

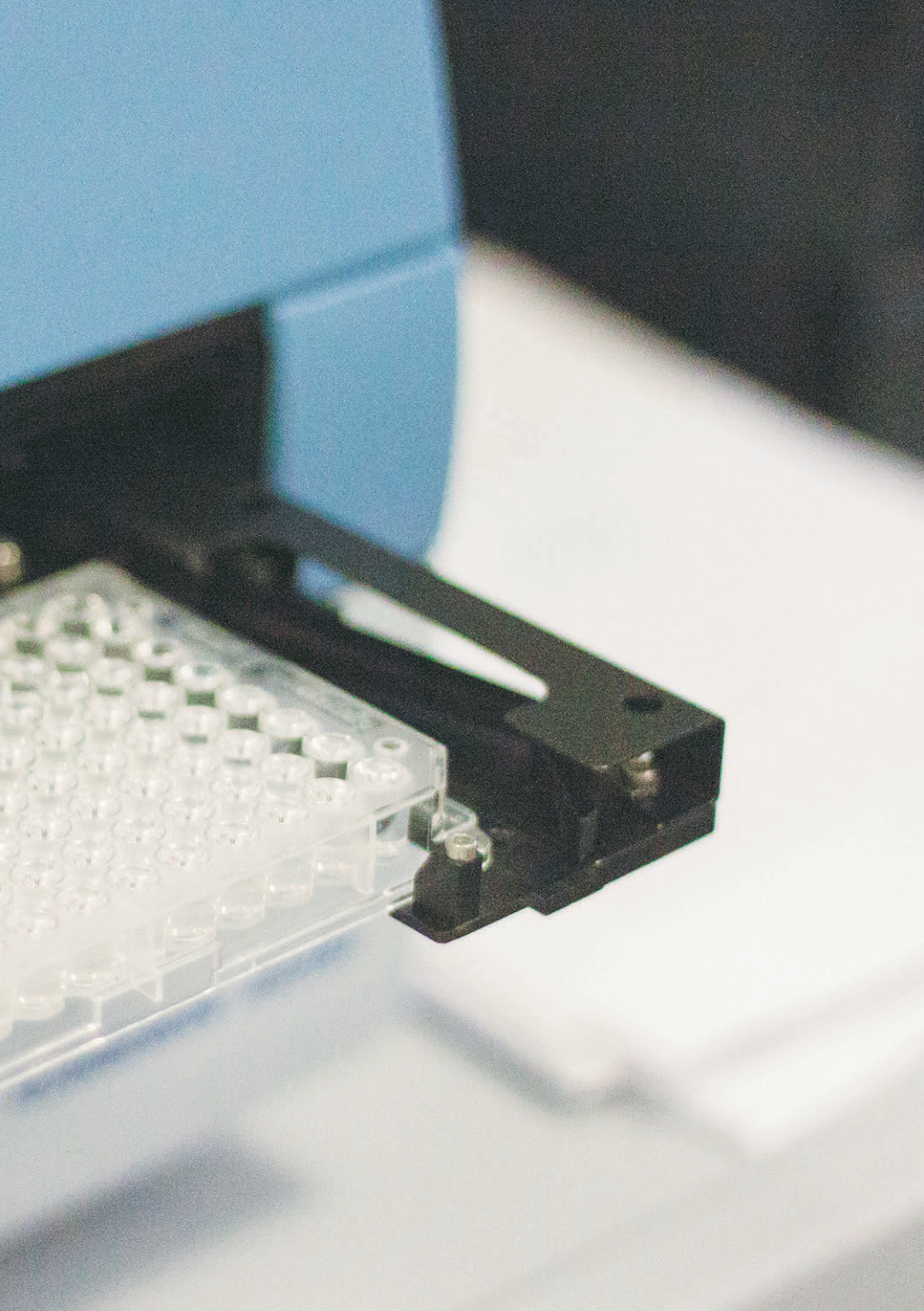


Genes:

From
the Past
to the Future

16th Baltic
Conference
on Intellectual
Co-operation
Vilnius,
Lithuania,
2-3 May 2019





Intellectual Cooperation of the Baltic Countries

After the First World War, Lithuania, Latvia, Estonia, and Finland emerged as young independent states and new political subjects recognised by the world community. Despite some political differences, these countries sought joint discussion and action in building progressive societies and enhancing the well-being of their people. Intellectuals, scientists, and professional leaders of these countries understood this need and encouraged mutual cooperation.

The first conference on intellectual cooperation of the Baltic countries was held at Vytautas Magnus University in Kaunas in 1935 and supported the idea of the establishment of academies of sciences in the Baltic countries. In Estonia, the Academy of Sciences was established in 1938. In Latvia and Lithuania, public institutions – the Latvian Institute of History and the Antanas Smetona Institute of Lithuanian Studies, respectively – which later developed into national academies of sciences, were founded before the Second World War. They were instrumental in organising research on a national scale.

The tradition of a number of conferences organised before the Second World War was revived after the Baltic countries regained their independence in 1990. A series of conferences with a focus on various issues of research and its development are organised in one of the three Baltic countries or Finland every second year. The themes and issues addressed during the recent decade included the following: diffusion of research and the relationships of the research community and the general public (2010, Vilnius); the role of small countries in the European research space (2013, Tallinn); activities of academies of sciences in initiating and stimulating research and innovation (2015, Riga); research-based teacher training in the Baltic region (2017, Helsinki). The 2019 conference is held in Lithuania again.

Participants of these conferences are academies of sciences of these countries and representatives of the academies of sciences of the Baltic region.



Genes: From the Past to the Future

The famous Human Genome Project, launched in 1990 and accomplished in 2013, was a major challenge, a great achievement, and a fascinating part of the never-ending human quest for knowledge about ourselves. Although the 1990s was the time when national research systems of the Baltic countries were facing extreme challenges, new exciting opportunities were there as well.

Nowadays genetics permeates biomedical research in the Baltic countries. Genetic identification of historic persons, modification of genes for selection and biodiversity, genetic medical diagnostics, development of gene modification tools are commonly performed tasks. Our proximity to world-class science here is an indicator of what we have achieved.

This year's conference in Vilnius is mostly focused on biomedical sciences, but it will not be confined just to them. The presentations of the first day of the conference will focus on the impact of modern genetics and genomics on plant selection, medical practice, and the emergence and development of novel scientific disciplines. The ways of how the latest achievements in genetics and genomics are changing the perception of the history of human populations will be demonstrated on the example of Lithuania on the second day of the event.

The latest technologies of biomedical research – bioinformatics, medical biotechnologies, genome editing tools for the analysis of the human genome – enable research into and the development of ethnogenesis-related issues. Studies into variations in DNA sequence make it possible to reconstruct the evolutionary history, origin, and structure of the human populations and to detect differences and similarities between individuals or populations. Demographic changes leave a trace in a population by changing its genetic diversity. Therefore one can assert that our history is encoded in a DNA sequence. Modern ethnogenetic research is developed by collating archaeological, genomic, and linguistic data. Comparison of results produced by separate branches of science is interesting to the general public as it facilitates a better understanding and clarification of the theory of the origin of nations.



CONFERENCE PROGRAMME



Thursday, 2 May

12.00–13.00 Registration

13.00–13.10 OPENING ADDRESSES

Prof. Jūras BANYS, President, Lithuanian Academy of Sciences

Prof. Vaidutis KUČINSKAS, Lithuanian Academy of Sciences,
Vilnius University

13.10–13.20 SHORT WELCOME SPEECHES

Prof. Tarmo SOOMERE, President, Estonian Academy of Sciences

Prof. Ojārs SPĀRĪTIS, President, Latvian Academy of Sciences

Prof. Romuald ZABIELSKI, Vice President, Polish Academy
of Sciences

Prof. Sirpa JALKANEN, Finnish Academy of Science and Letters

SESSION 1

Chairpersons: Prof. Zita Aušrelė KUČINSKIENĖ,

Lithuanian Academy of Sciences, Vilnius University

Dr. Pēteris TRAPENCIERIS, Latvian Academy of Sciences

13.20–13.45 From biobanks to personalised medicine

Prof. Andres METSPALU, University of Tartu,
Estonian Academy of Sciences

**13.45–14.10 Combining the biobank and health care system
resources for effective genetic studies in Latvia**

Prof. Jānis KLOVIŅŠ, Latvian Biomedical Research
and Study Centre, Latvian Academy of Sciences



14.10–14.35 Interleukin-6 and ADAM17 in inflammation and cancer
Prof. Stefan ROSE-JOHN, Christian-Albrechts-Universität zu Kiel,
Academy of Sciences and Humanities in Hamburg

14.35–14.55 Coffee break

SESSION 2

Chairpersons: Prof. Zenonas DABKEVIČIUS, Lithuanian Academy of Sciences
Prof. Maris LAAN, Tartu University

14.55–15.20 Atavistic theory of cancer: a shift towards the gene network of primitive unicellular organisms. Is it curable?
Prof. Jekaterina ERENPREISA, Latvian Biomedical Research and Study Centre, Latvian Academy of Sciences

15.20–15.45 Application of genetic methods in cereal breeding
Prof. Isaak RASHAL, University of Latvia,
Latvian Academy of Sciences

15.45–16.10 Genetic research for fruit crop improvement
Dr. Gunārs LĀCIS, Latvia University of Agriculture

16.10–16.30 Coffee break

SESSION 3

Chairpersons: Prof. Rimantas JANKAUSKAS, Vilnius University,
Lithuanian Academy of Sciences
Prof. Gintautas ŽINTELIS, Lithuanian Academy of Sciences

16.30–16.50 Tightly bound proteins are anchored to DNA by G quadruplexes
Prof. Nikolajs SJAKSTE, University of Latvia,
Latvian Academy of Sciences



**16.50–17.15 Computational studies of proteins involved
in DNA replication and repair**

Prof. Česlovas VENCLOVAS, Vilnius University,
Lithuanian Academy of Sciences

17.15–17.55 The genetic history of Northeast European peoples

Dr. Mait METSPALU, Estonian Biocentre, University of Tartu

17.55–18.00 QUESTIONS AND ANSWERS

**18.00–18.30 CEREMONY OF THE MEDAL OF BALTIC
ACADEMIES OF SCIENCES AWARD**

Prof. Tarmo SOOMERE, President, Estonian Academy of Sciences

Prof. Ojārs SPĀRĪTIS, President, Latvian Academy of Sciences

Prof. Jūras BANYŠ, President, Lithuanian Academy of Sciences



**Friday, 3 May
On the Origin of the Balts**

SESSION 4

Chairpersons: Prof. Vaidutis KUČINSKAS, Lithuanian Academy of Sciences,
Vilnius University

Prof. Domas KAUNAS, Lithuanian Academy of Sciences,
Vilnius University

**9.00–9.30 Population of Lithuania through the millennia:
archaeological perspective**

Dr. Laurynas KURILA, Lithuanian Institute of History

9.30–10.00 Lithuanian ethnogenesis: an historian's view

Prof. Rimvydas PETRAUSKAS, Vilnius University,
Lithuanian Academy of Sciences



**10.00–10.30 Changes in the conception of the origin
of the Lithuanian language**

Prof. Grasilda BLAŽIENĖ, Institute of the Lithuanian Language,
Lithuanian Academy of Sciences

10.30–11.00 Coffee break

SESSION 5

Chairpersons: Prof. Rimvydas PETRAUSKAS, Vilnius University,
Lithuanian Academy of Sciences

Prof. Grasilda BLAŽIENĖ, Institute of the Lithuanian Language,
Lithuanian Academy of Sciences

**11.00–11.30 Postglacial migration of Scots pine in Europe
and its associations with human migrations**

Prof. Darius DANUSEVIČIUS, Vytautas Magnus University,
Lithuanian Academy of Sciences

**11.30–12.00 Contribution of ancient DNA data
to population history of Lithuania**

Prof. Rimantas JANKAUSKAS, Vilnius University,
Lithuanian Academy of Sciences

**12.00–12.30 Genomic data illuminates demography, genetic structure
and micro evolutionary process in human populations**

Prof. Vaidutis KUČINSKAS, Lithuanian Academy of Sciences,
Vilnius University

12.30–12.40 GENERAL DISCUSSION

Prof. Jūras BANYS, President, Lithuanian Academy of Sciences

12.40–13.00 CONFERENCE CLOSING CEREMONY



Presenters





ANDRES METSPALU

Prof. Andres Metspalu, (MD 1976, PhD 1979), head of the Estonian Biobank, Institute of Genomics, University of Tartu. He did his postdoc at Columbia University and Yale University in 1981–1982. His main scientific interests are human genetics, genomics of complex diseases, population-based biobanks, and application of precision medicine in health care. From 1993 to 1994 he was a visiting professor at the Department of Molecular and Human Genetics at Baylor College of Medicine, Houston. In 2000 he was invited to the International Agency for Research on Cancer, France, as a recipient of the International VSS Award, and in 2012 spent his sabbatical at the University of Lausanne. From 1996 to 2008, Prof. Metspalu was also the head and founder of the Molecular Diagnostic Centre of the Tartu University Hospital. Metspalu is a former (2006) president of the European Society of Human Genetics. In 2010 he was elected to the Estonian Academy of Sciences. He is a member of several national and international committees and has received, among other awards and honors, the Order of the Estonian Red Cross 3rd Class and L'Ordre des Palmes Academiques from the Republic of France. In 2010, he was awarded the degree of Doctor Honoris Causa of Vilnius University.





JĀNIS KLOVIŅŠ

Jānis Kloviņš is the director of the Latvian Biomedical Research and Study Centre (LBRC) and a professor of molecular biology at the University of Latvia. He takes an active part in science management activities in Latvia. From 2016 he is the chairman of the Latvian Science Council. He is also a full member of the Latvian Academy of Sciences and a member of numerous professional and advisory committees.

Jānis Kloviņš graduated from the University of Latvia in 1996 and obtained his PhD at Leiden University in 1999. Since 2000, he has been focusing on the investigation of human genetics and functions of G protein-coupled receptors (GPCRs). He conducted studies as a postdoc at the Department of Neuroscience, BMC, Uppsala University from 2001 to 2004. During that time he received a number of prestigious fellowships including Marie Curie Individual Fellowship, EMBO short-term fellowship, and Wenner-Gren Fellowship. After return to the LBRC in 2005, he founded a research group, established the Genome Centre, and headed this unit. Since 2006 he has been involved in the establishment of Genome Database of the Latvian Population, the national biobank that comprises biosamples and associated phenotypic and clinical information of over 35,000 representatives of the Latvian population.

Some of the cohorts from the biobank provided a unique opportunity to study the complexity of responses to antidiabetic drug in healthy people and in patients of type 2 diabetes. Presented study goes beyond pharmacogenomics and demonstrates a system-based approach involving investigation into microbiome and epigenetic factors determining the response to diabetes treatment.





STEFAN ROSE-JOHN

Stefan Rose-John, Director of the Biochemical Institute of Kiel University, was born in 1954 in Heidelberg (Germany). He is a full professor of biochemistry from 2000. He was an associate professor at the University of Mainz (Germany). Stefan Rose-John obtained his doctorate at the University of Heidelberg, was a postdoc at the Michigan State University (USA), and for three years was a junior group leader at the German Cancer Research Centre in Heidelberg. He received his habilitation at the University of Aachen (Germany). Prof. Rose-John studies the molecular role of the cytokine Interleukin-6 in the mechanisms of inflammation and cancer. He has discovered the IL-6 trans-signaling pathway via the soluble Interleukin-6 receptor and developed a specific IL-6 trans-signaling inhibitor, which under the name Olamkicept is currently being tested in phase II clinical trials in patients with autoimmune diseases. He is an elected member of the Hamburg Academy of Science.

Stefan Rose-John will talk about the discovery of the IL-6 trans-signaling and an IL-6 trans-signaling inhibitor and its relevance for the personalised treatment of inflammation and cancer.





JEKATERINA ERENPREISA

Jekaterina Erenpreisa, *doctor habilis* in medicine, a full member of the Latvian Academy of Sciences from 2003, head of the Cancer Cell Biology group at the Latvian Biomedicine Research and Study Centre. She graduated in Riga as MD, obtained her doctorate in 1971 and habilitation in 1991. Jekaterina Erenpreisa undertook study visits and fellowships in the UK, the USA, and Germany, and was a Latvian leader of a dozen of international projects. She continues experimental and theoretical work in wide collaboration with scientists all over the world. Her main expertise and research interests: (1) resistance of cancer to therapy, its evolutionary mechanisms; (2) spatial regulation of the genome expression applying the methodology and ideas of systems biology.

In her talk, Jekaterina Erenpreisa will focus on the crisis of the somatic mutation theory of cancer resulting from cancer genome sequencing projects. She will describe her research of the last twenty years with collaborators, pointing to the disbalanced activation in cancer cells of the gene networks of the primitive single-celled organisms. They developed the tools for surviving catastrophic events on the Earth during three billion years of evolution. When becoming metastatic, human cancer cells acquire these features. The atavistic theory of cancer is finding more and more support in studies all over the world, in particular with the use of bioinformatic analysis of gene networks, single-cell transcriptomes, and methods of non-linear thermodynamics. There already exist some ideas and trials of meeting this challenge of life evolution to such a very recent creature as a mankind.





ISAAK RASHAL

Prof. Dr. Habil. Isaak Rashal graduated from the University of Latvia in 1972. He is a professor of genetics at the Faculty of Biology of the University of Latvia, a full member of the Latvian Academy of Sciences, president of the Latvian Society of Geneticists and Breeders. His research interests are focused on population genetics, evaluation and use of plant genetic resources, facilitation of plant breeding by genetic methods.

The presentation will show how recent achievements in molecular genetics have transformed modern breeding from a game of fishing out the best combination of unknown heritable units to direct manipulation with gene alleles to create varieties with a complex of desired traits.





GUNĀRS LĀCIS

Gunārs Lācis is a leading researcher at the Institute of Horticulture, Latvia, head of the Unit of Genetics and Biotechnology. He graduated from the University of Latvia as a biologist in 1996 and received a PhD in genetics and plant breeding at the Swedish University of Agricultural Sciences in 2010. In November 2018, he was elected a corresponding member of the Latvian Academy of Sciences. From the beginning of his scientific career his research activities have been linked with characterization and evaluation of plant genetic resources, various areas of fruit crop genetics as development and implementation of molecular biology methods in fruit crop breeding, research on mechanisms of plant resistance to pathogens.

The word 'gene' often causes concern in society; people are afraid of it, especially in relation to such food as fruit and vegetables. However, different gene-based technologies, directly or indirectly allow us to gain new knowledge that can help us to overcome challenges raised by climate change, promote the environmentally-friendly growing technologies based on the plant's natural abilities, and have access to safe and healthy products.





NIKOLAJS SJAKSTE

Nikolajs Sjakste graduated in the medical biophysics programme from the 2nd Moscow State Medical Institute in 1978 and from 1978 to 1983 pursued doctoral studies at the All-Union Cancer Research Centre (Moscow). Nikolajs Sjakste continued his scientific work in the Latvian Institute of Experimental and Clinical Medicine and the Latvian Institute of Organic Synthesis. He is a full professor of medical biochemistry at the University of Latvia from 1998 and a full member of the Latvian Academy of Sciences from 2010. His research is focused on interactions of DNA with proteins and small molecules, DNA breakage, and molecular pharmacology of nitric oxide.

The presentation 'Tightly bound proteins are anchored to DNA by G quadruplexes' will summarise the results of the work performed in collaboration with colleagues from Vilnius University. Tight complexes of DNA and proteins were isolated from barley shoots, both protein and DNA components were characterised. Changes in the distribution of the complexes in several genes depending on the stage of the shoot development were revealed: the protein composition of the complexes turned out to be complex. DNA fragments were purified, cloned, and sequenced. Most of the fragments were GC-rich. Possible formation of the G quadruplexes in the sequences was predicted by means of bioinformatics; the ability of the oligonucleotides derived from these sequences to form G quadruplexes in vitro was confirmed by circular dichroism spectroscopy. The role of the G quadruplexes in the organization of the nucleus will be discussed.





ČESLOVAS VENCLOVAS

Dr. Česlovas Venclovas leads the Department of Bioinformatics at the Institute of Biotechnology of Vilnius University. He graduated from Vilnius University in 1989 and in 1994 obtained a PhD in chemistry from Moscow University. From 1996 to 1998, he did his postdoctoral training at the University of Maryland and the University of California at Davis. After postdoctoral training he joined the Lawrence Livermore National Laboratory in California where he was a staff scientist until his return to Lithuania in 2004. In 2000 and 2005, Dr. Venclovas was awarded international scholar grants of Howard Hughes Medical Institute (USA). He is a recipient of the Lithuanian Science Prize (2008). He is a full member of the Lithuanian Academy of Sciences from 2016. Dr. Venclovas conducts research in the field of protein structural bioinformatics. His major research interests include computational prediction of three-dimensional structure of proteins and protein complexes, detection of distant evolutionary relationships between proteins, computational studies of DNA replication and repair machineries.





MAIT METSPALU

Mait Metspalu studied geography and molecular biology and evolution at the University of Tartu where he also defended his PhD on phylogeography of human mtDNA in South Asia in 2006. From 2012 to 2013, Mait was a visiting research fellow at UC Berkeley. His research concentrates on using and developing approaches in population genetic to understand the genesis of the genetic diversity patterns of humans through reconstructions of past population movements, splits and admixtures as well as adaptations to local environments (both natural and manmade). In recent years Mait has been working on a dedicated ancient DNA programme aimed mostly at reconstructing population changes in the East European Plain since the Paleolithic.

He became the vice-director (2010) and, subsequently, the director (2014) of the Estonian Biocentre, Estonia's leading research institute in the interdisciplinary and interconnected fields of evolutionary genomics, population genetics, and archaeogenetics. In 2018, the EBC merged with the Estonian Genome Centre and in the same year Mait Metspalu became the director of the new Institute of Genomics of the University of Tartu.





LAURYNAS KURILA

Dr Laurynas Kurila is head of the Archaeology Department of the Lithuanian Institute of History (Vilnius). In 2009, he completed his doctorate at the Faculty of History of Vilnius University. Dr. Kurila's research interests include the Roman Period – Viking Age Lithuanian and Baltic archaeology, burial archaeology, prehistoric social organizations, and the history of Lithuanian archaeology. From 2011, he is the editor-in-chief of the annual peer-reviewed journal *Lietuvos archeologija* (Lithuanian Archaeology). From 2012, Kurila is an expert for the Department of Cultural Heritage under the Ministry of Culture of the Republic of Lithuania, and from 2014 he is a lecturer at the Faculty of History of Vilnius University.

In his presentation, Dr Laurynas Kurila will discuss the capabilities of archaeology in research of development of past populations. He will address the question of how material culture reflects it, with a special emphasis on the archaeological evidence of migrations and the change in culture. He will propose a brief model of development of Lithuanian population from the earliest times to the Middle Ages from the archaeological perspective.





RIMVYDAS PETRAUSKAS

Rimvydas Petrauskas graduated from Vilnius University in 1997. He also received training at the University of Basel (Switzerland), universities in Berlin, Greifswald, and Kraków, at the German Historical Institute Warsaw, and Herder Institute (Marburg, Germany) before defending his doctoral thesis 'Lithuanian Nobility of the Late Fourteenth and the Fifteenth Century: Composition, Structure, Governance' in 2001. In 2003, a monograph of the same title was published (in Lithuanian). He is the author of the historical studies 'Power and Tradition: The History of the Families of The Grand Duchy of Lithuania' and 'The Grand Duchy of Lithuania. Politics and Society in the Late Middle Ages' (both in Lithuanian, published in 2016 and 2017, respectively) and has co-authored a number of other books. Professor Petrauskas is the dean of the Faculty of History of the University of Vilnius. He is also the president of the National Lithuanian Committee of Historians. From 2012, he is a member of the International Historical Commission of the Teutonic Order. In 2016, Rimvydas Petrauskas was elected full member of the Lithuanian Academy of Sciences. Currently, he is also the Chairman of the Board of the Research Council of Lithuania.

Who are Lithuanians?

The historical investigation of ethnogenesis of Lithuanians is a particularly complicated problem, if only for the lack of historical sources. The name of Lithuania appears in them only after 1009, and later Lithuanians are seldom mentioned. The aim of the presentation is to reveal what the term 'Lithuanians' actually meant in the early documents, what its relation to social terminology was, and how the use of this notion was changing during the formation of the medieval Lithuanian state.





GRASILDA BLAŽIENĖ

Prof. Dr. Grasilda Blažienė received her doctoral degree in philology from Vilnius University in 1993. Later she conducted empirical research in the Secret State Archives Prussian Cultural Heritage Foundation (Berlin, Germany). In 2007, she completed the habilitation procedure (thesis 'Old Prussian Place Names') at Vilnius University and obtained the title of professor. Grasilda Blažienė is a full member of the Lithuanian Academy of Sciences from 2014. From 2008 to 2015, she was vice-director for research at the Institute of the Lithuanian Language, and currently is a senior researcher and the head of the Centre of Research in Baltic Languages and Proper Names of this institute. Her research interests include Old Prussian and Baltic onomastics, studies into Baltic languages, comparative linguistics, historical and contemporary linguistics (their branches and methodology), the cultural history of Lithuania Minor, paleographic and linguistic analysis of historical manuscripts, and translation theory and practice.

Changes in the Conception of the Origin of the Lithuanian Language

The Baltic languages are understood as separate languages linked by a common basis: the genetic relationship and the territory of cultural activity. In this context, the origin of the Lithuanian language would be the question which could also be answered or solved on the basis of extralinguistic factors, first of all due to the origin of the Lithuanians themselves and the relationship between their language and the old languages spoken in Samogitia and Aukštaitia in the course of history, including the times when there were no dated linguistic monuments.





DARIUS DANUSEVIČIUS

Darius Danusevičius is a professor at the Faculty of Forestry Sciences of the Agriculture Academy of Vytautas Magnus University and a full member of the Lithuanian Academy of Sciences. In 1999, he obtained his PhD from the Swedish University of Agricultural Sciences. His teaching activities and research are concentrated on forest genetics. Prof. Darius Danusevičius is the head of the Committee for Doctoral Studies in Forestry Sciences and a member of the National Board on Plant Genetic Resources under the Ministry of Environment. Research of his group focuses on evolutionary genetics of trees aiming at a wide range of ecology-oriented issues in forestry and related areas. His recent studies address post-glacial migration of pines and oaks, genetic structure and genetic diversity of beech, Scots pine, black alder, lime, and birch in Lithuania and Eurasia, rare allele search in forest tree populations, genetic diversity of wetland pines, genetic diversity and differentiation of roe deer and wolf in Lithuania.





RIMANTAS JANKAUSKAS

Rimantas Jankauskas graduated from the Faculty of Medicine of Vilnius University and worked at the Department of Anatomy, Histology, and Anthropology ever since graduation. In 1988, he obtained his doctorate. Currently, he is a professor at this department, vice-rector of Vilnius University for research, and a full member of the Lithuanian Academy of Sciences. Rimantas Jankauskas' research interests are focused on the biological history of past populations, including their health status, demography, nutrition and paleogenetics, and forensic anthropology.

In his presentation, Rimantas Jankauskas will summarize recently available data on mitochondrial and nuclear DNA of past populations, and on pathogen DNA in the Baltic area during the Stone Age, indicating that major changes in the gene pool occurred during the significant inflow of people from the Pontic area at the Late Neolithic.





VAIDUTIS KUČINSKAS

Prof. Dr. Habil. Vaidutis Kučinskas is an active full member of the Lithuanian Academy of Sciences and a chairperson of the Division of Biological, Medical, and Geosciences. He has established the Human Genome Research Centre at the Institute of Biomedical Sciences of the Faculty of Medicine of Vilnius University and is the chief scientist and head of this excellence centre for fundamental and clinical research in genome diversity and inherited diseases in Lithuania. Prof. Vaidutis Kučinskas is a leading and one of the most cited researchers in the Baltic countries. He has published research papers in the most prestigious international research journals such as *Nature*, *Science*, *Nature Genetics*, *PLOS One*, *American Journal of Human Genetics*, *European Journal of Human Genetics*, *Annals of Human Genetics*, and others.

The analysis of geographically specific regions and the characterisation of fine-scale patterns of genetic diversity confirmed a homogeneous genetic landscape of Lithuanians. Frequencies of genomic pathogenic variants in the Lithuanian population differ from those in other European populations and are currently under investigation.



Genes: From the Past to the Future

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