneken Laanes *Translated into the language of trauma: transcultural memorial forms in Estonian memoirs of the Gulag and deportation* in the journal *Keel ja Kirjandus* and *Transnationalisation of the Estonian memory culture* in the Estonian Human Development Report; Linda Kaljundi and Ulrike Plath *Estonian historical writing from the entangled perspective* in the magazine *Tuna*; and Rein Undusk *Creating Estonia. Lennart Meri's "Silverwhite"* in the magazine *Looming*. In three issues of the historical culture magazine *Tuna*, Jaan Undusk published the annotated correspondence of Jaan Kross with Alma Vaarman and Huko Lumet exchanged in 1951-1954, during the writer's Siberian settlement years, which became the first ever publication of the letters of Kross. In two articles from the same magazine he shows, on the basis of new archive findings, how Kross methodically practiced

writing in Siberia and introduces readers to his to date unknown play and a verse novel. The field of drama and theatre saw the publication of Piret Kruuspere's article *Estonian drama and theatre as media of cultural memory*; Aare Pilv commented on a selection of Ingeborg Bachmann's poetry in *Akadeemia* as well as Sergei Zavyalov's poem *Soviet Cantatas* in *Vikerkaar*.

The Literature Centre also published two volumes of abstracts: *Siuru 100* (edited by E.-M. Talivee, E.-R. Soovik and K. M. Vaik) and *Entangled Literatures and Cultures: Systems of Relations, Intersections, Reciprocity* (edited by E. Laanes and J. Undusk). Both publications comprise abstracts of the presentations made during the scientific events organised by the Literature Centre.

In 2017, the Literature Centre organised a number of scientific events of international significance. The winter school 'New natures, entangled cultures: perspectives in environmental humanities' (main organisers U. Plath and M. Tamm), which focused on the understanding of environmental humanities and the entangled relationships of nature and culture, was held on 23-27 January in collaboration with the School of Humanities of Tallinn University, the Centre for Environmental History, the Art Museum of Estonia and the Rachel Carson Center for Environment and Society.

On 17-19 March, the Literature Centre was a partner of the Nordic Summer University research network, Narrative and Memory: Ethics, Aesthetics, Politics' and of the Graduate School of Culture Studies and Arts in the joint organisation of the international symposium 'Transcultural Memorial Forms: Contemporary Remembrance of War, Displacement and Political Rupture', which addressed the role of transcultural memory forms in the contemporary remembrance of war, displacement and political conflicts (main organisers E. Laanes and H. Meretoja). The symposium featured a discussion on the ethical and political issues of the use and misuse of aesthetical, political and intermedial memory forms.

In collaboration with the Estonian Writers' Union, the Literature Centre organised the international conference 'Siuru 100' (main organisers E.-M. Talivee and V. Kivisilla) on 17-18 May. The conference was dedicated to the centenary of the foundation of Siuru, one of the most significant modernist groups in the history of Estonian culture, and more than 20 Estonian and foreign researchers discussed the era of Siuru from an artistic and scholarly perspective. The Literature Centre published a volume

of abstracts of presentations made during the conference. At the same time as the conference, the Literature Centre held a thematic exhibition in the Main Exhibition Hall of the National Library of Estonia. Curator Jüri Hain selected publications, caricatures, epigrams and photographs of the writers and artists who had belonged to Siuru as an organisation and brotherhood, mainly using the Literature Centre's collections. *Siuru Evening 100* performances (directed by Riina Roose) organised upon the Literature Centre's initiative jointly with the Estonian Writers' Union were held to celebrate the 100th anniversary of the Siuru group.

The Literature Centre's international conference 'Entangled Literatures and Cultures: Systems of Relations, Intersections, Reciprocity' (main organisers E. Laanes and J. Undusk), which was held on 25-26 May, addressed cultural transfer and entanglement in culture and literature. In addition to keynote speakers Stefan Helgesson from Stockholm University and Kevin Platt from University of Pennsylvania, the two-day conference featured presentations given by close to 20 Estonian and foreign researchers. This high-level conference facilitated joint reflection on the conceptual framework for researching cultural entanglement on the basis of examples from various cultures and facets of culture. Abstracts of the conference presentations also became a part of the volume published by the Literature Centre.

The international conference on the artistic modernisation process 'End Games and Emotions: The Sense of Ending in Modern Literature and Arts', which was held on 15-18 August, was organised by Tallinn University, the University of Helsinki and the Literature Centre in collaboration with Kumu Art Museum and the research group Rethinking Realistic Worldmaking within the University of Helsinki (main organisers of the Estonian side: M. Hinrikus, A. Mattheus and P. Viires). The conference events took place in two cities, Tallinn and Helsinki, and were attended by over fifty specialists from Europe, North America, North Africa and Asia.

The Literature Centre was also one of the partners of the University of Tartu in the international Baltic literary culture symposium 'Medien der Aufklärung. Aufklärung der Medien', held by the latter on 4-6 September. The symposium within the German-Estonian academic week 'Academica' involved about 30 researchers from Europe discussing means of information exchange in the Enlightenment era.

On 22 September, an international symposium 'Literature and the Multilingual City', addressing the literary city, was held in the Museum Department of the Literature Centre in collaboration with the Association

for Literary Urban Studies (main organisers E.-M. Talivee and J. Finch). It was the first time the Association's regular symposium took place outside of Finland.

In addition to international conferences and symposiums, the Literature Centre also organised a number of scientific events in Estonia. On 8 June, the Museum Department hosted the seminar 'Baltic animal history 2: imprints of animals in the church, law and visual culture' organised jointly with the Institute of History, Archaeology and Art History of Tallinn University as well as the Centre for Environmental History and the Centre for Medieval Studies. This was also where, on 20 October, Lea Reitel Høyer gave a lecture on 'The image of the child in Danish and Norwegian children's literature through the ages'. The seminar 'Child in literature 5: child and history' was held jointly on 24 October with the Estonian Children's Literature Centre in order to discuss the expression of historical topics in children's literature. On 7 December, the seminar 'Storms, droughts and stars with tails: climate and extraordinary weather phenomena in Estonian history, literature and culture' took place, organised by the Literature Centre and the Centre for Environmental History of Tallinn University with the support of the Institute of History, Archaeology and Art History of Tallinn University.

Regular scientific seminars of the Literature Centre's researchers also continued in 2017. On 5 May, U. Plath held a seminar on 'Baltic-German national faith? Reflections on the history of entanglement'; on 29 September, there was R. Undusk's seminar on 'Cultural entanglement the Estonian way: the case of Lennart and Jaan'; on 10 November, P. Kruuspere gave a seminar on 'Illness as a phenomenon and metaphor in Madis Kõiv's dramaturgy'; and on 15 December, A. Pilv conducted a seminar on 'Creating literary terminology as exemplified by Bahtin'.

In 2017, the employees of the Literature Centre gave 54 scientific presentations, of which 32 were made at international conferences. Among others, the following conferences featured our speakers: 'Entangled Literatures and cultures: systems of relations, intersections, reciprocity' in Tallinn (M. Hinrikus, M. Klöker, P. Kruuspere, E. Laanes, A. Pilv, U. Plath, J. Undusk and R. Undusk); 'Feminist Utopias: Transforming the Present of Philosophy' in Skálholt, Reykjavik (M. Hinrikus); 'American Comparative Literature Association Conference' in Utrecht (E. Laanes); 'Trauma Narratives and the Ethics of Reading' in Saulkrasti (E. Laanes); 'Memory – Access Denied? Political Landscapes of Memory and Inclusion in Contemporary Europe. Versions, Tendencies and Analytical Novelties' in Helsinki (E. Laanes); 'Memory Studies Association 2nd Conference' in

Copenhagen (E. Laanes); 'Natures in between. Environments in areas of contact among states, economic systems, cultures and religions' in Zagreb (U. Plath); 'The Baltic states at 99: Past, Present and Future. The 12th Conference on Baltic Studies in Europe' in Riga (U. Plath); 'Die baltische Aufklärung und ihr Erbe' in Meenikunno and Tartu (U. Plath); 'August von Kotzebue (1761-1819) in Tallinn (Reval) und in Berlin. VI. Kotzebue-Gespräch' in Tallinn (J. Undusk); 'Das Echo der Reformation zwischen Danzig und Reval. Die Eigenarten des Kulturtransfers' in Klaipeda (K. Viiding); 'Workshop Rhetoric and Genres of Learned Communication in Early Modern Central Europe: From Humanist Correspondence to Scholarly Journal' in Prague (K. Viiding); and 'Annual conference of the Centre of Excellence in Estonian Studies and annual 61st Kreutzwald Days conference' in Tallinn (K. Viiding). J. Undusk gave a public lecture entitled 'On the Possibility of Studying Intellectual History on Estonian Grounds' at the University of Tartu and took part in two events held by the Jochmann Society in Heidelberg as its honorary member.

The following events in Estonia are notable in terms of the participation of the Literature Centre employees in conferences: 'Exile and Memory. Tiina Kirss and Bernard Kangro anniversary conference' of the Estonian Literary Museum and the University of Tartu (E. Laanes and J. Undusk); 'Master poet from Elva. Karl Muru 90' conference of the Estonian Writers' Union and the Estonian Literary Society (A. Pilv); 'Sketches of contemporary Estonian Russian culture' conference of Tallinn University, Estonian Academy of Arts and the Estonian Writers' Union (A. Pilv); 'Ivar Ivask, a cosmopolitan in literature' conference of the Estonian Literary Museum (A. Pilv); 'The city and words' conference of the Tammsaare Museum (E.-M. Talivee); 'How we became Protestants: spread of the Reformation culture in Estonia' conference of the Graduate School of Culture Studies and Arts of the Estonian Academy of Music and Theatre (J. Undusk); 'On the continuation of Estonian nationality II' conference of the Tallinn Scientist Club (R. Undusk); and 'Reformation: interpretations and translations' conference of the National Library of Estonia and Tallinn City Archives (K. Viiding).

The most remarkable popularising presentations were the speech of M. Hinrikus at the decadence evening event in Kumu; A. Pilv's participation in the discussion club 'The post-truth age and desire for simplified explanations' in Tartu City Library; U. Plath's presentations 'How strangers became ones of own. Reflections on the introduction and spread of plants in Baltic history' in the Estonian Open Air Museum during its Gardening Day, 'What life in church manors used to be like?' during Muhu Parish days, 'Animals in history' during the Researchers' Night Festival and 'Meat

on the table of Estonians and Baltic Germans' at Tallinn University during its Plant Tuesday event; E.-M. Talivee's presentations 'Two huge myths: Juhan Liiv and Ado Grenzstein' at the symposium marking the 130th anniversary of Oskar Luts and 'Classics of Estonian literature who thought about seeing as they were writing' at the literary forum 'When reading is complicated ...' organised by the Estonian Publishers' Association.

The Department of Literature Centre also continued with public lectures and literary events (with E.-M. Talivee and K. M. Vaik as the main organisers on the side of the Literature Centre). On 3 February, on the 128th anniversary of the birth of Artur Adson, the traditional dialectal poetry morning took place, featuring the actor Margus Tabor's speech about the Hiiu dialect and mindset (organised by Öne Kepp). This was also the date of the preliminary round of the III National Koidula Recitation Contest for Adults. On 2 March, at the 130th anniversary of the birth of F. Tuglas, winners of the 46th Friedebert Tuglas Short Story Award were announced. The panel with Marika Rink as the Literature Centre's representative selected Mudlum's short story *Ilma alguseta, ilma lõputa* [Without Beginning, Without End] and Urmas Vadi's short story *Auhind* [The Prize] as the laureates. On 20 April, literary scholar Livia Viitol gave a lecture on the life-long friendship of Eduard Vilde and Marie Under. On 20 May, the Museum Department opened its doors to celebrate European Night of Museums. The announced museum night topic, 'There are games in the night', provided the inspiration for organising literary and cultural history games for visitors. On 31 May, a literary walking tour along M. Under's memory lanes was conducted in Nõmme by culture historian Piret Loide. On 20 November, children's writer Jaanus Vaiksoo had a meeting with young readers from Tartu Raatuse School; and on 14 December, Jüri Hain gave a presentation about the works of art in the Literature Centre's collection, which used to belong to Marie Under, Artur Adson and the Tuglas family.

The latter event was also linked to the opening of a new exhibition in the Museum Department of Literature Centre. The photo, caricature and art exhibition *Siuru in Urban Space of Tallinn* (curator Jüri Hain) is a follow-up to the exhibition *Siuru 100* housed by the National Library of Estonia in spring and a part of the series of events marking the 100th anniversary of the Siuru group. Exhibitions, literary events, lectures, excursions and other activities brought an exceptional number of visitors to the Museum Department of Literature Centre in 2017: the former home of Marie Under, Artur Adson, Friedebert Tuglas and his spouse Elo Tuglas attracted over one and a half thousand of those interested in literature over the year. The museum's activities also ensured the involvement of the local community;

for example, it took part in the Street of Green Gates Festival, giving the residents of Nõmme an opportunity to see the writers' garden. The rate of participation in the "Let's do it!" communal action was also remarkable and ensured that spring works in the museum's garden were completed in one go.

The Literature Centre's collaboration with other research and development institutions was extensive. Over fifty researchers visited the Museum Department of Literature Centre in 2017 for their research purposes, having referred to over a thousand of units from the collections of the Literature Centre. The Literature Centre's employees participated in supervising, reviewing and evaluating bachelor's and master's degrees as well as doctoral theses in universities in Estonia and abroad (M. Hinrikus, P. Kruuspere, E. Laanes, U. Plath, A. Pilv, J. Undusk and K. Viiding). U. Plath received two national certificates of gratitude for supervising the research of two university students who were granted first prizes at the national contest of student research. As lecturers, our employees gave lecture courses and seminars (M. Hinrikus, P. Kruuspere, E. Laanes and U. Plath). The Literature Centre also takes part in the work of the Research Board of the Academic Library of Tallinn University, the National Library of Estonia and the Estonian Literary Museum (J. Undusk). J. Undusk is a Member of the Board of the President of the Republic's Cultural Foundation and the Awarding Committee of the Young Scientist Award as well as the Chairman of the Council for the 'Collected Works' of Friedebert Tuglas publication. E. Laanes is Deputy Chairman of the Cultural Endowment for Literature, a Member of the Cultural Endowment Council and the Coordinator of the Nordic Summer University research network 'Narrative and Memory: Ethics, Aesthetics, Politics'. U. Plath is a Member of the Research Council of the Estonian History Museum, headed the Centre for Environmental History and represented the Baltic States in the European Society for Environmental History. K. Viiding is a Member of the Steering Committee for the international project 'COST IS1310 Reassembling the Republic of Letters. A digital framework for multi-lateral collaboration on Europe's intellectual history (1500-1800)'; Estonia's representative in the *Thesaurus Linguae Latinae*; Member of the International Association of Neo-Latin Studies and the Conference Ambassador of Tartu. E.-M. Talivee was a Member of the Principal Board of Judges of the Cultural Endowment for Literature Awards in 2017 and a Member of the Board of Judges for the Estonian-Latvian Language Prize. The Literature Centre also took part in a number of Fiction Judging Panels (Friedebert Tuglas Short Story Award and Jaan Kross Literary Award) and Theatre Panel (Priit Põldroos Award). Its employees are members of a variety of academic publication panels and provide peer-reviews of contributions to a number of journals.

The social significance and standards of research of the Literature Centre were also highly appraised by a panel of external experts, which evaluated local research and development institutions in 2017 under the direction of the Ministry of Education and Research.

# ESTONIAN YOUNG ACADEMY OF SCIENCES

Founded in 2017

Members: 29 founding members

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On 4 January 2017, the Academy House hosted the first general meeting of the Founding Assembly of the Estonian Young Academy of Sciences (EYAS). The founding members of EYAS are active and outstanding scientists and scholars with a doctoral degree, aged under 37. At the request of the Estonian Academy of Sciences, all public higher education institutions of Estonia (the University of Tartu, Tallinn University of Technology, Tallinn University, the Estonian University of Life Sciences, the Estonian Academy of Arts, the Estonian Academy of Music and Theatre) put forward candidates, a total number of 26. Tartu Observatory and the National Institute of Chemical Physics and Biophysics were represented by one nominee each, and the Estonian Academy of Sciences nominated three founding members who work abroad.

The inauguration ceremony for the Estonian Young Academy of Sciences, a non-profit association, took place on 31 May. It was preceded by approval of the Statutes and election of the Board (the Commercial Register entry dates 28 June 2017). The Board consists of Els Heinsalu (President), Heisi Kurig (Vice President), Gert Preegel (Secretary General), Innar Liiv (Development Manager) and Andra Siibak (Communication Manager).

The EYAS is an independent non-profit association focusing on issues of interest to young researchers. It aims to represent the voice and interests of young Estonian scientists and scholars, contribute to the development of research and society, advocate and promote the role of science in society.

In 2017, the EYAS members published a dozen jointly written articles highlighting the problems of doctoral students, issues of career paths in research, and the importance of science communication in relation to a decrease in the vaccination rate. EYAS also expressed its ideas about the

role of science in education, cooperation between research and industry, power generation from oil shale and research funding.

The members of EYAS participated in organising the fourth conference “Science as an Engine of Development for Estonia”, which was held on 4 October in the Parliament’s Conference Hall and focused on increasing the common interest of science and government management. At the follow-up seminar on 5 December, Gert Preegel shared his experience of visiting the EU Joint Research Centre (JRC) in Ispra, Italy. In the final gala evening (on 27 October) of the “Science in Three Minutes” competition, Hannes Tõnisson was one of the judges assessing competitors. The discussion at the meeting of EYAS and the Estonian Association of Science Journalists on 24 November revolved around the relationship between researchers and media. On 28 November, Els Heinsalu took part in the annual forum “Science Meets Parliaments”, flagship initiative of the JRC in the European Parliament, where she was one of the three panellists in the session “Young Scientists Challenge MEPs”. On 14 December, Leho Teder-soo gave a presentation “Popularisation of science and problems in Estonian science from the perspective of young scientists” at the science forum “*teadusEST 2017*”.

The President of EYAS is also a member of the Research Policy Committee at the Ministry of Education and Research as well as the Science Communication Task Force at the Estonian Research Council. In the co-ordination process on updating laws that regulate higher education, the EYAS submitted its comments on the draft law intention to the Ministry of Education and Research.

## ASSOCIATED INSTITUTIONS

Estonian Academy of Sciences Act passed by the *Riigikogu* (Parliament) in 1997 stipulates that research, development and cultural institutions and scientific societies whose activities and objectives conform to those of the Academy may associate themselves with the Academy. The association is effected under bilateral agreements that specify the aims, tasks and commitments for the parties.

Surveys of the activities of such institutions have been published in the Academy Year Book since 1998.

Reviews on the 2017 activities of the institutions associated with the Academy have been presented in the chronological order of their association date:

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## TARTU OBSERVATORY

Associated with the Estonian Academy of Sciences since 8 May 1998

Founded in 1808

Employees: 91, of whom 69 researchers and research engineers

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Preparations continued for joining the University of Tartu. An agreement between the Ministry of Education and Research and the University of Tartu was signed on 13 December 2017. With this, the 70-year history of the Tartu Observatory as an independent research and development institution ended and the Observatory would continue as an institute of the field of nature and technology of the University of Tartu. According to the agreement, the Observatory will join the university as an integral institution with belongings, rights, obligations and contracts, necessary for its functioning.

The national science funding continued to support three institutional research topics and one centre of excellence: “Galaxy evolution in the hierarchical Universe” (principal researcher Gert Hütsi), “The role of dark matter filaments in large-scale structure and assembly of galaxies” (principal researcher Elmo Tempel), “Variability and evolution of massive stars in the Gaia era” (principal researcher Indrek Kolka), and a new Centre of Excellence “Dark Side of the Universe” was born in coordination with the National Institute of Chemical Physics and Biophysics.

Further, four personal research grants and one post-doctoral grant for an internship at the Massachusetts Institute of Technology in the United States were funded.

In addition to the seven international cooperation projects launched earlier (FP7: GLaSS, FORMIT, MULTPLY, AHEAD; H2020: EOMORES; ESA: MVT and FRM4SOC), we launched three new INTERREG projects in the field of space technology and remote sensing (Test4SME, SpaceTEM and BalticSatApps), and conducted successfully an applied research of the ARIB together with CGI, as well as performed several other smaller Estonian and international contracts.

As a major event, we organised a seminar for the parliaments of the European space states, the aim of which was to provide an input for the European Space Week that took place in the framework of the Estonian Presidency of the Council of the European Union. The researchers of Tartu Observatory contributed to the space education with the creation of a new active learning programme of astronomy and by participating in the development of a passive exposition in the courtyard. An international Summer Academy, as well as another Science Task Force, supported by the Tartu Hansa Rotary club took place.

Four of our young scientists defended their doctoral theses: Margit Aun “Dependence of UV radiation on climate factors”; Lauri Juhan Liivamägi “Properties and spatial distribution of galaxy superclusters”; Martin Ligi “Application of close range remote sensing for monitoring aquatic environment” and Jaan Laur “Variability of massive stars in Milky Way star clusters”.

95 different types of articles were published, 51 of which appeared in international peer-reviewed journals (ETIS 1.1 category).

A comprehensive overview of the activities of Tartu Observatory has been published in Tartu Observatory Annual Report 2017 and also in the traditional publication Observatory Calendar 2018.

## ACADEMIC LIBRARY OF TALLINN UNIVERSITY

Associated with the Estonian Academy of Sciences since 17.06.1998

Founded in 1946

Personnel: 91, of whom two researchers

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Number of registered users: 43 428

Number of copies in the circulating collection: 2 638 181

The international conference “Kotzebue Dialogs VI” dedicated to August von Kotzebue took place in October as the great event of the year. At the conference German researchers Conrad Wiedemann, Alexander Košenina and Nicola Kaminski, Iveta Leitane from Latvia and Estonian researchers Jaan Undusk, Harry Liivrand, Kristel Pappel and Maris Saagpakk gave presentations. Also Alexander von Kotzebue gave a speech as a representative of Kotzebue family. A collection of articles „August von Kotzebue. Ein streitbarer und umstrittener Autor“ was presented (editors: A. Košenina, H. Liivrand and K. Pappel). The book was published in Berlin-Brandenburg Academy of Sciences and Humanities series “Berliner Klassik”, volume 25.

Under the aegis of the Center for Early Printed Books, the series of presentation days were continued. In October, Tulvi Turo gave a lecture “Byzantine bookbindings” within the binding day and Rene Haljasmäe gave an overview of the rare bindings at the Academic Library within the series of lectures “Introducing the Baltica collections”. In December, Harry Liivrand introduced the photo collection and library calendar “Tallinn’s young chimney sweeps”.

Baltica scholars gave presentations about their research results within the second series of events “Researcher in the Baltica Reading Room”. In April, PhD Dominik Gutmeyr (Austria) gave a presentation “Ethnographic-anthropological photography. Russian view to the Caucasus”. In December, PhD Iveta Leitane (Latvia) talked about the role of schools and universities in Livonia in mediating Judaism knowledge, and PhD Michele Vangi introduced Daniel Chodowieck’s graphica materials from 18th and 19th century.

In 2017, the fourth Baltica scholarship competition was announced. Amongst many applicants three scholars were chosen: PhD Valentina Spune from Riga/Cologne (research topic: “Aristotelianism and the development of scientific thought in the Baltic States (1500–1800)”), PhD Denise von Weymarn-Goldschmidt from Basel („Death reports at weekly newspaper „Revalsche Wöchentliche Nachrichten (1772–1852)”) and PhD Dorothee Goetze from Bonn (“Saaremaa and Hiiumaa travelogs on 18th century”). The Baltica scholarship to international researchers is designed to attract scholars from outside Estonia to the cultural-historical Baltica collections.

In March, the retrospective Estonian national bibliography volume of “Estonian Books Abroad 1944-2010” was presented, compiled by Anne Valmas. Bibliography includes 9272 publications that have been published by Estonians living in exile or by their descendants. The bibliography describes many monographs, dissertations, textbooks, also books of fiction genre that amount to ca 25% of the registered publications. The Compatriots Programme and the Cultural Endowment of Estonia supported the compilation and publication of the book.

The Library held numerous tours for various target groups: university students, international students, high school students, lecturers, experts. The Library hosted visitors from various foreign countries. Cooperation continued with Tallinn German Gymnasium, Haabersti Russian Gymnasium, Tallinn English College, Gustav Adolf Grammar School, Rocca Al Mare School, University of Tartu and Tallinn University of Technology.

At the annual meeting of Estonian Librarians Association held on February 28, the Academic Library earned the award “The Act of the Year in Research Library” for opening a late night study room, an innovative and important service for readers in Estonia. The implementation of the service was coordinated by Heli Sirotkin.

In April, the library’s anniversary was celebrated by opening the museum chamber of the Center for Early Printed Books. Many books from spare stock, publications related to the history of the library, as well as a selection of rarities and books with unique bindings are exhibited. Thematic lectures and workshops will be organised in the chamber. This initiative was supported by the Cultural Endowment of Estonia.

In May and December the Night Library events were organised in cooperation with university students union. The Study Centre was open until 11 pm. The centre was visited by over 200 readers per week. The

event was sponsored by the companies Löffbergs, SAKU, and Sense. In August, a performance “The Quiet Volume” was organised at the library by Kanuti Guild Hall during the festival “SAAL Biennaal”. In September, the subject librarians attended the Researchers Night at Tallinn University with a workshop about ethics and plagiarism in research.

In 2017, the Compatriots Programme of the Ministry of Education and Research allocated 12 000 euro to the Expatriate Literature Centre for the project “Preservation and making available of cultural heritage of Estonians in exile”. The extra funds enabled to bibliograph exile articles to the Database of Estonian Articles (ISE), digitise the off-prints of research works, and start digitising the collection of books of the Expatriate Literature Centre.

In September, an online readers’ registration and authentication system KRAS was launched. The software is integrated into the e-catalogue ESTER and library system Sierra, ordered by ELNET Consortium. By the end of the year, 1220 readers had registered through web form (62% of all new readers of that time period).

Developing the digitisation centre continued and work processes were improved. All digitised materials are made available through the digital library ETERA; at the end of year 36 442 items (over 2,2 million pages) were accessible. ETERA was used 65 864 times in 2017.

Academic Library is a member of international organisations Bibliotheca Baltica (Association of Libraries of Baltic Countries), CERL (Consortium of European Research Libraries), EAHIL (European Association for Health Information and Libraries), ICOM (International Council of Museums), IFLA (International Federation of Library Associations), LIBER (Association of European Research Libraries), HIBOLIRE (Nordic-Baltic-Russian Network on the History of Books) and Nonprofit Organisation Consortium of Estonian Libraries ELNET.

# INSTITUTE OF THE ESTONIAN LANGUAGE

Associated with the Estonian Academy of Sciences since 11 May 1999

Founded in 1947

Personnel: 67, of whom 14 researchers, 35 lexicographers, terminologists and language planners

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The institute has seven departments.

Department of the History and Dialects of the Estonian Language and the Finno-Ugric Languages (Head Tiina Laansalu) carried out the projects “The cultural shift in Estonian in the 17th and 18th centuries” and “Completion of the concordance of Estonian Bible translations”. Compiling and editing of the Dictionary of Estonian Dialects, the Scientific Etymological Dictionary and dictionaries of small regional dialects were continued. The Estonian-Mari web dictionary was published, the compilation of the Estonian-Erzya web dictionary began. The Archive of the Estonian Dialects and Finno-Ugric Languages was supplemented and organised.

Department of Language Resources and Technology (Head Tõnis Nurk) developed and maintained dictionary writing systems and terminology management software. The EKI-ASTRA project will continue within the framework of the Institutional Development Programme for R&D and Higher Education Institutions (ASTRA). The project “Tools of lexical resources” was carried out.

The main work of the Department of Speech Research and Technology (Head Meelis Mihkla) included speech research and development of Estonian speech synthesis and its applications. The Estonian Android Text-To-Speech Application Programming Interface (TTS API), non-stop news reader and pre-processing module for HTML texts were completed. The projects “Speech styles, sentence prosody and phonological variation: description, theory and modelling”, “Speech synthesis improvements and extension of applications” and “Publishing e-books in the form of multimedia” were carried out.

Department of Language Planning (Head Peeter Päll) was mainly engaged in compiling the Dictionary of Standard Estonian (ÕS) 2018 and the related

Handbook of Standard Estonian. The project “A century of normative dictionaries. Applications of historical lexicography” was launched. The brochure “Writing Foreign Names” was published. The database of new words and meanings and the database of personal names were supplemented. The Department continued compiling the book of Estonian surnames. The entries of “The Dictionary of Estonian Place Names” were updated for the web version. Assistance to EU translators and interpreters was continuously provided on the use of good Estonian language. The EU language collection “Aspects of Translation” was published.

Dictionary Department (Head Margit Langemets) continued with their main works: “Dictionary of the Estonian Language” (one volume), “Estonian Collocations Dictionary”, the database of new words and meanings, “Estonian Association Dictionary” and the web version of the “Finnish-Estonian Dictionary”. Within the framework of the EKI-ASTRA project, the development of a new dictionary system EKILEX (partner TripleDev OÜ) began.

The main works of the Terminology Department (Head Tiina Soon) included multilingual terminology databases Esterm and Militerm, the dictionary of education and upbringing, the dictionary of hobby education. The participation in work of terminology committees continued and terminological advice was given. The Department continued cooperation with the compilers of the terminology database IATE and participated in the eTranslation (2016 CEF Telecom Call – Automated Translation) Europroject.

Personnel and Administration Department, Head Kai Oro – the Institute joined the Ministry of Social Affairs and the EU project “Family and employee friendly employer”. A satisfaction survey of employees and a risk analysis of the work environment were organised.

## ESTONIAN LITERARY MUSEUM

Associated with the Estonian Academy of Sciences since 11 May 1999

Founded in 1909 as the Archival Library of the Estonian National Museum

Personnel: 108, of whom 42 researchers, 13 librarians and bibliographers

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Secretary: Ave Soeorg, Tel +372 737 7700, Ave.Soeorg@kirmus.ee

In 2017, the structural units of the Estonian Literary Museum were the following.

**Centre of Excellence in Estonian Studies.** The application of systems theories to studying culture, the description of complex system phenomena (environments) and emergence as well as the development of terminology were of primary importance. The formulation of symbiotism and development practices as well as the formation of common points of view in various humanities were decisive. The simplifying method of the interpretation and presentation of symbolic representations is disorienting and can at times result in antagonism between researchers of related fields. Primary output has already attracted general attention.

**Estonian Folklore Archives.** In the model of cultural communication created by Lotman and Torop, folklore is considered to be one of community's means of autocommunication used for the organisation and consolidation of the community's knowledge, experience and beliefs. It turned out that folklore collections play the same role in the context of a nation state and literary culture; extensive public use of the materials of the Folklore Archives in various spheres of life as well as their contemporary interpretations support national identity, ethnic identity and the identities that are more local. Folklore studies fulfil the same role, and they are one of the components in the consistent creation and shaping of Estonian cultural cohesion.

**Department of Folkloristics.** Marc Augé's theory of non-places was used to determine the causes and criteria for the emergence of a temporary sacred site: the definitive component is the message and presence of the religious leader. As far as natural sites are concerned, the places

connected to family history, especially trees, are of central importance in the contemporary process of sacralisation. The post-truth era fosters information variability; the core theme and central opinions prevail selectively and in clusters; at the same time, the variability of the concept of national sport is closely linked to the paradigmatic of identity, as well as sarcasm.

**Estonian Cultural History Archives.** A novel theoretical framework of Soviet colonialism was developed on the basis of the postcolonialism theory: the power matrix built on affectivity-used feelings and visual means for the input of cultural imagery. Literature in one's mother tongue was a medium that connected both the politically persecuted and refugees to home. In exile, global social networking was achieved through festivals involving top Western politicians. Trauma, testimony and confession are characteristic of biographical literature, but they also occur in fiction.

## ESTONIAN NATIONAL MUSEUM

Associated with the Estonian Academy of Sciences since 21 December 2006

Founded in 1909

Personnel: 142, including 16 researchers

Address: Muuseumi tee 2, 60532 Tartu, ESTONIA

erm@erm.ee, www.erm.ee

Director: Tõnis Lukas (until 21 January 2018)

Director for Research: Pille Runnel, Tel. +372 736 3013,

pille.runnel@erm.ee

2017 was the first full year for the Estonian National Museum (ENM) in its new building, which was visited more than 250,000 times. The visitors were mainly keen on viewing the Estonian permanent exhibition *Encounters* and the Finno-Ugric permanent exhibition *Echo of the Urals*. The museum also offered a comprehensive folk costume exhibition *Regarded as a norm, perennially worn* and a fashion exhibition inspired by folk art. ENM held 230 culture and educational events, as well as several conferences and corporate events, and it participated in ten events related to the Estonian Presidency of the Council of the European Union. The work of ENM's educational centre began successfully – more than 12,000 people took part in the museums' educational programmes. The architecture, exhibitions, activity and personnel of ENM received plenty of recognition in 2017 in very diverse competitions. At international level, the science-based exhibitions and development activities were awarded with the European Museum of the Year Award (EMYA) nomination for the best museum of the year.

The research work of ENM focused on studies of Estonian and Finno-Ugric ethnology and museology, the results of which deserved a positive evaluation for the next seven years in the area of humanities and arts in 2017. ENM manages two research projects and participates in four international cooperation projects (themes include food culture, modern everyday life and the studies on Finno-Ugric peoples). Estonian National Museum became a partner of the Collegium for Transdisciplinary Studies in Archaeology, Genetics and Linguistics.

During the year, three scientific conferences were held including the annual conference of ENM in cooperation with the Estonian Literary Museum and the Centre of Excellence in Estonian Studies. ENM researchers delivered papers at 25 international conferences and 11 national conferences;

they also participated in the Estonian Presidency Conference “Cultural Heritage 3.0: Audience and Access in Digital Era”.

17 scientific articles and 28 popular science articles were published (themes included memory studies, studies of the Soviet period, migration studies, museum studies, history of science and folk culture). Piret Koosa, an ENM researcher, defended her PhD degree in the University of Tartu on the research direction of Finno-Ugric ethnology. ENM researchers gave 12 popular science presentations and introduced the exhibitions and development activities of ENM to professional visitors on more than 100 occasions. In addition, the museum collections were supplemented, employees participated as experts in programme councils and committees, research was supervised, more than 60 lectures were held at universities and in-service training was organised in the museum field.

## ESTONIAN CROP RESEARCH INSTITUTE

Associated with the Estonian Academy of Sciences since 23 September 2008

Founded in 1920

Employees: 142, of whom 45 are researchers

Address: J.Aamisepa 1, Jõgeva, 48309 Jõgevamaa, ESTONIA  
info@etki.ee, www.etki.ee

Director: Mati Koppel, Tel.: +372 776 6903, fax: +372 776 6902,  
mati.koppel@etki.ee

The Estonian Crop Research Institute is a state research and development institution in the area of governance of the Estonian Ministry of Rural Affairs.

The Institute's most important achievement of 2017 is the positive evaluation of the Institute's research and development activities in the sphere of agricultural sciences and veterinary science. The evaluators emphasised that the merging of research institutions undertaken in 2013 had yielded quite positive results. Excellent collaboration with research institutions in the Baltic States and Nordic countries, the existence of long-term field experiments and gene bank collections as well as the promotion of molecular biology developments create the conditions necessary for the Institute's sustainable development and an increase in the level of research.

In 2017, the Institute participated in implementation of six international scientific projects. The EUROLEGUME and LEGATO projects within the EU 7th Framework Programme focus on the legume breeding, the enhancement of cultivation technologies and the development of new products from beans and peas. The EU FP7 project on Healthy Minor Cereals focuses on winter rye, oat, spelt, emmer and einkorn wheat. The issues under research are breeding, sustainable cultivation technologies and development of novel grain products. The idea of the SoilVeg project by ERA-NET CORE Organic Plus lies in growing agro-ecological service crops in between the seasons of growing catch crops to foster the preservation of soil fertility, improve soil moisture balance and contribute to the prevention of pest occurrence in organic production. INTERREG projects for the Baltic Sea region titled Baltic Slurry Acidification and Manure Standards aim to make the use of manure more environmentally friendly and to introduce more precise recording and more efficient use of the plant nutrients in manure. The project for the cooperation of the private and public sector uniting grass plant breeders in the Baltic States and Nordic countries aims

to create synthetic populations carrying novel gene combinations as well as the development of molecular biology techniques for the identification of specimens carrying the required gene combinations.

Breeding activities in 2017 yielded the registration of new varieties: winter-resistant, short-season winter wheat variety Ruske and high-yield, good grain quality oat variety Kusta.

## ART MUSEUM OF ESTONIA

Associated with the Estonian Academy of Sciences since 9 June 2015

Founded in 1919

Employees:154

Address:Weizenbergi 34/Valge 1, 10127 Tallinn,ESTONIA  
muuseum@ekm.ee, kunstmuuseum.ekm.ee/

Member of the Board:Sirje Helme, Tel.: +372 602 6001

The Art Museum of Estonia Foundation (AME) collects, preserves, studies and introduces Estonian and foreign art to the public. The structure of the Art Museum does not allow for a separate researcher position, but its research activities are based on the following principle: all registrars and curators operate in accordance with the principles of the history of arts and keep upgrading their skills continuously.

Principles of AME's research activities:

- Research areas stem from the nature of the collections and cover the range from medieval art to contemporary art. Primary research areas: Estonian medieval and ecclesiastical art; contemporary art of Western Europe and Russia in Estonia; Estonian art in the 17th-19th centuries; Estonian modernism of the first half of the 20th century; Estonian modernist and avant-garde art after World War II; Estonian art after 1991; conservation.
- Research projects are performed within the relevant research area, last for 2-4 years and are generally related to exhibitions except for archive-based research.
- Seminars and conferences are linked to research areas. Conferences are international events that can be related to exhibitions, but are not necessarily so. Selected presentation texts are published in the *Proceedings of the Art Museum of Estonia* journal in two languages.
- The Art Museum of Estonia collaborates with universities in working on research projects, museum employees' degree studies, lecture courses, supervising university students' research papers and providing them with apprenticeships as well as organising joint conferences.

The purpose of the 16-member research board of the AME is to strategically interpret the museum's work and research activity, assess its research activity and provide recommendations. The board organises seminars and discussions related to museum history studies and exhibition analysis, and it selects texts that require peer review from the publication plan.

The AME supports its personnel in their degree studies, allowing them to attend lectures and seminars during working hours. In 2017, the AME had 5 employees with doctoral degrees, and 7 more are completing their doctoral studies.

During the reporting year, five projects continued, and three new projects were started:

- Lost Estonian sculptors: Linda Sõber and Endel Kübarsepp (2016-2018);
- Michel Sittow. Estonian Painter at the Courts of Renaissance Europe (2014-2018);
- History in the painting – painting in history. National and Transnational Past in Estonian Art (former title Visual Narratives of Estonian History in Art (2014-2018);
- Christian Ackermann – Tallinn’s Pheidias, Arrogant and Talented (2016-2020);
- Archive project I Truly Suffer when I Cannot Work... Agathe Veeber (2016-2018);
- Forgotten Heritage – European Avant-Garde Art Online (2016-2018);
- The Mythical / Material Nineties (2017-2019);
- The Modern Woman – New Identities (2017-2019).

The international conference ‘Indifferent Things? Material and Ceremonial Church Practices in the 16th and 17th Centuries in the Baltic Sea Region’ (Niguliste Museum); international seminar ‘With a Curious Eye. Mannerist Painting from the National Museum in Warsaw’ within the *With a Curious Eye* exhibition (Kadriorg Art Museum) and ‘On the Problematics of Surrealism’ (KUMU).

The publication of the bilingual peer-reviewed journal *Proceedings of the Art Museum of Estonia* continued with special issue 12, *Wealth of Nature. The Idea of Closeness to Nature and the Düsseldorf School of Painting* (edited by Tiina Abel). The editor-in-chief of *Proceedings* is Merike Kurisoo.

Seven art and popular-science catalogues were published in accordance with plans:

- Children of the Flowers of Evil. Estonian Decadent Art (compiled by Mirjam Hinrikus, Lola Annabel Kass and Liis Pählapuu);
- Jüri Okas (Jüri Okas and Sirje Helme);
- Anu Pöder. Be Fragile! Be Brave! (Rebeka Pöldsam);
- IV B. Addenda to Soviet-era art history 3

#### Symmetrical Worlds – Mirrored Symmetries:

- Ülo Sooster, Juri Sobolev, Tõnis Vint, Raul Meel (Elnara Taidre);
- *With a Curious Eye. Mannerist Painting from the National Museum in Warsaw* (edited by Greta Koppel);
- *Abundance and Ephemerality. Still Lives from Finnish and Baltic Collections* (compiled by Kerttu Männiste);
- *Adamson-Eric (1902-1968)* (Kersti Koll).

During the reporting year, 19 scholarly publications by AME employees were published.

#### Awards and honours:

- In the National Contest for University Students held by the Estonian Research Council, Elnara Taidre achieved 2nd place in the category of doctoral students of social sciences and culture for her thesis *Model, Metaphor, Play: a Changing Total Mythological Work of Art in the Visual Art of the 20th Century*;
- Niguliste Museum's project for the research and conservation of the Rode altarpiece won the 2017 Creative Europe and Europa Nostra Award for cultural heritage in the research category;
- In the Annual Awards of Estonian Museums competition, the catalogue of the AME's research exhibition *Children of the Flowers of Evil. Estonian Decadent Art* (compiled by Mirjam Hinrikus, Lola Annabel Kass and Liis Pählapuu) was nominated for the Annual Award in research.

## ASSOCIATED ORGANISATIONS

Organisations whose activities and objectives comply with those of the Academy, may associate with the Academy. Association is effected in the form of a bilateral agreement, specifying the aims, duties and commitments of the parties.

Reviews on the 2017 activities of the organisations associated with the Academy have been presented in the chronological order of their association date:

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## ESTONIAN NATURALISTS' SOCIETY

Associated with the Estonian Academy of Sciences since 23 January 1998

Founded in 1853

Members: 14 honorary members, 658 active members, 70 trustees

Divisions: 23

Location: Struve 2, 51003 Tartu, ESTONIA

Address: POB 43, 50001 Tartu, ESTONIA

elus@elus.ee; ww.elus.ee

President: Urmas Kõljalg, Tel.: +372 5341 2823

Academic Secretary: Ivar Ojaste, Tel.: +372 734 1935

As of 31 December 2017, the Estonian Naturalists' Society (ENS) had 23 divisions: sections of anthropology, botany, entomology, geology, amateur meteorologists, forestry and theoretical biology; the Commission of Lakes, the Estonian Theriological Society, the Estonian Malacological Society, the Estonian Mycological Society and the Jakob von Uexküll Centre. The Estonian Society of Amateur Science is a new division that started operations in 2017. The society also comprises commissions performing special tasks for natural sciences education, the history of natural sciences, the library, Estonian plant names, and observation networks; there is also the assembly of honorary members, the Estonian ecology assembly, the round table for nature conservation and the commissions for botanical rarities and Estonian environmental terminology.

In 2017, the ENS held 8 general meetings with scientific presentations. In March, the "Baer Day" seminar was held in collaboration with the Estonian University of Life Sciences as well as the Natural History Museum and Botanical Garden of the University of Tartu, featuring presentations in English given by Erki Tammiksaar (University of Tartu / Estonian University of Life Sciences) on "Why did Karl Ernst von Baer travel to Italy in 1845-1846?"; Margherita Raineri (University of Genoa) on "Karl Ernst von Baer in Italy (1845-46) and his relationships with Italian naturalists"; Maxim Vinarski (Saint Petersburg State University) on "Remains of Karl Ernst von Baer's malacological collection in the Zoological Institute, Saint-Petersburg"; and Ken Kalling with Erki Tammiksaar (University of Tartu) on "Karl Ernst von Baer and the craniological collection of the St. Petersburg Academy of Sciences". The exhibition "From the North to the Mediterranean: Karl Ernst von Baer in Italy in 1845-1846" was also prepared.

The section of geology organised the XIII Geology Autumn School “Resources of the Earth” in October in collaboration with the University of Tartu and Department of Geology of Tallinn University of Technology. Nineteen scientific presentations were given, and the publication *Schola Geologica XIII* (79 pages) was issued.

The section of theoretical biology held its 43rd Spring School on Baer in May. Seventeen scientific presentations were given, and the annual journal *Schola Biotheoretica XLIII “Baer”* was published.

In the section of botany, the meeting of moss researchers with 23 participants took place in May. Field research yielded 251 moss species. Issue 20 of the online journal *Samblasõber [Moss Connoisseur]* was published:

[https://sisu.ut.ee/sites/default/files/samblasober/files/samblasober\\_20.pdf](https://sisu.ut.ee/sites/default/files/samblasober/files/samblasober_20.pdf).

The observation network coordinated by the section of amateur meteorologists continued operation. Data were obtained from 40 amateur observation points and 7 automatic weather stations; combined with the data received from the observation network of the National Weather Service, the above were used for the compilation of maps showing the distribution of precipitation, minimum air temperature, snow cover thickness and other meteorological parameters (see [www.etki.ee](http://www.etki.ee)). The traditional meeting of amateur meteorologists and thunderstorm watchers took place in July. Their presentations introduced the work of the national weather observation network as well as other weather observation networks operating in Estonia.

In September, the Estonian Theriological Society organised the Baltic Theriological Conference in Tartu, collaborating with the Theriology Unit of the University of Tartu. Support of and interest in the creation of an international Baltic platform for lynx population management were expressed.

Jointly with the Centre for Physical Anthropology of the University of Tartu, the section of anthropology held the “Aul Day” to celebrate the 120th anniversary of Juhan Aul.

The Commission of Lakes undertook two major inventory surveys in 2017: the 2016-2017 specification of the distribution of large invertebrates in large water bodies under the Habitats Directive and the inventory of large invertebrates in Pärnu river system.

The Estonian Mycological Society held its two traditional mycology camps in Southern Estonia. During the spring mycology camp, 83 fungi species were found, which became the subjects of 182 observations; in the autumn, a total of 598 observations was made about 308 fungi species. The annual meeting “Actiones” was held in December at the Estonian Crop Research Institute in Jõgeva. It gathered 32 participants and featured 11 presentations. The title of the 2018 Fungus of the Year was attributed to tinder fungus. Journal *Folia Cryptogamica Estonica* vol.54 was issued in collaboration with the University of Tartu. The 2017 Fungus of the Year was the chanterelle, which was featured in a topic-specific article in the *Eesti Loodus* [Estonian Nature] magazine.

The most important event for the section of forestry was the seminar “Is Estonian forest management sustainable?”, organised in January jointly with the Estonian University of Life Sciences in front of a packed lecture hall of 300 participants. The video feed of the seminar was broadcast live online and later widely covered by the media.

The members of the Estonian Malacological Society performed work within the national monitoring sub-programme ‘Land mollusc monitoring’.

The ENS library joined the electronic catalogue ESTER in 2017. During the year, 3,084 obsolete redundant books and journals were removed from the library collection. As of 31 December 2017, the library contained 158,793 items.

In 2017, the ENS took part in five public procurements. Customers concluded 11 contracts for various services with the ENS, and the performance of 4 contracts obtained in 2016 continued. The Society’s primary client was the Estonian Environmental Board. The Environmental Investments Centre financed the following projects in 2017:

- Baltic Theriological Conference;
- improvement of a smart application for nature observation;
- Oil shale extraction and wildlife (preparing the book manuscript);
- expeditions of the ENS in 2016-2017 (10 and 10 expeditions respectively for the assessment of the species distribution, habitat and relative abundance of dragonflies and land snails).

## ESTONIAN GEOGRAPHICAL SOCIETY

Associated with the Estonian Academy of Sciences since 27 January 1998

Founded in 1955

Membership: 205, 16 honorary members, 5 foreign members

Address: Kohtu 6, 10130 Tallinn, ESTONIA

egs@egs.ee, www.egs.ee

President: Mihkel Kangur, Tel.: +372 619 9800,

mihkel.kangur@tlu.ee

Academic Secretary: Tiit Vaasma, Tel.: +372 619 9828, egs@egs.ee

Estonian Geographical Society (EGS) is an organisation that unites geographers and people interested in geography. The main areas of activity of the Society are the publication of specialised printed matter, research, organisation of scientific events and dissemination of knowledge in geography. The EGS Youth Club (EGSY) takes care of the continuity of activity of the Society.

In 2017 EGS published one collection:

- Järvet, A. (editor). 2017. Eesti Geograafia Seltsi aastaraamat 42. kd. (Yearbook of Estonian Geographical Society, Vol.42). Tallinn, 362 pp.

In connection with planning of the Rail Baltic railway that will traverse the Baltic states, a seminar was organised on 9 April where Arvo Järvet and Kalev Kukk spoke about Rail Baltic from a geographer's perspective, Ene-Margit Tiit touched upon the social problems involved in construction of the railway, Karli Lambot considered the economic aspects and Mihkel Kangur talked about the environmental protection aspects. As regards Rail Baltic, the EGS members have made proposals and appeals to the President of the Republic, the Riigikogu (Parliament), the County Governor of Pärnu and the general public.

On 2-4 June, EGSY went hiking to the island of Vormsi. The summer excursion on 8-10 August took the participants to Latvia along the planned Rail Baltic route. On 8-12 August, the EGSY cycling trip in East and North Saaremaa took place.

On 6 October, EGS, the Department of Geology at the University of Tartu and the Institute of Geology at Tallinn University of Technology organised in the Chemicum of the University of Tartu a conference on development of the radiocarbon dating method and application of the method in Estonia.

2017 marked the 70th anniversary of the publication of W. Libby's and E. Anderson's article "Radiocarbon from Cosmic Radiation", which could be considered as the revealing of the  $^{14}\text{C}$  dating method, and already in 1957, the first  $^{14}\text{C}$  laboratory in Estonia at the Institute of Zoology and Botany of the Academy of Sciences of the Estonian SSR was set up in Tartu.

On 24-26 October EGS took part in organising a high-level conference "Nature-based solutions: Innovation on day-to-day basis" in Tallinn. The conference was held within the programme of the Estonian Presidency of the Council of the European Union and was dedicated to the environmental priorities and ecological innovation, introducing practices and knowledge that help solve the burden of climate change and urbanisation.

The school geographers of EGS participated in organisation of geography olympiads. The EGS was involved in preparation and evaluation of exam assignments. Study trips were taken.

At KoKoKo club evening events, hobby education travel memoirs were shared: Anja Põrh talked about Karelia, Jaanis Priimets about Sri Lanka, Kalev Kukk about Swedish Lapland, Mati Rahu about Iceland and Jako Reinaste about the Issyk-Kul trip.

## SOCIETY OF ESTONIAN AREAL STUDIES

Associated with the Estonian Academy of Sciences since 27 January 1998

Founded in 1939

Membership: 203 members

Address: Kohtu 6, 10130 Tallinn, ESTONIA

ekus@ekus.ee, www.ekus.ee

Chairman: Andrus Ristkok, Tel.: +372 5664 7806

Secretary: Ene Luka, Tel.: +372 644 0475

For the fifth time, a contest was held for the best publication by a Member of the Society. Among the research works published in 2016 (a total of 18), the voluminous and thorough summary of the activities of Sillaotsa School during the post-war years compiled by Taivo Kirmi and Ilmar Voltri (Kirm, T., Voltri, I., 2016. Sillaotsa kool 1944-2016. Tartu. 359 lk.) received recognition.

The regular Yearbook was published. The section of the Society of Estonian Areal Studies of the Yearbook published jointly by three societies includes studies of two farms, facts about the Spanish soldiers in Estonia during WWII, as well as a study on the web catalogue of monuments, personal stories, photo memories about the past working year of the Society and more.

On 1 April, Koidula museum (Pärnu) celebrated the 150th anniversary of Mihkel Kampmaa, a meritorious researcher in areal studies and scholar, with an exhibition arranged by researcher in areal studies Vaike Birk.

The general meeting of the Society took place in Tallinn on 5 May. The standard reporting was followed by a presentation on Estonian place names from Marja Kallasmaa (Institute of the Estonian Language).

On 8 July 2017, the Society organised the “Cultural history of Vändra municipality” study trip to continue a more thorough examination of Pärnumaa. This time, the participants stayed longer in Võidula Manor and Kurgja. The county students’ conferences were held in Pärnu (on 27 April at Pärnu House of Arts), in Järvamaa (on 17 May at Paide Town Hall), in Võrumaa (on 2 November at Võru County Vocational Training Centre), in Virumaa (on 9 November in Sõmeru Basic School) and Raplamaa (on 15 November at the conference hall of Rapla Riigimaja). As with last year, the National Conference of Students took place in Pärnu at the initiative of

the cultural body of Pärnu County Government and the education department of Pärnu City Government (on 29 November at Pärnu House of Arts).

In the past decade, the most active researchers in areal studies have come from Pärnumaa. Members of the Union of Pärnumaa Researchers in Areal Studies celebrated their 15th anniversary on 25 November with the St.Catherine's Day conference.

The Board of the Society has informed researchers in areal studies about many events on-site. Researchers in areal studies are often asked for help in illustrating the events of local history or anniversaries of famous persons with relevant material, as well as organising presentations and exhibitions where their fruits of work reach a broader audience. As usual, long-term research results are cumulated into books. A selection of these is available on the webpage of the Society.

## ESTONIAN MOTHER TONGUE SOCIETY

Associated with the Estonian Academy of Sciences since 4 February 1998

Founded in 1920

Members: 369 active members and 15 honorary members

Address: Roosikrantsi 6, 10119 Tallinn, ESTONIA

es@eki.ee, www.emakeeleselts.ee

Chairperson: Helle Metslang, Tel.: +372 522 5074

Academic Secretary: Killu Paldrok, Tel.: +372 644 9311

Librarian: Annika Oherde, Tel.: +372 644 9311

In 2017, the Society organised four conferences with a total of 26 presentations.

On 17 February, the conference titled “Language is a journey: on the borderline between diachronic and synchronic approach to the language” was held in Tallinn, commemorating the prematurely departed linguist Katre Õim (25 August 1970 – 20 July 2016) and jointly organised by Tallinn University, the University of Tartu, the Estonian Literary Museum and the Centre of Excellence in Estonian Studies.

On 27 June, the traditional J.V. Veski language conference took place in Tartu. The title of the 50th conference in the series was “Language is full of images”.

On 10 August, the memorial to Eduard Ahrens was unveiled in Kuusalu, and a relevant conference was held in collaboration with the St. Lawrence Society, the Institute of the Estonian Language and the Learned Estonian Society.

The university students’ conference organised annually by the Mother Tongue Society to celebrate the European Day of Languages was held at Tallinn University on 29 September. Bachelor’s, and masters students of the University of Tartu and Tallinn University gave five presentations about their research in linguistics during two topical sessions: “Syntax and Semantics” and “Phonetics”.

Abroad, three Language Day events (in Brussels, Vilnius and Tampere) were organised in collaboration with the Estonian Ministry of Education and Research, local Estonian associations and Estonian language teaching centres. Presentations were given on a broad variety of topics selected on

the basis of the local audience's suggestions and expectations, but, as usual, an overview of Estonia's language policy became one of the presentations.

In collaboration with the Ministry of Education and Research, the Society organised the 2016 Best Language Deed competition. The *Eesti kohanimeraamat* publication (Book of Estonian Place names).

On 27 April, a language day event marking the Ferdinand Johann Wiedemann Language Prize was held at Väike-Maarja community centre. The agenda comprised six presentations. As it has become a tradition, a presentation was given and a young tree was planted in the 'Language oak grove' by the Laureate of the Wiedemann Language Prize, which had gone to Marja Kallasmaa in 2017.

Eight symposiums (four in Tallinn and four in Tartu) featured a total of 28 presentations.

The Society continued organising language days at schools. In 2017, three language day events took place (at Kreutzwald School in Võru, Antsla Gymnasium and Rakvere Gymnasium) – a total of 8 presentations. Estonian philologists specialising in various spheres as well as local school students gave speeches at the schools; at Rakvere Gymnasium, visiting lecturers gave language lessons.

In October, a three-day language camp for youth titled "Republic of Estonia 100" was organised in Nina village on the shore of Lake Peipus. Eight lectures and seminars took place, during which linguists of different generations introduced their field of research; the programme comprised disputes, games, exchange of ideas and pleasant socialising.

Since 1 April 2016, Maire Raadik has been the elder of the Language Working Group of the Society. The Group consists of Reili Argus, Reet Kasik, Krista Kerge, Katrin Kern, Einar Kraut, Helika Mäekivi, Urve Pirso, Peeter Päll, Külli Habicht and Arvi Tavast. The group's meetings featured discussions concerning the manuscript of the web-based Standard Estonian handbook to be completed in 2018 at the Department of Language Planning of the Institute of the Estonian Language, which has to be approved by the Language Working Group as a source for the language norm. The general public was informed about the latest language-related topics and positions through the internet, the media, the *Oma Keel* [Own Language] journal and public speeches. Our experts spoke on the radio, were published by newspapers and answered questions sent by institutions and individuals.

The use of financial support provided by the Ministry of Education and Research continued for the completion of a comprehensive academic analysis of the Estonian language (preparing the layout of the written language history and morphology section; reviewing and preparing the layout for the comprehensive analysis of word formation).

The company name image building campaign launched a year ago and featuring the slogan ‘Genuine Estonia: an Estonian name to an Estonian company’ continued in 2017. Four awards were distributed in four categories (winner in the industrial enterprise category: OÜ Hiire Önn; honourable mentions: Taruvabrik OÜ and Tormitehnika OÜ; winner in the service provider category: Vinoteek Mulks (Vats Toitlustus OÜ); honourable mentions: Tuuletuka OÜ and OÜ Upitaja; winner in the NGO category: Ajapaik (MTÜ Eesti Fotopärand), honourable mentions: Töötuba Ratastel MTÜ and MTÜ Loodusring; newcomer of the year: MTÜ Rabarber; honourable mentions: OÜ Võitleja and Südamepesa OÜ).

Language-related initiatives that had become traditional earlier were continued in 2017: the dictation contest on the Mother Tongue Day in collaboration with the University of Tartu and Estonian National Broadcasting; summary writing competition Tuum in collaboration with the University of Tartu and the Mother Tongue Teachers’ Society; educational exchange of students between the University of Tartu and Tallinn University, language quizzes and language tweets on Vikerraadio.

In collaboration with the Ministry of Education and Research, six one-off grants of €400 were awarded for the third time to master students studying under curriculum “Teacher of the Estonian Language and Literature”.

Publications of the year 2017:

- Yearbook of the Mother Tongue Society 62 (2016). Editor-in-chief Mati Erelt, editor Sirje Mäearu. The Mother Tongue Society of the Estonian Academy of Sciences. Tallinn, 2017. 350 pp;
- Dialect stories of Northwest Estonia. Selected texts in dialect IX, a collection of articles by Evi Juhkam. Tallinn, 2017, 280 pp;
- language journal Oma Keel, issue 1, 103 pp;
- language journal Oma Keel, issue 2, 111 pp.

In 2017, the Society’s library received 49 publications that were obtained through exchange, donation or purchase. The library has 6,587 recorded publications; the digitalisation of earlier publications continues.

## ESTONIAN ASSOCIATION OF THE HISTORY AND PHILOSOPHY OF SCIENCE

Associated with the Estonian Academy of Sciences since  
4 February 1998

Founded in 1967

Membership: 64 active members, 7 honorary members, 6 member  
organisations

Address: Akadeemia tee 3, 12618 Tallinn, ESTONIA

Chairman: Peeter Mürsepp, phone: +372 620 4116, peeter.  
muursepp@ttu.ee

Academic Secretary: Kaija-Liisa Koovit, phone: +372 5341 1985,  
kaija-liisa.koovit@ut.ee

The Estonian Association of the History and Philosophy of Science (EAHPS) is active in Tallinn and Tartu. It is a member of the Baltic Association of the History and Philosophy of Science and a member of both autonomous divisions of the International Union of the History and Philosophy of Science and Technology, of which the first embraces the history of science, and the other the logic, methodology and philosophy of science and technology.

A general meeting was held in Tartu, at the Centre for Science Studies of the Estonian University of Life Sciences on 5 May 2017. The general meeting approved the activities and financial report of the EAHPS for 2016 and the working plan for 2017.

The main event in 2017 was the 28th Baltic Conference on the History of Science, organised by the EAHPS in cooperation with the University of Tartu Museum. Held in Tartu on 18-20 May, the conference titled "On the Border of the Russian Empire: German University of Tartu and its first Rector Georg Friedrich Parrot" proved to be interesting and successful. Altogether 58 presentations were given. In addition to science historians from the Baltics and the neighbouring areas, a number of prominent experts from Germany, France, and other countries took part. The conference was nominated for the Annual Award of Estonian Museums in the category of science events.

The Association continued to publish *Acta Baltica Historiae et Philosophiae Scientiarum*, a journal included in the SCOPUS database. Both editions of the fifth volume of the semi-annual journal were published as planned.

Under the leadership and active participation of EAHPS members, the journal *Studia Philosophica Estonica* published an edition focusing on the role of metaphysics in science.

Peeter Mürsepp, Head of the EAHPS and Corresponding Member of the International Academy of the History of Science, represented the Baltic states at the 25th International Congress of History of Science and Technology in July in Rio de Janeiro.

The EAHPS was sad to lose two dedicated members in autumn 2017: Member of Academy Karl Siilivask, a long-standing Head of the Association, and Member of Academy Ülo Lumiste.

## ESTONIAN LEARNED SOCIETY IN SWEDEN

Associated with the Estonian Academy of Sciences since 19 March 1999

Founded in 1945

Membership: 88 active members, including honorary members

Address Wallingatan 32/34, c/o Eesti Maja, 11124 Stockholm,  
Sweden

teadusselts@gmail.com, www.etsr.se

Chairperson: Evelin Tamm, tammevelin@gmail.com

Co-chair and Secretary: Helena Faust

The Society had placed an order for digitization of its Year Books with the National Library of Estonia and by the autumn of 2017 the work was complete. The long-lasting research activities of the Society members are now publicly available for every interested reader in the digital archives DIGAR and also on the Society's web site. Communication with members takes place mainly by e-mail; notes and articles have been published electronically. On 25 November, Evelin Tamm gave a presentation on the historical background and ongoing activities of the Society at the conference "One hundred years of the Republic of Estonia" hosted by the National Library.

In 2017, the Society held seven colloquia, including the following:

- Evelin Tamm "Gaps in Estonian history: Marie Reisik 130";
- Katrin Uba "Protestations and their impact on the national politics of Sweden in 1980-2011";
- Harri Mutvei "67 years of research in the Swedish Museum of Natural History"
- Teet Pullerits "Allergy: a century since diagnosis, half a century of understanding";
- Anti Liivat "Materials that move electric cars".

In cooperation with the Association of Estonians in Sweden the Society celebrated the Mother Tongue Day that also featured Professor Birute Klaas-Lang's lecture "Estonian language under the sun" on 16 March.

On 1 December, the Society traditionally celebrated the anniversary of university education in the Estonian language. At the festive meeting, Professor Martin Ehala (University of Tartu) gave a talk "Cold compositions and hot compositions: how nations appear and disappear", Toomas Tuulse played piano music composed by Heino Eller, Eduard Tubin and Arvo Pärt; Kairi Illisson recited poetry.

On 15-16 September thirteen Society members made a field trip to Tartu and visited the Institute of History and Archaeology at the University of Tartu. Considering the remarkable contribution of the founding members of the Society towards the pre-war advancement of the University of Tartu, the event was a historically significant milestone. Member of the Estonian Academy of Sciences, Professor Tõnu-Andrus Tannberg (Chair of Estonian History) delivered a lecture “Mechanisms of control by Moscow in the Soviet republics: case of Estonia”. Member of the Society, *Professor Emeritus* Hain Rebas gave a talk “Extend research on the Forest Brothers to Stanford!” The group also visited the National Archives of Estonia and the Estonian National Museum and was warmly received.

## ESTONIAN LITERARY SOCIETY

Associated with the Estonian Academy of Sciences since 23 January 2001

Founded in 1907

Membership: 268 members (including 35 lifetime members, 6 honorary members and 21 trusted members)

Address: Vanemuise 19, 51014 Tartu, ESTONIA

[www.kirjandus.ee](http://www.kirjandus.ee)

Chairman: Toomas Liivamägi, Tel.: +372 515 3274,

[toomas.liivamagi@ut.ee](mailto:toomas.liivamagi@ut.ee)

Academic Secretary: Marja Unt, Tel.: +372 742 7079,

[eks@kirjandus.ee](mailto:eks@kirjandus.ee)

2017 was a very busy and intensive year for the Estonian Literary Society (ELS) in several areas of activity. The Society continued with long-term projects, e.g. the project popularising literature called Bus Poetry and poetry CD series 'Voices of Writers' published in cooperation with the Estonian Literary Museum. Many new undertakings were started. As coordinator for Tartu as a UNESCO City of Literature, the Society enhanced international cooperation as well as information exchange and joint activities with several local authorities and organisations. The Society also participated in joint projects between the Cities of Literature.

In January, the conference "Elva's wise man of poetry Karl Muru 90" was organised in Elva in cooperation with the Estonian Writers' Union, the University of Tartu and Elva Town Government. In February, the "Description of Nature" series of seminars continued with the aim to forge links between the studies of literature and nature. In March, the traditional session of the annual review of literature of ELS took place. On 8–13 May, the 14th Tartu International Literary Festival Prima Vista was held, co-organised by ELS. In June, the Liinakuru farmstead hosted the 10th spring school of students of literature organised jointly by ELS and the Institute of Cultural Sciences and Arts of the University of Tartu.

The autumn season started with a new undertaking for ELS – the Estonian Children's and Youth Literature Festival took place for the first time, co-organised by the Tartu Public Library and Association of Estonian Language Teachers. The Society also coordinated the Tartu City of Literature International Residency Programme for the first time in the autumn of 2017. A writer from Slovenia, Andrej Tomažin, was elected as the first writer-in-residence in Tartu.

In 2017, 110 years passed from the founding and 25 from the re-establishment of ELS. The anniversary was celebrated on 27 October with a session entitled “Learned societies in the changing world”. On 9–10 November, the international interdisciplinary festival Crazy Tartu took place for the eighth time.

ELS published the CD *Present Perfect* by Leelo Tungal in 2017.

## LEARNED ESTONIAN SOCIETY

Associated with the Estonian Academy of Sciences since 23 January 2001

Founded in 1838

Membership: 115 active members, 16 honorary members

Address: Jakobi 2, 51005 Tartu, ESTONIA

[www.ut.ee/OES](http://www.ut.ee/OES)

Chairperson: Marju Luts-Sootak, Tel.: +372 737 5396,

[marju.luts-sootak@ut.ee](mailto:marju.luts-sootak@ut.ee)

The Board (M. Luts-Sootak, H. Valk, T. Rosenberg, T. Tannberg, K. Taal, P. Õunapuu, A. Andersen, B. Melts, and T. Pae) held three meetings (on 18 January, 8 February and 10 October). Several topical issues were settled by e-mail.

Fourteen symposia were organised in 2017, and a conference in addition. The symposia dealt with a wide range of topics: starting from the Estonian prehistoric enclosed burial mounds and the medieval fief disputes to the themes of war and peace in the 20th century. On 15 November, the conference “Road to independence. Estonian people and the Russian revolutions 1917” was held with 12 presentations on the agenda. The conference was supported by the Institute of History and Archaeology and the Faculty of Law of the University of Tartu, the national professorship of Estonian history and the museums. At the 110th anniversary meeting of the Estonian Literary Society at Tartu Literature House (Tartu Kirjanduse Maja) on 27 October, K. Taal, T. Rosenberg and M. Luts-Sootak spoke about the activities of the Learned Estonian Society throughout the history.

The Yearbook 2016 of the Learned Estonian Society was compiled and edited, T. Pae being the editor-in-chief and F. Ehrlich the operation manager for the compilation. The Society participated in the publishing of the book “Inimese Muuseumi välitööd Eestis: Boris Vilde ja Leonid Zurov Setomaal (1937-1938)” (The field work of the Museum of Mankind in Estonia: Boris Vilde and Leonid Zurov in Setomaa (1937-1938)) and the publication of the 2017 annual Estonian journal of archaeology *Tutulus*. The yearbook 2017 (editor-in-chief A. Andresen, operation manager F. Ehrlich) is currently under preparation.

The Society carried out archaeological surveillance on the sites of Vaimastvere and Pajusi, and smaller salvage excavations at the city side

of the medieval Jakob cemetery of Tartu, as well as at the Soe burial mound.

Riina Rammo received an award for the best article published in the Yearbook 2015 of the Learned Estonian Society, titled “Pilguheit Tartu keskaegse elaniku rõivakappi” (A glimpse into the wardrobe of an inhabitant of medieval Tartu).

## ESTONIAN MUSICOLOGICAL SOCIETY

Associated with the Estonian Academy of Sciences since 21 May 2004

Founded in 1992

Membership: 91 active members of whom 4 outside Estonia, one honorary member (Professor Emeritus of Lund University Folke Bohlin)

Address: Tatari 13, Tallinn 10116, ESTONIA

emts@hot.ee, www.muusikateadus.ee

Chairman: Kerri Kotta, Tel: +372 528 8781, kerri.kotta@gmail.com

Estonian Musicological Society brings together researchers in music and people entertaining the interest in scholarly study of music and supports research in all fields of musicology in Estonia.

The achievement of 2017 was release of the ninth issue of the musicological yearbook *Res Musica* in cooperation with the Department of Musicology at the Estonian Academy of Music and Theatre. It includes articles based on papers presented in the conference held in the memory of Urve Lippus on 23 April 2016 in Tartu. *Res Musica* is a periodical issue with international editorial board, publishing peer-reviewed scientific articles of all areas of musicology. The yearbook is open to international cooperation. The issue is prevalently in Estonian; however, it includes extended abstracts of articles in English or German. In 2017, a new website was developed: see <https://resmusica.ee/en/>.

The Society organises two symposia per year regularly, a spring meeting in Tartu and an autumn meeting in Tallinn. The Society's Day of Tartu was held in the Estonian National Museum on 22 April, it was dedicated to the 500th anniversary of the Reformation. The meeting focused on the influence of the Reformation to music practice. Presentations were delivered by Andres Andresen, Toomas Siitan, Piret Lotman, Eerik Jõks, Janika Päll and Mart Jaanson.

Leichter Day in Tallinn was held on 22 November 2017. Pauline Larrouy (Max Planck Institute for Empirical Aesthetics) gave a talk on perception mechanisms which allow to distinguish correct singing from incorrect. In addition, the ninth issue of *Res Musica* was presented.

It has been a long tradition of the Society to organise a culture-lore trip at the beginning of September. In 2017, the Society visited the places of Harjumaa.

## ESTONIAN PHYSICAL SOCIETY

Associated with the Estonian Academy of Sciences since 14 June 2005

Founded in 1989

Membership: 193 active members

Address: W Ostwaldi 1, 50411 Tartu, ESTONIA

efs@fyysika.ee, www.fyysika.ee/efs

Chairman: Kaido Reivelt, Tel.: +372 737 4623, kaido.reivelt@ut.ee

The goal of activities of the Estonian Physical Society (EPS) is introducing physics and the related fields to the general public, connecting the community of physicists, and improving and supporting teaching of physics in the Estonian educational system by coordinating, among other things, the network of physics teachers.

The Estonian Physical Society has two divisions: the Division of Teachers of Physics (Chairman of the Board is Siim Oks) and the Division of Physics Students (Physics Students Society, Chairperson of the Board is Karoliine Kurvits). In addition, the Society also operates the Science Bus (managed by Mats Mikkor and Mari-Liis Jaansalu). In 2017, Kaido Reivelt, Andi Hektor and Silver Lätt belonged to the Board of the EPS.

The most important activities in 2017:

- The XLVII Estonian Physics Days and XXXIX Days of Education in Physics took place on 24-25 March in Tartu, at the Physicum of the University of Tartu.
- We organised the Science Camp of the University of Tartu in Kloogaranna for the tenth time. In two shifts, a total of 220 pupils of 5th to 10th forms took part.
- The development of physics e-textbooks continued.
- The Science Bus continued its former momentum – another group of young science popularisers were trained and launched.
- We have provided practical and moral support to a number of undertakings of partner organisations.

Division of Teachers of Physics continued with trainings of physics teachers at CERN (managed by Riina Murulaid). In cooperation with the school physics centre of the University of Tartu the Division organised the physics teachers' autumn seminar in Voore.

Activities of the Society of Physics Students (SPS) of EPS:

- On 3-5 November, the EPS Autumn School in Natural and Exact Sciences was held.

- The project “The student to the physics class!” continued, wherein students of physics and materials science give physics lessons in Estonian schools.
- SPS organised numerous events in 2017: evenings with guests of honour, a chess tournament, a table tennis tournament, photo competition, scientific seminars and trips.
- On 26 May, a spring party with the celebration of the 5th birthday of the SPS was held. SPS also participated in organising a Christmas party of the Institute of Physics of the University of Tartu on 15 December.

## ESTONIAN ASSOCIATION OF ENGINEERS

Associated with the Estonian Academy of Sciences since 23 September 2008

Founded in 1921 as the Estonian Society of Engineers  
Re-established in 1988 under the name of the Estonian Association of Engineers  
Membership: 19 legal entities  
Address: Liivalaia 9, 10118 Tallinn, ESTONIA  
inseneronlooja@hotmail.ee, www.insener.ee  
President: Arvi Hamburg, Tel.: +372 516 2026,  
arvi.hamburg@ttu.ee

The Estonian Association of Engineers (EAE) is a non-profit association operating in public interests and bringing together sector-specific organisations of engineers, trainers of engineers and innovative employers who are interested in advancement of engineering and technology.

In 2017, EAE focused on education and erudition by promoting technological education. Main activities of EAE in 2017:

- Foundation of the Estonian Science and Technology Museum. Purpose: educational activities, namely, revitalisation of technical education; ensuring sustainability by means of collecting, preserving and communicating cultural heritage in the sphere of technology.
- Participation in the Paide Opinion Festival on 11 August 2017 with the session “Engineering Thought in Time”. Purpose:
  - popularisation of the creative engineer’s competence to create technologies that can change the world;
  - collecting the opinions and testing the priorities of stakeholders along the science – development/engineering – industry chain;
  - monitoring of the prerequisites of the motivation system for the improvement of knowledge, skills/experience and responsibility of a professional engineer.
- A thematic one-day event in Järveküla Gymnasium on 7 December 2017 in cooperation with the Estonian Research Council. Purpose:
  - appropriateness of the curricula and assessment criteria in basic schools and upper secondary schools for the selection of the technology sphere by students;
  - analysis of the factors that influence the choice of students and mapping the problems;
  - consistency of basic and extracurricular education;

mapping of the prerequisites for popularisation of engineering and potential solutions for implementation of such prerequisites.

- On-site meetings with representatives of companies: BLRT Grupp shipyards, AS Metaprint, ABB Baltics, Harju Elekter Grupp. Purpose: testing the role of the scientist and the engineer in the company's innovation process; expanding the possibilities for involvement.
- International cooperation: participation in the FEANI General Assembly, the 3rd European Engineers Day and the FEANI Nordic Group. Purpose: participation in working groups and obtaining European and global information about the prerequisites for the development of engineering as well as the results achieved.
- Activities in the field of legal regulation: integrating EAE positions in planning or amending the legislation on higher education.
- Results of the contest for EAE honorary titles:
  - 2017 Engineer of the Year – Heino Harak, Chairman of the Board of KH-Energia Konsult AS;
  - 2017 Technology Student of the Year – Mihkel Härm, doctoral student at Tallinn University of Technology.
- The end-of-year gathering of the EAE on 8 December 2017 in the hall of the Estonian Academy of Sciences featured a summary of the year and future guidelines. A presentation was given by Andres Tarand.

## ESTONIAN BIOCHEMICAL SOCIETY

Associated with the Estonian Academy of Sciences since 13 November 2009

Founded in 1959

Membership: 62 acting members, 18 student members

Address: Akadeemia 15, 12618 Tallinn, ESTONIA

katrina.laks@gmail.com, www.biokeemiaselts.ee

President: Olga Mazina, Tel.: +372 5698 5281, olga.mazina@ut.ee

Academic Secretary: Katrina Laks, Tel.: +372 529 6923,

katrina.laks@gmail.com

The goal of activities of the Estonian Biochemical Society is supporting and promoting research and teaching in biochemistry and in the related theoretical and applied research areas, raising public interest in those areas of science, and supporting and protecting the professional interests of the members of the Society.

Estonian biochemists have a long tradition of organising spring schools for members of the Society and guests interested in the topic. In 2017 the spring school was titled “Time in Biochemistry” and held at Vana-Veski Puhkekeskus, Järva County on 11-12 May (coordinator: Professor Ago Rinke, the University of Tartu; executive organiser: Reet Link, a doctoral student of the same University).

The annual meeting of the Society was held as an electronic general meeting, with the approval of the annual report and the auditor’s report on the agenda. The voting was open from the end of September until the beginning of October. The meeting was successful.

The annual congress of the Federation of European Biochemical Societies (FEBS) was held in Jerusalem on 10-14 September. At the end of the congress, the FEBS Council meeting was held where a board member of the Society, Peep Palumaa participated as a representative of Estonia.

On 31 August, a seminar on the development of Estonian terminology was held at the Chemicum of the University of Tartu, led by Peep Nemvalts, Head of the Language Centre at Tallinn University. A biochemistry dictionary, a joint work developed and constantly updated by biochemists, available on the Society’s website, was also discussed.

With the aim to popularise the research activities among students and encourage the best students who have published their results in well-known journals, the Society has awarded student science prizes since 2007. This year, the first prize was granted to Karl Rene Kõlvart, a 3rd year student of the Chair of Bioorganic Chemistry at the University of Tartu.

## ESTONIAN SEMIOTICS ASSOCIATION

Associated with the Estonian Academy of Sciences since 15 December 2009

Founded in 1998

Membership: 70

Address: Jakobi 2-318, 51014 Tartu, ESTONIA

[www.semiootika.ee](http://www.semiootika.ee)

President: Katre Pärn, Tel.: +372 5661 9492, [katre.parn@ut.ee](mailto:katre.parn@ut.ee)

Vice-President: Eva Lepik, Tel.: +372 737 5413, [eva.lepik@ut.ee](mailto:eva.lepik@ut.ee)

In 2017 Estonian Semiotics Association (ESA) continued with its traditional events. In addition we organised an ESA conference and participated as a partner in several other projects. *Acta Semiotica Estica XIV* was published.

May 6-7, 2017 ESA organised a conference “Learning to Understand” dedicated to semiotics of education and interdisciplinary issues of education. Fourteen presentations were held with Peeter Torop, Ülle Pärli, Märt Läänemets, Kai Pata, Anzori Barkalaja, Kalevi Kull, Silvi Salupere among speakers. A discussion with film director Rainer Sarnet on literary adaptations on screen took place. A traditional prize “Semiootilise Jälg” was awarded to Silvi Salupere for her outstanding contribution to teaching and editing semiotic publications, including the first Estonian textbook of semiotics, soon to be out of print. As part of the conference, the ESA general assembly was held where the financial and activity reports of the previous year were presented, and future plans made.

In spring we had an event of the Semiosalongs series that aims at promoting semiotics. The spring event was titled “Semiotics in a post-truth world”, it included five sessions and nine presentations that offered a semiotic perspective on the issues of truth and post-truth in philosophy, politics, media and arts. Three sessions of autumn Semiosalong event were dedicated to education and teaching and included a roundtable on teaching semiotics at different study levels. Participants were former students of department of semiotics. Further information: <http://semiosalong.blogspot.com.ee>.

On November 4-5 the traditional Autumn School of Semiotics (18th) was organised in Taevaskoda, featuring Jean Baudrillard and titled “Simulation”. Jaak Tomberg, Andres Luure, Madis Ligema, Andreas Kaju, Ahto Lobjakas, Madis Vasser, Elis Tamula, Oliver Laas, Keiu Virro, Timo Maran and others gave talks. They discussed the emergence of alternative formations

of reality in various domains, from literature and theatre to politics and nature. A virtual reality workshop was held. More information: <http://semiootikasygiskool.blogspot.com.ee>.

ESA participated in organisation of the Tartu International Summer School of Semiotics that was held on August 15-18 in partnership with the Department of Semiotics, University of Tartu. The topic of this biannual gathering was “Gentle Generalisations” and it aimed to inquire into the possibilities of generalisation and transposition of knowledge in disciplines studying society, culture and nature. Keynote lecturers were Robert Innis, Frederik Stjernfeld, Jaan Valsiner and Denis Bertrand. Additional information: <http://tsss.ut.ee>.

ESA was also a partner in the project “I remember” that studied formation and communication of historical memory through the film adaptation of Leelo Tungal’s novel “Comrade child”. Merit Rickberg was the project manager.

In the end of the year a new volume of ESA’s journal *Acta Semiotica Estica* appeared. Topics of the articles included teaching history, national discourse in Estonia, theory of identity politics, post-truth meaning making and semiotics of space of mansions. The volume continued the series of interviews with contemporary key figures of semiotics that are carried out by Ekaterina Velmezova and Kalevi Kull as essayistic approaches to social choreography, chess-playing machines and teaching mythology. Journal’s homepage: <http://www.semiootika.ee/acta/>.

## ESTONIAN SOCIETY OF HUMAN GENETICS

Associated with the Estonian Academy of Sciences since 5 April 2011

Founded in 2000

Membership: 198

Address: Riia 23, 51010 Tartu, ESTONIA

estshg@ebc.ee, www.estshg.ee

President: Ants Kurg (until 17 November 2017),

since 18 November 2017 Maris Laan, Tel.: +372 737 5008,

maris.laan@ut.ee

Secretary: Maarja Kõiv, Tel.: +372 522 9126,

maarjakoiv@gmail.com

The management board of the Estonian Society of Human Genetics (EstSHG) includes the following people: President Maris Laan and Members of the Board Ants Kurg, Mari Palgi, Neeme Tõnisson, Olev Kahre, Kai Muru, Lili Milani. Compared to the year before, the number of the EstSHG members increased by 16 in 2017.

The EstSHG organized its nineteenth annual conference that was held on 16-17 November at Rakvere Theatre, with 200 participants in attendance. Traditionally we compiled the conference programme to ensure that it didn't include a speaker who had given a presentation at an EstSHG conference in at least the previous two years. Foreign lecturer Professor Hannu Sariola from the University of Helsinki, Finland, delivered an interesting lecture. Estonia was represented by Sander Pajusalu (Genetics Centre of Tartu University Hospital), Siim Sõber (Institute of Biological and Translational Medicine, University of Tartu), Vallo Volke (Institute of Biological and Translational Medicine, University of Tartu), Kai Kisand (Institute of Biological and Translational Medicine, University of Tartu), Riin Tamm (United Laboratories of Tartu University Hospital), Veljo Kisand (Institute of Technology, University of Tartu), Kristiina Tambets (Estonian Biocentre), Andres Salumets (Tartu University Hospital's Women's Clinic, Institute of Biological and Translational Medicine), Ana Rebane (Institute of Biological and Translational Medicine, University of Tartu), Arnold Kristjuhan (Institute of Molecular and Cell Biology, University of Tartu), Laura Tamberg (Tallinn University of Technology), Neeme Tõnisson (Institute of Genomics, University of Tartu), Tiit Lukk (Tallinn University of Technology), and Petri-Jaan Lahtvee (Institute of Technology, University of Tartu) as speakers. During the conference, the society's award for Lifetime Achievement in Genetics 2017 was bestowed upon Riina Žordania, Head of the Tallinn division of the Centre of Genetics of United Laboratories,

Tartu University Hospital. Preparations were started for the organisation of the 2018 conference, which is to be held on 22-23 November at Ugala Theatre in Viljandi.

The Estonian Society of Human Genetics is a member of the European Society of Human Genetics. For this reason, it also participated in the 13th Meeting of the European Human Genetics Societies held within the annual conference of the European Society of Human Genetics (ESHG) in May 2017 in Copenhagen, Denmark. As the 2017 ESHG conference was dedicated to its 50th anniversary, the jubilee proceedings were published. EstSHG contributed to the proceedings by preparing materials on the history and development of human genetics and clinical genetics in Estonia.

## ESTONIAN SOCIETY FOR THE STUDY OF RELIGIONS

Associated with the Estonian Academy of Sciences since 16 June 2011

Founded in 2006

Members: 63

Address: Ülikooli 16, 50090 Tartu, ESTONIA

[www.eaus.ee](http://www.eaus.ee)

President: Madis Arukask, Tel.: +372 737 5227,

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Academic Secretary: Piret Koosa, Tel.: +372 735 0414,

[piret.koosa@erm.ee](mailto:piret.koosa@erm.ee)

By uniting scholars who specialise in the study of religions in various fields of research, the Estonian Society for the Study of Religions (ESSR) is a member of leading umbrella organisations within the sphere: the International Association for the History of Religions (IAHR) and the European Association for the Study of Religions (EASR). The ESSR primarily operates in the form of conducting symposiums and conferences. The society's activity mainly takes place at the University of Tartu. In 2017, one of the society's events was held at Tallinn University.

A symposium on pilgrimages featuring six presentations was held on 11 January in cooperation with the Department of Estonian and Comparative Folklore at the University of Tartu.

On 4 May, a symposium titled "Death and Otherworldliness in Religions" was held at Tallinn University. The speakers were Vladimir Sazonov on death and otherworldliness in Ancient Mesopotamia, Jaan Lahe on life after death in ancient mystery cults, Alari Allik on otherworldliness in Japanese religions, Anu Põldsam on death and otherworldliness in Judaism, Helen Gershman on death and otherworldliness in Islam, and Marju Kõivupuu on "Cremation in modern day: religious or pragmatic?". The presentations were followed by a panel discussion.

On 1 June, a symposium on contemporary beliefs was held in Tartu. The speakers were Pille Runnel on "Exhibiting religious items as exemplified by the permanent display of the Estonian National Museum", Madis Arukask on "Religious aspects of communication with trees practiced by Baltic Finns", Triin Lees on "A woman on a boulder in the woods. Beliefs about women's power of creation", Eva-Liisa Roht-Yilmaz on "Conversion of the Romani to evangelical Christianity in Estonia and Latvia",

Raivo Alla on “Spiritual landscapes of the long-distance runner”, Katre Koppel on “Health on the borderline between medicine and religion as exemplified by traditional Chinese medicine”, Tenno Teidearu on “Practice of wearing semi-precious stones from the perspective of studying material culture”, and Kristel Kivari on “The miracle of Fátima: a hundred years of interpretations”. During the society’s annual meeting held on the following day after the symposium, the management reported on the last year of operation. The annual report for the previous year was approved.

Two symposia were held in Tartu during the autumn semester: on 11 October, Jüri Allik spoke on “Does religious thinking exist?”; and on 2 November, Martin Ehala gave a presentation on “Secular and religious core values and the sense of cohesion”.

On 15 December, a symposium titled “Religiosity and Sexuality” took place in Tartu. The speakers were Roland Karo on “Fertility and impotence cults – on Christian hedonophobia and erotophobia”, Merili Metsvahi on “Conflicts of three parish pastors about sex-related topics”, Madis Arukask on the “Erotic forest of Baltic Finns”, Reet Hiimäe on the “Boom of sauna rituals in Estonia: hedonism, traditions and New Age spirituality”, Vladimir Sazonov on “Sex and ritual in Ancient Mesopotamia: aspects of cult prostitution”, Jaan Lahe on “Sexual rites of Gnostics – stereotypes of anti-heretic rhetoric or historical reality?”, Elo Süld on “Houris in Islam”, and Ain Riistan on “New Testament and the Registered Partnership Act”.

## ESTONIAN ECONOMIC ASSOCIATION

Associated with the Estonian Academy of Sciences since 16 June 2011

Founded in 1930

Re-founded in 2002

Membership: 121 private persons and 4 legal entities

Address: Estonian Business School, Lauteri 3, 10114 Tallinn 10114,  
ESTONIA

[www.emselts.ee](http://www.emselts.ee)

President: Meelis Kitsing, Tel.: +372 665 1348,

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Board members: Kaire Pöder, Tel.: +372 665 1348,

[kaire.poder@ebs.ee](mailto:kaire.poder@ebs.ee),

Karmo Kroos, Tel. +372 665 1349, [karmo.kroos@ebs.ee](mailto:karmo.kroos@ebs.ee)

The Estonian Economic Association (EEA) is a non-profit scientific society that brings together Estonian economists with the aim to promote the spread of modern economics and discussion on contemporary economic topics. The association contributes to improving the quality of education in economics and supports cooperation between institutions working in economic research and teaching. EEA supports the enhancement of the quality of doctoral dissertations and their supervising and it promotes the seminars of Doctoral School in Economics and Innovation.

In 2017, EEA continued the tradition of annual conferences, giving them a specific focus and involving more researchers outside of Estonia and specialists from different areas. The 12th annual conference of the Estonian Economic Association was held on 26-27 January in the Estonian Business School (EBS) in Tallinn and was dedicated to the memory of the founder of the EBS, Professor Madis Habakuk, who has made a significant contribution to Estonian management science.

The main topic of the conference was „An economic person in a room: change management in the spatial economy”. The main presenter was Andres Sevtšuk from Harvard Graduate School of Design, a lecturer and the City Form Lab Director, who spoke on the subject of „Street trade: The hidden logic of patterns of retail location and vitality of public space”. The presentation was followed by a discussion on the spatial nature of urban economy. The first conference day concluded with a general meeting where the representatives of the association member organisations of gave an overview of their activities in the past year. The second day of the conference included different sessions on the black economy and labour

market, innovation, macroeconomy, research methods and other topics. The presentations were made by scientists from Latvia, Macedonia, the US and leading Estonian universities and research institutions.

In 2017, EEA again, for the fifth time, awarded the research prize named after Professor Vello Vensel. The prize is meant for a doctoral student who presents his/her research at the international summer school organised as part of the Doctoral School in Economics and Innovation, and whose research work merits this particular award. The committee, comprising representatives of the University of Tartu, Tallinn University of Technology, Bank of Estonia and Estonian Business School, awarded the prize to Simona Ferraro, a doctoral student from Tallinn University of Technology, for her work titled „Is there a trade-off between efficiency and equity in education?”.

## ESTONIAN SOCIETY OF TOXICOLOGY

Associated with the Estonian Academy of Sciences since 31 May 2017

Founded in 1997

Membership: 62 active members

Address: Akadeemia 23, 12618 Tallinn, ESTONIA

[www.kbfi.ee/ets](http://www.kbfi.ee/ets)

Chairperson: Anne Kahru, Tel.: +372 639 8373, [anne.kahru@kbfi.ee](mailto:anne.kahru@kbfi.ee)

Secretary: Angela Ivask, Tel.: +372 639 8361, [angela.ivask@kbfi.ee](mailto:angela.ivask@kbfi.ee)

The Board of the Estonian Society of Toxicology (ETS) includes Anne Kahru (Chair), Angela Ivask, Kaja Orupõld, Reet Pruul, Arvo Tuvikene and Villem Aruoja. The Members of the Society are researchers and students from the University of Tartu (UT), Tallinn University of Technology (TUT) and the National Institute of Chemical Physics and Biophysics (NICPB) as well as occupational health physicians, employees of the ministries and their divisions or authorities dealing with environmental monitoring.

The goal of ETS is to advance and promote toxicological research, training and general knowledge in toxicology. This involves cooperating with the toxicology societies of other countries, transferring information among members, and organising scientific conferences, courses and trainings. ETS is committed to the sustainable management of Estonian natural resources and solving environmental protection related issues.

ETS has been a member of the Federation of European Toxicologists and European Societies of Toxicology (EUROTOX) since 1998 and of the International Union of Toxicology (IUTOX) since 2004.

Traditionally, the ETS annual meeting includes a scientific seminar. It took place on 2-3 June and marked the 20th anniversary of the Society. Talks were given by Viive Pille (North Estonia Medical Centre (NEMC) and the Estonian Society of Occupational Health Physicians) who introduced the activities of the Society; Gültšara Karajeva (NEMC) gave a talk on environment and health; Karin Reinhold (TUT) spoke about the safety of the working environment; Toomas Paalme (TUT) gave an overview of the water soluble vitamins in our food; Olesja Bondarenko (NEMC) introduced the environment and health hazard aspects of nanoparticles; Kalle Olli (UT) spoke about algae toxins and Anne Kahru gave an overview of the history of the Society.

ETS has currently communicated information from EUROTOX, IUTOX and elsewhere to keep its members aware about the opportunities of professional development and events addressing the students. Preparation continued for

a session that is organised by ETS during the 10th Congress of Toxicology in Developing Countries conference on 18-21 April 2018 in Belgrade.

Members of the ETS Liina Kanarbik and Tiina Titma defended their doctoral degrees and the Chairwoman of the Society, Anne Kahru, was awarded the Estonian state decoration Order of the White Star, 4th class.

## IN MEMORIAM



Hans-Voldemar Trass

02.05.1928-14.02.2017

Hans-Voldemar Trass was born on 2 May 1928 in Tallinn. His early interest in observing nature originated in the childhood spent in Nõmme and Pääsküla: Harku woods, bogs, river banks and Glehn Park. After graduating from Nõmme Gymnasium in 1947, he started studying biology at the University of Tartu, majoring in botany. The university diploma, received in 1952 was followed by postgraduate studies and the defence of a dissertation for the Candidate of Sciences (equivalent to PhD) degree on the topic “Flora and Vegetation Cover of Fens in Western Estonia” in 1955. In 1969 Hans-Voldemar Trass defended a doctoral dissertation on the topic “Estonian Lichen Flora Analysis” at the Komarov Botanical Institute in Leningrad.

Hans-Voldemar Trass was elected a Member of the Estonian Academy of Sciences in 1975.

In 1955 H.-V. Trass started to work as a lecturer in the Department of Plant Taxonomy and Geobotany (later known as the Institute of Botany and Ecology) at the University of Tartu. During the years 1956-1991 he was the Head of the Institute and continued as Professor Extraordinary until becoming *Professor Emeritus* in 1994. In his scientific research H.-V. Trass has dealt with general botany, geobotany, plant ecology, plant geography, lichenology and history of biology. He has supervised dozens of diploma and Candidate's theses, field work research and expeditions, delivered lectures and taught short courses at numerous universities abroad.

Hans-Voldemar Trass was active in raising the issues of nature conservation and environmental protection in Estonia. In 1968 he devised a method for identification of lichens for determination of air pollution levels, and in 1999 a method for determination of the condition of primeval forests. In 1976 he compiled the world's first complete overview of the history and development trends in the vegetation science. He held the position of the President of the Estonian Naturalists' Society during two periods (1964-1973 and 1985-1991), since 1991 its Honorary President. The number of publications by H.-V. Trass approaches six hundred.

In 1996 Hans-Voldemar Trass was awarded the National Science Prize for outstanding lifetime research in the field of lichenology. In 1997 he was elected a Foreign Member of the Russian Academy of Natural Sciences. In 1998 Hans-Voldemar Trass was awarded the Estonian state decoration Order of the White Star, 3rd class. Since 2006 he was an Honorary Citizen of Tartu and a holder of the Order of the Tartu Great Star.

Coming from a home where culture was deeply valued, no wonder music, literature and poetry were close to his heart. Professor Trass could combine science with art and would often emphasise that natural science, nature conservation and culture were very close phenomena. Being a brilliant and versatile person, he published much theatre criticism, numerous opinion articles in press and travelogues. He also wrote poetry.

Hans-Voldemar Trass passed away on 14 February 2017.



Arvo Krikmann

21.07.1939-27.02.2017

Arvo Krikmann was born into a family of farmers in Virumaa on 21 July 1939. He graduated from Väike-Maarja Secondary School in 1957 and the University of Tartu in the specialty of the Estonian language and literature in 1962. After his postgraduate studies at the Institute of Language and Literature of the Estonian Academy of Sciences in 1970-1972, he defended his dissertation for the Candidate of Sciences (PhD) degree on the topic of researching the content and the world-view of proverbs in 1975. In 1998 Arvo Krikmann defended his Doctor of Sciences dissertation on the topic “Introspections into Minor Forms of Folklore, Vol.1. Basic Concepts, Genre Relations, General Issues” at the University of Tartu.

During the years 1962-1969 Arvo Krikmann worked as Researcher and Senior Researcher in the Department of Folklore at the Estonian Literary Museum. After his postgraduate studies he continued to work at the Institute of Language and Literature (later the Institute of the Estonian Language) as Junior Researcher and Senior Researcher in the Sector of Computational Linguistics, Senior Researcher and Chief Researcher at the Department of Studies of Folklore, and the Head, Senior Researcher and an Expert of the Paremiology Working Team. In 2000-2014 Arvo Krikmann worked as Senior Researcher at the Estonian Literary Museum.

Arvo Krikmann was elected Member of the Estonian Academy of Sciences in 1997.

Arvo Krikmann's research primarily focused on short forms of folklore, geographical spread of folklore, popular humour, and the theory of figures of speech and humour. His folklore research was closely linked with the analysis of the old Estonian language, the figures of speech and the vernacular language. A. Krikmann was the chief compiler or co-compiler and editor of such major publications as "Proverbia Estonica" (vol. I-V, 1980-1988), "Estonian Riddles" (vol. I-II, 2001-2002; III:1, 2012; III:2; 2013) and many other works. His invaluable merit was ensuring the international visibility of Estonian folklore. It was just recently that a reprint was published of "Laustud sõna lagub. Valik eesti vanasõnu". This book of selected Estonian proverbs, was compiled by Arvo Krikmann. Its former entire print run of which was destroyed in 1975.

In addition to research, Arvo Krikmann was a university lecturer. In 1992-2005 he delivered lectures as Extraordinary Professor at the University of Tartu on short forms of folklore and the history of their sources, popular humour, semantics of expressions and the theory of figures of speech. He was the supervisor of many successfully defended Master's and Doctoral dissertations.

Arvo Krikmann was a member of several Estonian and foreign scientific organisations, editorial boards, steering committees and research councils. He was a member of the Finnish Literary Society, the Kalevala Society, Academia Scientiarum et Artium Europaea, the Estonian Mother Tongue Society, and the Academic Folklore Society, an Honorary Member of the International Society for Folk Narrative Research (ISFNR) and an editorial board member of the yearbook *Proverbium*.

Arvo Krikmann's work was acknowledged with the Estonian state decoration Order of the White Star, 3rd class (1998), the Estonian National Science Prize (1999), the Culture Prize of the Baltic Assembly in science (2004), the annual prize of the Cultural Endowment of Estonia (2004), and the Finnish Kalevala Society Allhallows Prize (2013). In 2014 he received the Ferdinand Johann Wiedemann Language Prize and Paul Ariste Memorial Medal of the Estonian Academy of Sciences. He was selected honorary member of the Estonian Mother Tongue Society.

Arvo Krikmann passed away on 27 February 2017.



Peeter Tulviste

28.10.1945-11.03.2017

Peeter Tulviste was born to the family of a military serviceman in Tallinn on 28 October 1945. He spent his childhood in Järve, in a near-perfect setting for an active child. He attended Nõmme Gymnasium where the achievement and performance needs of young people were encouraged in every way. In 1964 Peeter Tulviste graduated from the school and intended to study history at the University of Tartu. However, an unexpected opportunity opened out to study psychology at one of the so-called student vacancies, allocated for Estonia at Moscow State University. He happened to become a student of cultural psychology of Alexander Luria, a classic of neuropsychology who had always influenced his research work. Peeter Tulviste graduated from Moscow University in 1969, continued his postgraduate studies and defended also there his dissertation for the Candidate of Sciences (equivalent to PhD) degree in psychology, titled “On socio-historical development of cognitive processes: on the basis of foreign experimental psychology research” in 1975. He defended his doctoral dissertation in psychology on the topic “Cultural and historical development of verbal thinking” also at Moscow University in 1987.

Peeter Tulviste was elected Member of the Estonian Academy of Sciences in humanities and social sciences in 1994.

Peeter Tulviste’s affiliation with the University of Tartu goes back to 1974, when he became a Lecturer at the Chair of Psychology and Logic (1974-1975). Afterwards he worked as a Senior Lecturer (1975-1978) and Associate

Professor (1978-1988), became a Professor at the Chair of Psychology in 1988 and *Professor Emeritus* in 2015. His most important lecture courses addressed the psychology of thinking and speech, cultural psychology and the history of psychology. He served as the Vice-Rector for Research in 1992-1993 and Rector in 1993-1998.

Peeter Tulviste started his political activity in 1999. He was the Chairman of Tartu City Council in 1999-2002 and a Member of the 10th and 11th Riigikogu (the Parliament of Estonia) for the period 2003-2011.

In his research, Peeter Tulviste studied connections between thinking and culture. Having analysed the existing concepts of the role of culture in the development of thinking, both in history and in the case of the individual, he further developed these concepts by trying to examine them through the lens of the humaniora and not to overestimate the principles of natural sciences.

Peeter Tulviste was a member of the European Academy of Sciences and Arts, the New York Academy of Sciences, the Russian Academy of Pedagogical and Social Sciences, the Council of Greifswald University, the Council of the Aleksanteri Institute of the Helsinki University and an associate member of the Finnish Literature Society as well as a member of the Council of Elders of the Estonian Defence League. He was also known as a member of the editorial board of the *Akadeemia* journal, the academic board of TEA entsüklopeedia and member of the council of the Ilmamaa publishing house, as well as a member of the editorial board of the *Journal of Russian and East European Psychology*. In 1994-2004 Peeter Tulviste was Vice-President of the Estonian Academy of Sciences, and in 1994-1999 as well as in 2004-2009, Head of the Division of Humanities and Social Sciences.

Peeter Tulviste's contribution was recognised with the Royal Order of the Polar Star, 1st rank (1995, Sweden), Estonian state decorations Order of the National Coat of Arms, 4th class (1998), 3rd class (2006) and the White Cross of the National Defence League. He was awarded the Order of the Coat of Arms of Pärnu County, Order of the Tartu District of the Defence League and received an award from the University of Tartu Raefond Foundation. In 2015 he deserved the title of Honorary Citizen of Tartu.

Peeter Tulviste has translated fiction, as well as the works of philosophers (e.g. Schweitzer, Kon) from German and Russian. He was an avid reader of memoirs and surrealist poetry, collected jokes and published collections of humour.

Peeter Tulviste passed away on 11 March 2017.



Georg Liidja

04.08.1933-12.06.2017

Georg Liidja was born to the family of a military serviceman in Tallinn on 4 August 1933. After graduating from the Tallinn Evening School for Working Youth No. 1 in 1952, he entered the University of Tartu to study physics. He graduated from the university in 1957. Optics became his specific field of study, and it was already during his university years that he could start working in the luminescence laboratory under Feodor Klement, Member of the Academy of Sciences. In 1963 Georg Liidja defended his dissertation for the Candidate of Sciences (equivalent to PhD) degree in physics and mathematics at the University of Tartu and in 1981, his doctoral dissertation at the Institute of Physics of the Academy of Sciences.

Georg Liidja was elected Member of the Estonian Academy of Sciences in 1987.

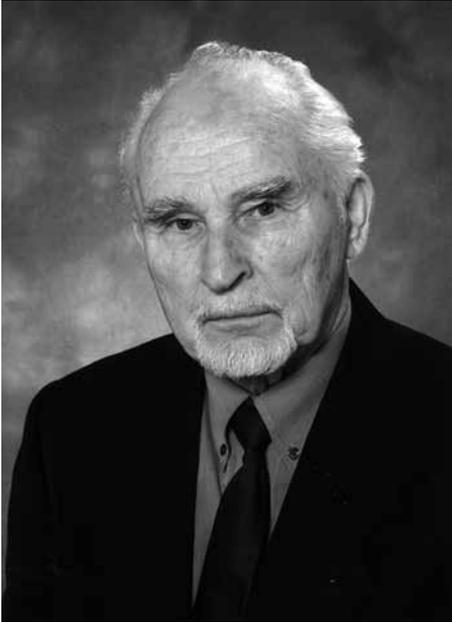
During the years 1957-1973 G. Liidja worked at the Institute of Astronomy and Physics of the Academy of Sciences of the ESSR (later Institute of Physics of the Academy) as a Laboratory Assistant, Equipment Operator, Senior Equipment Operator, Junior Researcher and Senior Researcher; in 1973-1982 as the Head of the Sector of Low-temperatures. During the period from 1982 to 2016 he was affiliated with the Institute of Chemical Physics and Biophysics as Senior Researcher.

Georg Liidja's research primarily focused on the physics of luminescent crystals, optical spectroscopy of cryogenic technology and radio spectroscopy of bioapatites exposed to radiation. He was a member of the internationally renowned Tartu School of Luminescence. In the field of solid-state physics, he explained the effect of radiation on crystals, as well as its microprocesses and micromechanisms. He was one of the participants in the discovery of photon multiplication in the photoluminescence of crystal luminophores. Georg Liidja developed vacuum ultraviolet spectroscopy at cryogenic temperatures and was the first to have performed luminescence research on crystals exposed to ultra-low temperatures.

Georg Liidja was a long-term chairman of the Student Research Competition Board at the Academy of Sciences. The number of his scientific publications exceeds 150 and he supervised seven Doctoral dissertations.

In 1975 Georg Liidja received the State Scientific Award of the Estonian SSR for his research contributions. The Estonian Physical Society recognised him with its Annual Award in 1994. The Estonian state decoration order of the White Star, 5th class was bestowed on him in 2001 and the Medal of the Estonian Academy of Sciences in 2003.

Georg Liidja passed away on 12 June 2017.



Karl Siilivask

20.01.1927-18.11.2017

Karl Siilivask was born on 20 January 1927 to a teachers' family in Veriora Parish, South Eastern Estonia. In 1940 he began his education at Võru Secondary School, where his studies were interrupted due to war and evacuation to the Soviet home front. Eventually, after obtaining his high-school diploma from Tallinn Secondary School No.9 in 1945, he proceeded to study history at the University of Tartu. His undergraduate studies were completed in 1951. Karl Siilivask earned his academic degrees – Candidate of Sciences (equivalent to PhD) degree and Doctor of Sciences in history at the same university (in 1954 and 1968, respectively).

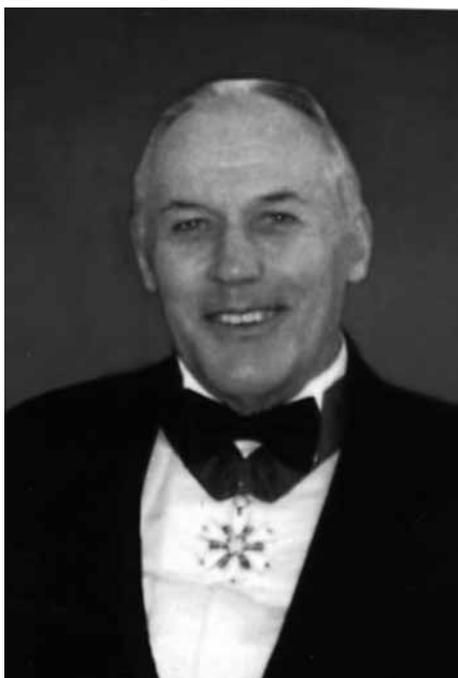
During two decades (from 1954 to 1974), Karl Siilivask was professionally associated with the Chair of the Soviet Union History: as Senior Lecturer, Associate Professor and, finally, Professor (since 1969). At the same time, he was alternately engaged as Head of the Chair (1962-1974), Dean of the Faculty of History and Language (1962-1964), and subsequently, Dean of the Faculty of History (1971-1973, 1973-1974). He worked as Director of the Institute of History at the Estonian Academy of Sciences from 1974 to 1983, thereafter, as Head of Sector until 1992. Through all the years (1974-1992) he also gave lectures at the University of Tartu in the position of a part-time Professor. From 2004 onward Karl Siilivask was Senior Researcher with the Estonian Union of the History and Philosophy of Science.

In 1977 he was elected a Member of the Estonian Academy of Sciences in the area of history.

The major areas studied by Professor Karl Siilivask lie with the history of Estonia in the 19th and 20th centuries and the history of science. He authored over 200 scholarly publications, including about 40 monographs; he was among the compilers of several history textbooks for high schools and universities. Among his other works on the history of science, a highlight should be given to compilation and editing of the three-volume edition covering the historical background of the University of Tartu “Tartu Ülikooli ajalugu 1632-1982”. Likewise, he is the initiator of a series dedicated to the history of the university “Ülikooli ajaloo küsimusi”, of which over 30 volumes have been published. His work is reflected in the serial compendia “The history of science and modern times”, “Glimpses on the history of science in Estonia” and Baltic History of Science conference materials (since 1977 “*Historiae Scientarum Baltica*”). From 1995 Professor Siilivask was the driving force of the “Biographical Lexicon of Estonian Science” and editor in chief of the 1st and the 2nd volumes.

While in his undergraduate years, Karl Siilivask was Chairman of the Students’ Research Association and sports club. Later he was Head of the Working Group on the History of the University of Tartu (1971-1985) and Chairman of the Estonian Union of the History and Philosophy of Science (1974-2004), President of the Baltic Association of the History and Philosophy of Science (1991-1993 and 1999-2001) and Vice-President of the association (1993-1999).

Karl Siilivask passed away on 18 November 2017.



Ülo Lumiste

30.06.1929-20.11.2017

Ülo Lumiste was born in Vändra on 30 June 1929. He went to school in Tammsalu, continued in Paide and graduated from Vändra Secondary School in 1947. Inspired by his teacher of mathematics, he entered the University of Tartu to study mathematics. Along the way to contemporary mathematics, Ülo Lumiste was guided by professor Gunnar Kangro who employed him at his department in 1952, after graduation. He was soon sent to refresher courses (1953-1954) and post graduate studies (1956) at Moscow State University, majoring in differential geometry. He defended his dissertation for the Candidate of Sciences (equivalent to PhD) degree at the same university in 1959. Ülo Lumiste defended his Doctoral dissertation in 1968 at the University of Kazan and was awarded professorship in the same year.

After defending his dissertation for the Candidate of Sciences degree, Ülo Lumiste started lecturing and conducting research at the University of Tartu, in the position of a Lecturer and Assistant Professor in 1959-1969, the Head of the Chair of Geometry and Algebra in 1969-1989. He was concurrently holding professorship from 1969 to 1995 and serving as the Dean of the Faculty of Mathematics between 1974 and 1980. Since 1995 he was *Professor Emeritus*.

Ülo Lumiste was elected a Member of the Estonian Academy of Sciences in 1993.

Ülo Lumiste's research was mainly related to the foundations of geometry, focusing on various aspects of the theory of submanifolds. By involving students and post-graduates in his research, he contributed to the establishment of the Estonian school of differential geometry at the beginning of 1960s. Another considerable sphere of interest for him was the history of Estonian mathematics. He published over 260 scientific publications, including numerous textbooks and monographs. The outcomes of his decades-long research were summed up in a voluminous monograph published by Springer Publishing Company in 2009 under the title "Semiparallel Submanifolds in Space Forms".

In addition to research, Ülo Lumiste considered teaching extremely important. His lectures were attended by the majority of Estonian mathematicians. Fifteen dissertations, master's and diploma theses were defended under his supervision, and he was a consultant for numerous Doctoral dissertations. Ülo Lumiste was also an enthusiastic pioneer of professional development, being an initiator of numerous international scientific conferences, reviewer of scientific journals, opponent of dissertations, participator in the activities of several professional councils and societies. In 1987 he brought the Estonian Mathematical Society back to life and became its first President.

For his outstanding research contribution, Ülo Lumiste received the National Science Prize twice (in 1999 and 2012). In 1999 he was also awarded the Estonian state decoration Order of the White Star, 3rd class. Lumiste was Dr.h.c. of Tallinn University (1996), an honorary member of the Estonian Association for the History and Philosophy of Science (1997) and of the Estonian Mathematical Society (2003).

Ülo Lumiste passed away on 20 November 2017.



Foreign Member

Antero Jahkola

5.02.1931-10.12.2017

Antero Jahkola was born on 5 February 1931 in Korpilahti, Finland. In 1956 he graduated from Helsinki University of Technology with a degree in power energetics. Subsequently he was employed with the largest Finnish energy enterprise Imatran Voima OY, where he worked until 1974 as an Engineer and Deputy Head of the Planning Department. At the same time, he continued his career in science at Helsinki University of Technology. His academic positions included: Research Fellow at Power Equipment Laboratory in 1957-1963, Assistant Professor of Energy Economics and Power Plants in 1971-1974, Professor and Head of Laboratory since 1974. Antero Jahkola became Professor Emeritus in 1994, but he continued to participate in research projects at the Laboratory of Energy Economics and Power Plants. His main research topics were associated with burning and gasification of solid fuels and the economics of thermal schemes in power stations. He was the author of more than 150 scientific publications and the owner of two patents.

Professor Jahkola had close contacts with Tallinn University of Technology and the Estonian Academy of Sciences since 1976. His collaboration with Estonian colleagues materialised in various forms: delivering lectures, participating in joint research projects, organising Finnish-Estonian joint seminars on power engineering and large-scale conferences devoted to the EU energy policy and its implementation in the Baltic States. He took part in the work of the Estonian-Finnish Inter-Academy Working Group

on energy cooperation since it was founded in 1991, and was a long-time Co-chair for the Finnish partner. In 1993 Antero Jahkola received an honorary doctorate from Tallinn University of Technology, in recognition of his outstanding contribution to the investigation of solid fuels and enhancement of scientific cooperation between Finland and Estonia.

The Estonian Academy of Sciences elected Antero Jahkola its Foreign Member in 1998. He was a member of the Finnish Academy of Technology, New York Academy of Sciences, Finnish Union of University Professors and several other Finnish as well as international scientific organisations in his area of expertise. In 2004 he was awarded the Estonian state decoration Order of the Cross of Terra Mariana, 3rd class.

Antero Jahkola passed away on 10 December 2017 in Helsinki.



Arno Kõörna

02.02.1926-21.12.2017

Arno Kõörna was born on 2 February 1926 in Nõo Parish, where he also went to school. In 1947 he graduated from Tartu Secondary School No.1. During the war his family was evacuated to Tatarstan. It was after returning to Estonia that Arno Kõörna entered the University of Tartu to study history, graduating in 1955. He remained working at the university for twelve years as Lecturer at the Department of Political Economy. His future scholar path involved researching economic issues. In 1965 he moved on into the system of the Academy of Sciences where he worked for almost 40 years, filling various positions.

In 1961, Arno Kõörna defended his dissertation for the Candidate of Sciences (equivalent to PhD) degree in economics on the topic “Development of national economy in Estonia at the beginning of the 20th century” at the Academy of Sciences of the ESSR, where he also gained in 1970 his Doctor of Sciences degree in economics with a dissertation on the topic “The methods of industrial production quality management in economy”. He was awarded Professorship in 1972.

Arno Kõörna was elected Member of the Estonian Academy of Sciences in economics in 1972.

During the years 1965-1973 Arno Kõörna worked at the Institute of Economics of the Estonian Academy of Sciences, starting as Deputy Director for Research, and Director from 1966 onward. He served as Secretary General of the Estonian Academy of Sciences in 1973-1982, Vice-President in 1982-1990, and President in 1990-1994. During the years 1996-1997 Arno Kõörna was Rector of the International University of Social Sciences LEX. Then he afterwards was engaged as Professor at Euroacademy (1998-2005) and *Professor Emeritus*.

Arno Kõörna's research primarily focused on the history of Estonian economy, comparative analysis of economic mechanisms, economics of quality, science economics and innovation. He published around 200 research articles, 10 monographs and 3 textbooks.

In the period of regaining Estonian independence, Arno Kõörna participated in the work of numerous national institutions as a scientist, expert of economics and President of the Academy. He was a member of the Advisory Council to the Chairman of the Presidium of the Supreme Council and also Chairman of that particular committee at the Supreme Council which declared the incorporation of Estonia into the Soviet Union in 1940 an occupation. During the years 1990-1993 Arno Kõörna was Chairman of the Estonian Research Council and Chairman of the National Science Prize Committee. He was also a longtime member of several international scientific organisations.

Arno Kõörna was acknowledged with the National Science Prize for his studies in the history of economics (1970) and the Medal of the Estonian Academy of Sciences (1986). In 2006 he was awarded the Estonian state decoration Order of the White Star, 3rd class.

Arno Kõörna passed away on 21 December 2017.

## APPENDIX 1: FINANCIAL ACTIVITIES

The budget of the Estonian Academy of Sciences for 2017 and its execution (EUR)

INCOME	
Allocations to the Estonian Academy of Sciences from the state budget	1 400 992
Other revenue	116 608
Allocations to Under and Tuglas Literature Centre	326 305
<b>TOTAL INCOME</b>	<b>1 843 905</b>
EXPENDITURES (general breakdown)	
Main activities of the Academy (through Academy Office)	735 569
Estonian Academy Publishers	241 464
Remuneration to Members of the Academy	293 090
Grants of Academy Research Professors	100 662
Research paper prizes for university students	5 498
Allocations to the scientific and learned societies	60 357
Activities related to the Institute for Advanced Study	4 081
Preparations for the 80th anniversary of the Academy	3 872
Membership fees to international science organisations	40 331
Activities of the National Science Prize Committee	26 000
Expenditures of Under and Tuglas Literature Centre	326 305
<b>TOTAL EXPENDITURES</b>	<b>1 837 229</b>

## APPENDIX 2: ESTONIAN CONTACT POINTS FOR INTERNATIONAL SCIENTIFIC ORGANISATIONS

as of 31th January 2018 (whose membership fees in 2017 were covered by the Estonian Academy of Sciences from a specific allocation of the Ministry of Education and Research)

<b>Estonian contact organisation</b>	<b>International organisation</b>
Estonian Physical Society (contact: Kaido Reivelt, efs@fyysika.ee)	European Physical Society, EPS
Estonian National Geophysical Committee (contact Rein Rõõm, rein.room@ut.ee)	International Union of Geodesy and Geophysics, IUGG
Estonian National Committee for IGU (contact Mihkel Kangur, egs@egs.ee)	International Geographical Union, IGU
Estonian National Committee for Geology (contact Dimitri Kaljo, dimitri.kaljo@ttu.ee)	International Union of Geological Sciences, IUGS
Estonian Association of Engineers/ Estonian Systems Engineering Society (contact Sven Nõmm, sven.nomm@ttu.ee)	International Federation of Automatic Control, IFAC
Estonian National Committee for Mathematics (contact Mati Abel, mati.abel@ut.ee)	International Mathematical Union, IMU
Estonian Polar Research Committee (contact Rein Vaikmäe, rein.vaikmae@ttu.ee)	European Polar Board, EPB
Estonian National Committee on Astronomy (contact Laurits Leedjärv, laurits.leedjarv@to.ee)	International Astronomical Union, IAU
Estonian National Committee for Mechanics (contact Andrus Salupere, salupere@ioc.ee)	International Union of Theoretical and Applied Mechanics, IUTAM
Estonian Academy of Sciences (contact Jüri Engelbrecht, j.engelbrecht@akadeemia.ee)	International Council for Science, ICSU
Estonian Academy of Sciences (contact Jaan Undusk, jaan@utkk.ee)	Union Académique Internationale, UAI

Estonian Academy of Sciences  
(contact Jüri Engelbrecht,  
j.engelbrecht@akadeemia.ee)

Estonian Academy of Sciences  
(contact Margus Lopp,  
margus.lopp@akadeemia.ee)

Estonian Academy of Sciences  
(contact Kristi Viiding,  
kristi.viiding@gmail.com)

Committee on Phylogenetics and  
Systematics, Estonian Academy of  
Sciences (contact Urmas Kõljalg,  
urmas.koljalg@ut.ee)

Committee on Marine Sciences,  
Estonian Academy of Sciences  
(contact Tarmo Soomere,  
tarmo.soomere@cs.ioc.ee)

ESTQUA (Estonian National  
Committee for INQUA)  
(contact Tiit Hang, tiit.hang@ut.ee)

Estonian National Committee of IAG  
(contact: Tiit Hang, tiit.hang@ut.ee)

Section of Philosophy and  
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Sciences and Humanities ALLEA

European Academies' Science Advisory  
Council, EASAC

International Commission for  
Thesaurus Linguae Latinae, TLL

Consortium of European Taxonomic  
Facilities, CETAF

European Marine Board, EMB

International Union for Quaternary  
Research, INQUA

International Association of  
Geomorphologists, IAG

International Union of History and  
Philosophy of Science and Technology,  
Division of Logic, Methodology and  
Philosophy of Science and Technology,  
IUHPST/DLMPST

## APPENDIX 3: COOPERATION AGREEMENTS WITH PARTNER ORGANISATIONS

(in brackets, the date of signing the currently valid agreement)

1. Academy of Sciences of Bashkortostan (23.06.2012)
2. Academy of Sciences of the Republic Tajikistan (4.06.2012)
3. Austrian Academy of Sciences (12.11.2007)
4. Azerbaijan National Academy of Sciences (27.10.2016)
5. British Academy (4.08.2011)
6. Berlin-Brandenburg Academy of Sciences and Humanities (16.05.2002)
7. Bulgarian Academy of Sciences (2.04.1996)
8. Chinese Academy of Sciences (26.05.2000)
9. Council for the Lindau Nobel Laureate Meetings; Foundation Lindau Nobelprizewinners Meeting (02.06.2016)
10. Czech Academy of Sciences (04.04.2017)
11. Finnish Academy of Science and Letters (10.03.1992)
12. French Academy of Sciences (22.03.1994)
13. Georgian National Academy of Sciences (19.10/01.11.2012)
14. Hungarian Academy of Sciences (20.06.1995)
15. Israel Academy of Sciences and Humanities (19.07.1995)
16. Italian National Research Council (23.04.2004)
17. Latvian Academy of Sciences (12.11.1991)
18. Lithuanian Academy of Sciences (12.11.1991)
19. Macedonian Academy of Sciences and Arts (16.12.1996)
20. Montenegrin Academy of Sciences and Arts (17.10.2005)
21. National Academy of Science of Belarus (18.02.2002)
22. National Academy of Sciences of Ukraine (2.10.2000)
23. Polish Academy of Sciences (17.06.1996)
24. Romanian Academy (06.04.2016)
25. Royal Flemish Academy of Belgium for Science and the Arts (26.03.2004)
26. Royal Society of London (30.10.1991)
27. Royal Swedish Academy of Letters, History and Antiquities (28.02.2017)
28. Royal Swedish Academy of Sciences (17.11.2005)
29. Russian Academy of Sciences (17.02.1993); additional memorandum on cooperation in earth sciences (30.03.2012)
30. Slovak Academy of Sciences (28.11.1993)
31. Slovenian Academy of Sciences and Arts (28.04.1997)
32. Spanish Council for Scientific Research (19.06.2001)
33. Swiss Academy of Sciences (18.09.1989)
34. Tajik National University (4.06.2012)

## APPENDIX 4: DIRECTORY

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ANNUAL REPORTS COMPILED AND  
PUBLISHED BY THE ESTONIAN ACADEMY  
OF SCIENCES

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|-----------|--|
| 1940      | Year Book of the Estonian Academy of Sciences<br>(I, in Estonian)  |
| 1969-1988 | Annual Report<br>of the Academy of Sciences of the Estonian SSR<br>(20 volumes, in Russian)                                    |
| 1989      | Annual Report of the Estonian Academy of Sciences<br>(issued separately in Estonian, Russian and English)                      |
| 1990-1995 | Annual Report of the Estonian Academy of Sciences<br>(6 volumes, issued separately in Estonian and English)                    |
|           | List of Scientific Publications of the Estonian<br>Academy of Sciences<br>(6 volumes, with a foreword in Estonian and English) |
| 1996-2017 | Year Book of the Estonian Academy of Sciences<br>(II-XXIII, issued separately in Estonian and English)                         |



