The Grand Prize of the Finnish Society of Sciences and Letters – Professor E.J. Nyström's Prize

Professor Tuomas Heikkilä, University of Helsinki

Tuomas Heikkilä (b. 1972) has served as Professor of Church History at the University of Helsinki since 2019. He defended his doctoral dissertation at the same university in 2002. From 2013 to 2017, he was Director of the Finnish Institute in Rome (Institutum Romanum Finlandiae), where he led a research project on medieval calendars and concepts of time. He has also held visiting research positions at the Swedish Collegium for Advanced Studies (2010) and the University of Gothenburg (2009). He has been a member of the Academia Europaea since 2022.

Tuomas Heikkilä is one of Finland's most internationally recognised medievalists. His research is characterised by a multidisciplinary approach in which he has innovatively applied and further developed methods such as the digitisation of medieval sources and algorithmic stemmatology to study the historical development of hagiographic texts and monasticism. His projects focus on medieval literary culture, manuscript studies, and the dissemination of information in Northern Europe. His work has illuminated the circulation of texts, the spread of literacy in the Nordic region, and their broader social significance. Heikkilä has also played a central role in the systematic preservation and analysis of parchment fragments and other source materials in Finland for the Diplomatarium Fennicum web service, which has provided important new material for international scholarship.

Heikkilä's research introduces perspectives that challenge established interpretations and develops creative analytical methods that have generated significant new data for the field. His academic leadership is particularly evident in the major Nordic ERC Synergy Grant consortium project "CODICUM: The Medieval Book and Networks of Northern Europe, c. 1000–1500: Texts, Crafts, Fragments", scheduled for completion in 2031. In this project, Heikkilä's research team, together with other Nordic groups, investigates how the literary culture of Northern Europe became integrated into broader Western European cultural networks during the Middle Ages. This type of ERC funding in the humanities underscores the high international standing of Heikkilä's research at the University of Helsinki.

Heikkilä also leads other international projects, including "CHARM: Combining Humanities and Natural Science Research to Study Medieval Texts, Scribes, and Craftsmanship" (2024–2028), funded by the Academy of Finland. The project combines biocodicology, radiocarbon (C14) dating, and isotopic analysis of parchment with the study of manuscript traditions.

Heikkilä supervises doctoral students in both the PhD Programme in Theology and Religious Studies and the doctoral programme in History and Cultural Heritage.

Heikkilä's publications are characterised by a multidisciplinary methodological toolkit and the systematic use of digital humanities approaches. His research teams have produced data and publications that have substantially expanded understanding of medieval literary culture in Finland and Europe, while also providing datasets and methodological frameworks for future research.

Professor Heikkilä's career is marked by scientific originality, success in international competition for research funding, and a strong ability to initiate and lead multidisciplinary research projects that reshape the foundations of his discipline. In addition, he is highly active in public engagement as a widely respected speaker and author. He is known for his books on the legend of Saint Henry (2005) and the outlaw Lalli (2022), as well as for numerous columns, contributions to public debate in newspapers and social media, and sustained advocacy for the humanities in contemporary society.

The Ruth and Nils-Erik Stenbäck Foundation

Doctor of Science (Technology) Jan Kronqvist, KTH Royal Institute of Technology

Jan Kronqvist (b. 1989) was born in Finland and is a native Swedish speaker. He received his PhD from Åbo Akademi University with honours in 2018 and was awarded the Faculty of Science and Engineering prize for the best doctoral thesis. During his doctoral studies, he spent six months as a visiting researcher at Carnegie Mellon University. In 2018, he was awarded a Newton International Fellowship by the Royal Society, which enabled him to work as a postdoctoral researcher at Imperial College London for two years.

Kronqvist was subsequently appointed Assistant Professor (universitetslektor) in Optimization and Systems Theory at the Department of Mathematics, KTH Royal Institute of Technology in Sweden. His research focuses on mixed-integer optimization, in particular algorithm development, strong convex relaxations, and applications of mixed-integer optimization in artificial intelligence and machine learning. He is a leading researcher in convex mixed-integer nonlinear optimization and has developed several state-of-the-art algorithms and award-winning software. He leads a research group consisting of three postdoctoral researchers and two doctoral students.

Kronqvist received the Howard Rosenbrock Prize in 2022 for the best paper published in the journal *Optimization and Engineering*. He was also awarded best paper at the CPAIOR 2021 conference in Vienna for his work on intermediate relaxations of disjunctive constraints. These intermediate relaxations have enabled significant advances in AI and machine-learning applications, including optimization over ReLU-based deep neural networks and mixed-integer clustering. He has published papers at AAAI 2020 and NeurIPS 2021 on mixed-integer optimization for robust verification and optimal adversarial inputs for deep neural networks.

Kronqvist is the founder and lead developer of the open-source MINLP solver SHOT, for which he received the COIN-OR Cup in 2018 at the INFORMS Annual Meeting in Phoenix. In 2024, he was elected a member of the Young Academy of Sweden (Sveriges unga akademi).

Professor Theodor Homén's Prize in the History of Finland

Professor Juhana Aunesluoma, University of Helsinki

Juhana Aunesluoma (b. 1967), Professor of Political History and Head of Discipline at the University of Helsinki, is one of Finland's leading scholars of European and Finnish contemporary history, international politics, and economic history. He was born in Helsinki on 6 July 1967 and completed his matriculation examination at Sibelius Upper Secondary School in 1986. He studied political history at the University of Helsinki, where he received his Master's degree in 1993. His doctoral dissertation, *Britain, Sweden and the Cold War 1945–1954*, was accepted at the University of Oxford in 1998.

Aunesluoma has previously served as Research Director at the Centre for European Studies at the University of Helsinki and as a visiting professor at the University of Minnesota (2015–2017). His research integrates Finnish national history with international developments in foreign, economic, and security policy. His particular areas of expertise include the development of Finnish trade and integration policy since the Second World War, as well as the history of political institutions and decision-making in Europe and Finland. He has published extensively on the Cold War, Finnish foreign policy, and European integration.

Aunesluoma is an exceptionally active scholar. According to the University of Helsinki research portal, he has authored 125 publications, completed four research projects, and participated in a total of 283 academic activities. His book *Vapaakaupan tiellä: Suomen kauppa- ja integraatiopolitiikka maailmansodista EU-aikaan* (On the Path to Free Trade: Finland's Trade and Integration Policy from the World Wars to the EU Era) (2011) provides a comprehensive analysis of Finland's position in a changing Europe. Another major work, *Neutrality as identity? Finland's quest for security in the Cold War* (2016), demonstrates his ability to uncover the historical structures and ideological foundations of political decision-making, as well as the influence of geopolitics, political culture, and economic factors on policy choices.

Aunesluoma's research offers a long-term perspective on Finland's place in Europe and the international system. He is among Finland's leading scholars examining the room for manoeuvre of small states situated between major powers. His work has influenced Finnish debates on foreign and security policy by highlighting structural constraints, historical continuities, and the evolving strategic choices available to Finland. This perspective has been particularly relevant as Finland has reassessed its relations with the European Union, NATO, and major powers.

Aunesluoma has also played an important role in public debate. He emphasises that Finland's foreign and security policy has developed in close interaction with twentieth-century experiences and that economic integration has been central to Finland's security. His research highlights the significance of neutrality for national identity, the impact of Cold War-era choices on Finland's room for manoeuvre, and the ways in which historical developments have shaped later decisions, including EU membership and, more recently, NATO membership.

For Aunesluoma, Finnish history is inseparable from European history. His articles in the Finnish foreign policy journal *Ulkopolitiikka* have examined the institutional development of the European Union and the effects of great-power competition on Europe. He has emphasised the EU's growing importance for Finland's security and the strong domestic support for membership. In his analysis, successive internal crises have shaped both the Union and Finland's position within it, contributing to the emergence of the EU in Finnish discourse as a security-policy community as well as an economic union.

Aunesluoma represents a historically grounded and analytically rigorous approach to debates on Finnish foreign and security policy. He is known for his ability to communicate complex historical and political developments clearly and accessibly. His work provides the historical depth necessary to understand why certain policy choices become possible at particular moments. According to the University of Helsinki research portal, he has made more than 100 media appearances, reflecting his established role as a bridge-builder between academic research and public discourse.

The Magnus Ehrnrooth Prize in Chemistry

Professor Tanja Kallio, Aalto University

Professor Tanja Kallio (b. 1974) received her Ph.D. in 2003 from the Helsinki University of Technology, specialising in physical and electrochemistry. Following her doctoral studies, she worked as a researcher at the Helsinki University of Technology until her appointment as Professor of Physical Chemistry in 2015, with a particular focus on electrochemical energy conversion. Kallio holds adjunct professorships at the Helsinki University of Technology and the University of Oulu. She has undertaken research visits to the University of Alicante (2013) and the University of Tartu (2014), and served as a visiting professor at the Skolkovo Institute of Science and Technology in Moscow from 2015 to 2019.

Kallio has published more than 200 peer-reviewed scientific papers in electrochemistry. Her research spans several areas of energy technology, including electrocatalysis for water splitting into hydrogen and oxygen, electrochemical synthesis, fuel cells, and various battery technologies. She is particularly recognised as an expert in lithium-ion batteries. Kallio has established a research team and collaborative network conducting comprehensive studies of

battery materials and electrochemistry, and she is widely regarded as one of Finland's leading experts in battery technology.

Kallio's research area is highly relevant to the green transition, namely the shift from fossil fuels to renewable energy and electrification. She has played a central role in numerous national and international research programmes in this field and has successfully secured competitive funding from the Academy of Finland, Business Finland, the EU's Horizon Europe programme, the Impact Foundation, and the Jane and Aatos Erkko Foundation. Kallio has supervised 13 doctoral dissertations and is currently supervising an additional 15 doctoral researchers.

The Prize of the PhD Mikael Björnberg Memorial Fund

PhD Henry Hirvonen, Vanderbilt University

Henry Hirvonen, Ph.D. (b. 1996), defended his doctoral dissertation in theoretical physics in 2024 within the Centre of Excellence in Quark Matter at the Department of Physics, University of Jyväskylä. He currently works as a postdoctoral researcher at Vanderbilt University in Nashville. His dissertation was supervised by University Researcher Harri Niemi and Professor Kari J. Eskola. Hirvonen's research focuses on the theoretical modelling of high-energy nuclear collisions at CERN's LHC accelerator and on investigating the properties of the quark–gluon plasma formed in these collisions. He is among the pioneers in applying machine learning methods to the theoretical analysis of heavy-ion collisions.

Under normal conditions, strongly interacting quarks and gluons are confined within protons, neutrons, and other hadrons. However, the fundamental theory of the strong interaction, quantum chromodynamics, predicts that at sufficiently high temperatures quarks and gluons form a deconfined plasma in which they can move freely. The extremely high temperatures required to produce a hot quark–gluon plasma, exceeding 10^{12} K, can be achieved by colliding heavy atomic nuclei at ultra-relativistic energies. Such collisions are studied at the CERN LHC and the BNL RHIC accelerators. Hirvonen's research examines the formation and dynamical evolution of the quark–gluon plasma created in these collisions and aims to determine its physical properties. The theoretical description of these processes relies heavily on relativistic computational fluid dynamics. These calculations are computationally demanding, as meaningful comparisons between theory and experiment require simulations of tens of thousands, and in some cases millions, of individual nuclear collisions.

As a major contribution, Hirvonen developed in his dissertation a novel neural-network–based method that, in certain cases, can reproduce flow-simulation results up to 100,000 times faster than conventional approaches. The method involves training neural networks on the results of full hydrodynamic calculations so that they can predict final observable quantities directly from given initial conditions. Building on this work, Hirvonen has applied these techniques to determine the shear and bulk viscosities of the quark–gluon plasma by

systematically comparing theoretical predictions with a wide range of observables measured in different collision systems. He has also refined hydrodynamic models by incorporating more realistic descriptions of the conversion of quark–gluon plasma into measurable particles, taking into account the strong event-by-event variation in the size and flow profile of the plasma droplet formed in each collision.

In addition, Hirvonen has played a significant role in developing a model based on perturbative quantum chromodynamics and gluon saturation, which can be used to predict the initial energy-density profiles of the quark–gluon plasma for hydrodynamic simulations. During his postdoctoral work at Vanderbilt University, he has expanded his international collaboration network and further deepened his expertise in relativistic hydrodynamic modelling. Alongside his research, Hirvonen has also contributed to teaching through lecturing at Vanderbilt University. He is an exceptionally talented, independent, and innovative young researcher who has already achieved notable breakthroughs at an early stage of his career.

The Magnus Ehrnrooth Prize for the best doctoral dissertations in mathematics accepted at a Finnish university last year

PhD Aleksis Vuoksenmaa, University of Helsinki

Aleksis Vuoksenmaa defended his PhD thesis, *Dynamical Aspects of Nonequilibrium Systems in Mathematical Kinetic Theory*, in May 2025 and received the grade “passed with distinction”, awarded to approximately the top 15% of doctoral theses. Following the completion of his PhD, he has worked as a postdoctoral researcher in the ERC project led by Sergio Simonella at the Department of Mathematics “Guido Castelnuovo”, Sapienza University of Rome, Italy.

Vuoksenmaa’s 192-page thesis consists of an introductory chapter and three research papers, one of which has been published in the *Journal of Statistical Physics*. The published paper is single-authored. The other two papers are available on arXiv and are currently under review in leading mathematics journals. The second paper is co-authored with his supervisor, Professor Jani Lukkarinen, and the third with Marina A. Ferreira. In the joint papers, Vuoksenmaa played a major role in their completion and was responsible for most of the key results and proofs.

As indicated by the title of his thesis, Vuoksenmaa’s work addresses a broad range of dynamical problems in mathematical kinetic theory. The first paper arose as a side project connected to controlling wave kinetic theory for the discrete nonlinear Schrödinger evolution. The second paper studies the overall accuracy of kinetic theory in a historically important model in which the theory has been rigorously validated, namely the stochastic mean-field-type process introduced by Mark Kac in 1956. The third paper, co-authored with Marina A. Ferreira, extends results from Vuoksenmaa’s MSc thesis on the Smoluchowski coagulation equation, another kinetic evolution equation with a rich mathematical solution structure.

In particular, the second paper represents a significant advance in the broader programme of establishing the accuracy and validity conditions of kinetic models for large physical systems. Although for classical particle systems, such as the stochastic Kac model or a rarefied gas of spherical particles in the Boltzmann–Grad scaling limit, velocity and energy cumulants may not always provide the most precise analytical tools, they offer the advantage of being directly connected to wave-kinetic modelling of quantum systems and other wave-evolution phenomena. Several of the key technical estimates, including the partition-classifier analysis, were obtained by Vuoksenmaa.

Magnus Ehrnrooth Prize for the best doctoral dissertations in physics accepted at a Finnish university last year

Doctor of Science (Technology) Kristian Arjas, Aalto University

Kristian Arjas, Ph.D. (Tech.), defended his doctoral dissertation, *Topological Effects in Plasmonic Lattices,* at the School of Science at Aalto University on 24 October 2025. The work was supervised by Professor Päivi Törmä (Aalto University) and Dr. Grazia Salerno (Aalto University and the University of Pisa). The opponent was Dr. Paloma Arroyo Huidobro of the Universidad Autónoma de Madrid.

Arjas's dissertation consists of four articles published in leading journals—*Nature Communications, Physical Review Letters*, *ACS Photonics*, and *Physical Review B*—together with a comprehensive summary. As indicated by the title, the thesis investigates topological phenomena associated with twists in the polarization state of light in various lattice structures. These twists, analogous to vortices, generate topological charges, and Arjas's work represents a significant advance in understanding their formation and properties. During his doctoral research, Arjas served as the lead theorist of the research team. He applied group-theoretical methods and symmetry analysis with notable originality and technical sophistication.

In addition to theoretical analysis, the dissertation includes an experimental component based on Arjas's own ideas and theoretical predictions. The research team fabricated nanoparticle-based crystal structures, known as quasicrystals, in which the interaction between the electromagnetic field of light and the nanoparticles could be locally minimized. This enabled the generation of exceptionally high topological charges. Such charges are expected to increase the information capacity of optical fibres significantly, potentially by a factor of 8–16.

Arjas's findings have attracted considerable interest within the international scientific community, and citation databases indicate that the articles included in the dissertation have already begun to receive attention. The approximately 60-page summary is a carefully written synthesis that provides a concise introduction to topological charges and the group-theoretical methods employed, as well as an integrated presentation of the main results.

The opponent and the two preliminary examiners gave highly favourable evaluations of the dissertation's quality and scientific significance. Immediately after completing his PhD, Arjas was offered a postdoctoral position at Trinity College Dublin.

Magnus Ehrnrooth Prize for the best doctoral dissertations in chemistry accepted at a Finnish university last year

PhD Santeri Larnimaa, University of Helsinki

Santeri Larnimaa defended his doctoral dissertation at the University of Helsinki on 7 August 2025. The opponent at the public defence was Professor Takuro Ideguchi of the Institute for Photon Science and Technology and the Department of Physics at the University of Tokyo, Japan.

Larnimaa's doctoral thesis, *Advanced Techniques for Fourier-Transform Absorption Spectroscopy* (University of Helsinki, Faculty of Science, Department of Chemistry), represents an outstanding contribution to molecular spectroscopy and experimental physical chemistry. The work was supervised by Professor Markku Vainio and Senior Lecturer Markus Metsälä, PhD. The thesis was awarded the grade 'Pass with distinction'.

Santeri Larnimaa's thesis combines advanced optical instrumentation, theoretical analysis and numerical simulation with experimental validation to a degree that is exceptional for a doctoral dissertation. The thesis is based on five scientific publications, with Santeri Larnimaa listed as the first author in all of them and as the corresponding author in one of the papers. The articles were published in peer-reviewed international scientific journals (*Chemical Physics Letters* (IF 2.8–3.1), *Journal of Quantitative Spectroscopy and Radiative Transfer* (IF 1.9), *Optics Continuum* (IF 1.4), *Optics Letters* (IF 3.3), *AIP Advances* (IF 1.4)).

Santeri Larnimaa developed several advanced techniques in Fourier transform spectroscopy, including phase-controlled Fourier transform spectroscopy, dual-comb spectroscopy and vortex-comb spectroscopy, particularly in connection with photoacoustic detection. These contributions represent significant progress in the field. During the public defence, the candidate answered all questions, ranging from general concepts to specific technical details and future research directions, with confidence and clarity. The quality of the discussion reflected the candidate's academic maturity and in-depth understanding of the subject.

The thesis proposes a new approach to Fourier transform spectroscopy that will be significant for future spectroscopic investigations and innovative solutions in the field. The technology developed enables fast, high-resolution measurements while keeping the experimental setup compact.

Santeri Larnimaa's doctoral thesis is an exemplary piece of academic research characterised by originality, methodological rigour and significant international impact. His work is among

the most outstanding doctoral theses in physical chemistry and spectroscopy in Finland in recent years.

Teacher prizes

Master of Arts Frida Crotts, Vasa Övningsskola Upper Secondary School

Frida Crotts is a French teacher at Vasa Övningsskola Upper Secondary School. She is described as a dedicated teacher who has had a significant professional impact in her field. She is engaged in both basic and advanced teacher education and has, *inter alia*, delivered lectures on supporting students' motivation and developing study strategies. Crotts promotes language teaching and language awareness in schools through language and literature. Her contributions are described as being of national significance.

She has encouraged numerous students to pursue language studies at institutions of higher education. Former students form an important and growing network, to which Crotts' student-centred pedagogy contributes. Through her pedagogical approach, she creates environments that encourage students in ways that support learning. She is characterised as a teacher who encourages students to actively engage in their language studies. A genuine interest in and respect for students lie at the heart of Crotts' approach.

Among the key values that Crotts seeks to convey through her teaching are sustainability and the promotion, through personal example, of activities that transcend cultural and linguistic boundaries. Together with colleagues, she has organised events aimed at promoting linguistic and cultural understanding. These include 'Le Québec, connais-tu?' as well as language trips and student exchanges. Crotts has also contributed to the production of educational materials.

PhD Reetta Kariola, Lahden lyseo

Reetta Kariola, PhD and Docent in Genetics, coordinates the school's science stream. During her 13 years at Lahden Lyseo, she has been responsible for cooperation between the school and institutions of higher education, thereby helping to promote science in schools. This is also reflected in her teaching approach, which incorporates scientific thinking, laboratory work and an introduction to the latest research findings in biology. These elements of her teaching help to clarify potential future career paths for students.

Kariola has also developed several courses for the upper secondary school science stream covering topics such as biology experiments, medical biology and epigenetics. She also teaches on two courses, including one on genetic engineering, that are organised in collaboration with universities. In terms of content, the courses are advanced. Through these courses, she incorporates a research-oriented mindset and knowledge of research methods

into her teaching, helping students to recognise future opportunities within biology in particular and science in general. Many of her former students have gone on to study biology, medicine and other natural sciences at universities.

Kariola is frequently praised for her ability to create a supportive learning environment for her students. She is described as a teacher with the ability to teach complex subject matter in a relatable, practical and engaging way. Kariola is also involved in the production of biology teaching materials.

Doctor of Arts Piritta Malinen, Kaurialan lukio

Piritta Malinen is an art teacher at Kaurialan Lukio General Upper Secondary School. She holds a PhD in Fine Art and is described as a pioneering educator in the visual arts. Malinen is deeply committed to encouraging students to engage with the world of art. In practical terms, art is visible throughout the school year, for example in exhibitions of pupils' artwork and art installations. A fundamental principle underpinning her teaching is the individual's freedom to engage in and express themselves through art.

Kaurialan Lukio General Upper Secondary School offers a science-focused programme. Malinen helps bring science and art together with the aim of fostering interdisciplinary interest and engagement. This has been achieved through her involvement in, among other things, two projects focusing on science and art, as well as augmented reality and programming, with the aim of promoting authentic learning. She has actively promoted the projects by sharing her experiences as a teacher with colleagues interested in combining art with science. Malinen is also a long-term pioneer in the use of virtual reality in teaching.

Malinen has taught at Aalto University and is occasionally called upon by the university as an expert. She has inspired many students to continue their studies in the arts at university level, and her former students have secured places on highly competitive art programmes.

A defining feature of Malinen's educational activities is a particularly strong commitment to the community. This has been demonstrated, *inter alia*, through a mural project between Kaurialan Lukio and the Central Hospital in Hämeenlinna, events organised in collaboration with the Hämeenlinna Cultural Centre for Children and Young People, and educational workshops at nurseries run by the school's students. Malinen has promoted collaboration with local businesses in art education, which also helps deepen students' understanding of the social context and potential of the visual arts.