



ELKH | Eötvös Loránd
Research Network

Who we are

Building the future -
driven by heritage

The **Eötvös Loránd Research Network (ELKH) Secretariat** is an independent nonprofit public budgetary organization established on August 1, 2019. The ELKH Secretariat is under the supervision of the National Assembly, led by a 13-member independent Governing Body devoted exclusively to scientific research excellence while safeguarding academic freedom. The function of the Governing Body is supported by a Scientific Council and an International Advisory Board.

The **ELKH Secretariat** maintains the expansive research network funded from the central budget for purposes of carrying out scientific research.

The **ELKH Secretariat** builds on the rich legacy of Eötvös Loránd in articulating the multifaceted character of the collective wealth of knowledge accumulated in the research network over several decades.



In 1891, Eötvös Loránd and his colleagues founded the Hungarian Society for Mathematics and Physics

The newly formed organization was named after **Eötvös Loránd** (Baron Roland von Eötvös) (1848-1919) the preeminent Hungarian researcher and multidisciplinary scientist; physicist, geophysicist. He was the founding father of modern Hungarian science and research development policy who established conditions for the development of university-based innovations and technical education.

Eötvös Loránd is commemorated for his work on gravitation, his study of the equivalence of gravitational and inertial mass; the gravitational gradient on the Earth's surface; the surface tension of liquids, and the invention of the highly accurate torsion balance or Eötvös pendulum for gravimetry.

„So, finally, we must be rest assured that science does not give the true explanation of natural phenomena, but only leads to the border where the elusive begins.”

Eötvös, 1877

Eötvös Loránd's legacy of pushing boundaries

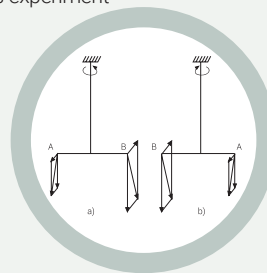
Eötvös unit

a unit for expressing horizontal gradients of gravity (geophysical prospecting) equal to 10^{-9} gal per horizontal centimeter. The symbol of the eötvös unit is E.



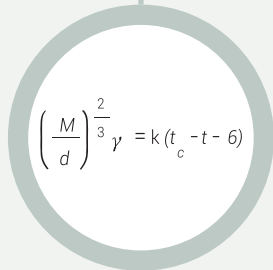
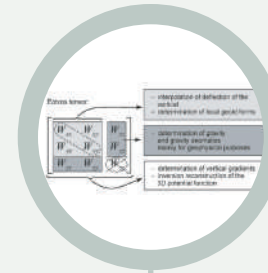
Eötvös parameter

is used to quantify a deviation from the Weak Equivalence Principle of two test bodies with different compositions (A and B), inertial mass m_i , and gravitational mass m_g . The term is derived from the acclaimed Eötvös experiment



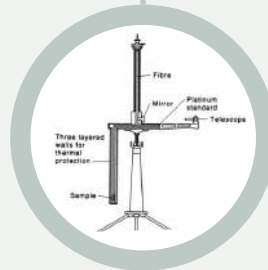
Eötvös-tensor

(gravity gradient tensor) measures the rate of change of the gravity vector in three perpendicular directions



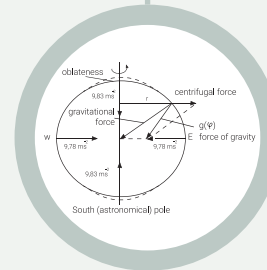
Eötvös rule

or Law (capillarity) for the temperature dependence of a surface tension, where k is the Eötvös constant



Eötvös torsion balance

The device measures the direction of force of gravity and the change in the force of gravity's extent in the horizontal plane



Eötvös effect

is the change in perceived gravitational force caused by the change in centrifugal force resulting from eastbound or westbound velocity



Eötvös number

or Bond number characterizes the ratio of gravitational forces to the surface tension forces

Mission & Vision

Science is at the heart of our policy process

ELKH's vision

To endow ELKH as a forthcoming network of 'think tanks' for policymakers, addressing sustainable transformation while contributing to Hungary's prosperity.

ELKH's mission

- to acknowledge, foster and protect scientific freedom and promote research ethics and research integrity
- to strive for scientific excellence in basic and applied research in natural and life sciences, social sciences, and the humanities
- to efficiently operate the publicly funded research institute network with diversity, inclusivity and by equal opportunity
- to be at the forefront of scientific innovation that generates impact in key strategic and global sustainable areas
- to develop innovative and targeted research programs and policy
- to foster and advance partnerships internationally and regionally
- to strengthen synergies between education and research
- to evolve as a progressive, open and inspiring organization

Key Facts

ELKH | Eötvös Loránd Research Network

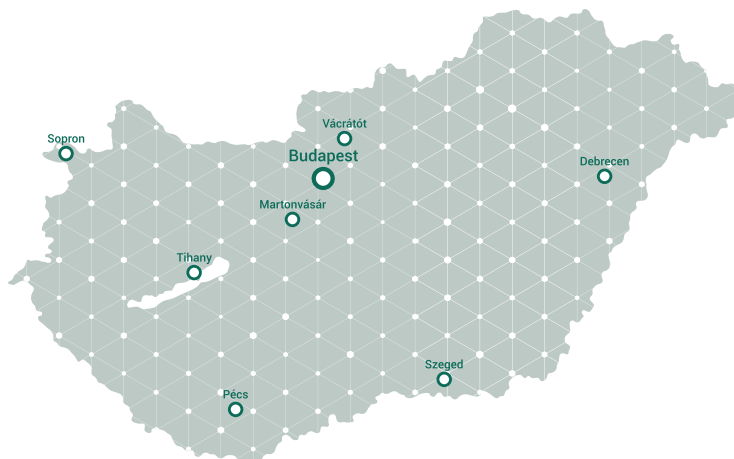


- **220** patents
- **7 841** Scientific and Educational publications (2019)
- **19** Spin-offs
- **178** ongoing HORIZON 2020 Grants Awarded
- **86 M €** ELKH Budget Appropriation (2020)
- **167,2 M €** Annual Planned Total Budget (2020)
- **110** Planned Headcount at the ELKH Secretariat
- **4 872** Employees (3 033 Scientific Researchers) (2019)

What we do

Research for the challenges of our time

- Strengthening capacity, efficiency and linkages
- Interdisciplinary, international collaborations and projects
- Utilization of research results
- Facilitate scientific career building and future challenges of mobility for young researchers
- Effective R+I readiness for future crisis management – in line with sustainable green recovery (EU Green Deal)



5 Research Institutes & 1 Office

Institute for Nuclear Research (ATOMKI)	Debrecen
Institute of Experimental Medicine (KOKI)	Budapest
Research Institute for Linguistics (NYTI)	Budapest
Alfréd Rényi Institute of Mathematics (RI)	Budapest
Institute for Computer Science & Control (SZTAKI)	Budapest
Office for Research Groups Attached to Universities and Other Institutions (TKI)	Budapest

10 Research Centre(s) & 39 Research Institutes

Centre for Agricultural Research (ATK) Martonvásár / Budapest	Institute for Veterinary Medical Research
	Agricultural Institute
	Plant Protection Institute
	Institute for Soil Science and Agricultural Chemistry
Research Centre for the Humanities (BTK) Budapest	Institute of Philosophy
	Institute for Literary Studies
	Institute of Art History
	Institute of Ethnology
	Institute of Archaeology
	Institute of History
Research Centre for Astronomy & Earth Sciences (CSFK) Sopron / Budapest	Geographical Institute of Research
	Institute for Geological and Geochemical Research
	Geodetic and Geophysical Institute
	Konkoly Thege Miklós Astronomical Institute
Centre for Energy Research (EK) Budapest	Institute for Atomic Energy Research
	Institute for Energy Security and Environmental Safety
	Institute for Technical Physics and Materials Science
Centre for Economic & Regional Studies (KRTK) Budapest / Pécs	Institute for Economics
	Institute for Regional Studies
	Institute of World Economics

Centre for Ecological Research (ÖK) Tihany / Vácraátót / Budapest	Balaton Limnological Institute
	Danube Research Institute
	Institute of Ecology and Botany
	Institute of Evolution
Biological Research Centre (BRC) Szeged	Institute of Biophysics
	Institute of Biochemistry
	Institute of Genetics
	Institute of Plant Biology
Centre for Social Sciences (TK) Budapest	Institute for Legal Studies
	Institute for Minority Studies
	Institute for Political Science
	Institute for Sociology
Research Centre for Natural Sciences (TTK) Budapest	Institute of Materials and Environmental Chemistry
	Institute of Enzymology
	Institute of Cognitive Neuroscience and Psychology
	Institute of Organic Chemistry
	<i>Brain Imaging Center</i>
Wigner Research Centre for Physics (WIGNER FK) Budapest	Institute for Particle and Nuclear Physics
	Institute for Solid State Physics and Optics

ELKH's Fields of Basic (Exploratory) and Applied Scientific Research



Natural Sciences:

Mathematics; Computer and Information Sciences (AI, AV); Physical Sciences (Physics, Chemistry); Astronomy and Earth Sciences; Nuclear Physics and Atomic Energy Sciences; Materials Sciences; Biological Sciences; Biochemistry and Enzymology

Environmental and Life Sciences:

(Limnology, Ecology, Botany, Zoology, Virology); Agriculture Sciences (Chemistry); Plant Sciences; Soil Sciences; Crop Sciences; Atmospheric Sciences; Geo Sciences; Animal Sciences; Veterinary Sciences (Emerging Zoonotic Diseases)

Medical and Health Sciences:

Cognitive Science; Neuroscience; Pharmacology; Experimental Medicine; Veterinary Medicine; Biomedical Sciences; Medical Genetics Nanotechnology; Biomedical; Telemedicine; Microbiology

Social Sciences:

Economics; Philosophy; Sociology, Law; Political Sciences; Literary Studies; Art History; Ethnology; Archaeology; History, Musicology; Linguistics

ELKH's Interdisciplinary Science and Research Portfolio



HEALTH-RELATED DRUG RESEARCH AND DEVELOPMENT; MOLECULAR BIOLOGY; NEUROBIOLOGY; PSYCHOLOGY; ECOLOGY; CLIMATE CHANGE; AGRICULTURE; WASTE MANAGEMENT; ECONOMICS; HISTORY; THE HUMANITIES; LANGUAGE; ADVANCED STRUCTURAL MATERIALS; ENERGY; SPACE; QUANTUM SCIENCE AND NANOTECHNOLOGIES; DIGITALIZATION OF MANAGEMENT PROCESSES; MATHEMATICS; AI; MACHINE LEARNING; BIG DATA ANALYTICS; INTELLIGENT SYSTEMS; AVIATION INNOVATION AND HYDROGEN

Impact

International Rankings

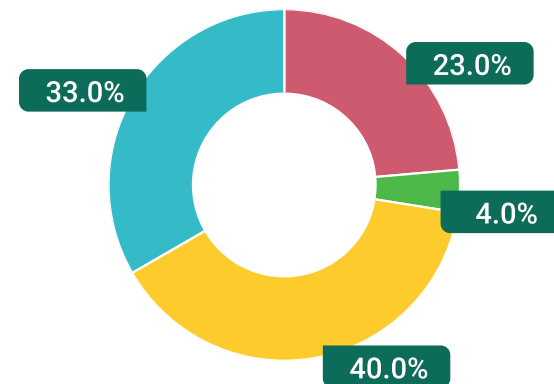
1 April, 2019 – 31 March, 2020

- Placed 395th in 2019
- Hungarian Academy of Sciences (HAS)
Eötvös Loránd Research Network (ELKH)

Region: Global	Count	Share
Subject/Journal group: all	296	38.01

Subject	Count	Share
● Chemistry	51	9.66
● Physical Sciences	189	13.76
● Earth & Environmental Sciences	14	1.46
● Life Sciences	66	16.45

Outputs by subject (Share)



Source: Nature Index

Research network

The ELKH research network currently comprises ten research centers, five research institutes, and around 150 additional supported research teams operating at universities and other public institutions, conducting basic and applied research, exploring the most varied disciplines of mathematics and natural sciences, life sciences, social sciences and the humanities.



Institute of Experimental Medicine (KOKI)

KOKI focuses on basic research in the field of neuroscience: neurotransmission, learning and memory, behavior, brain damage related to aging and epilepsy, and the regulation of hormone secretion by the central and the peripheral nervous system. The research groups take a multidisciplinary approach to problems, integrating traditional, well-founded and proven methods (anatomy, electrophysiology, neurochemistry and pharmacology methodology) with the latest technologies. The five departments of the Institute, the Departments of Pharmacology, Endocrine Neurobiology,



Cellular and Network Neurobiology, Molecular and Developmental Neuroscience, Behavioral Neurobiology, operate divided into research groups and laboratories. Since 2004, the Institute has also included the Medical Gene Technology Unit, which works in the field of transgenic animal technology.

Alfréd Rényi Institute of Mathematics (RÉNYI, RI)



The Institute was founded in 1950 and was later named after its first director, Alfréd Rényi, who led the Institute for 20 years until his death in 1970.

The number of researchers at the Institute is around 120, but many of them work for periods abroad, and the Institute regularly has guest researchers. The researchers are organized into research groups and departments, with their performance being proven by their publications in leading international journals. In 2001, the Rényi Institute was awarded the title EU Center of Excellence.

Institute for Computer Science and Control (SZTAKI)



The Institute for Computer Science and Control (SZTAKI) is the largest and most successful research institute in Hungary in the field of information science.

SZTAKI is an information science workshop in the broad sense, a national research base for IT, computer science and related fields. It primarily focuses on the technical-scientific and mathematical aspects of IT, but research also includes all fields connected to the basic problems. Alongside a wide range of basic and applied research tasks, the Institute finds it important to apply its know-how in the fields of R&D, system design and integration, consulting and software development.

Institute for Nuclear Research (ATOMKI)



The Institute for Nuclear Research (Atomki) was founded in Debrecen in 1954. The founding director was Sándor Szalay, who even at that time stressed the importance of interdisciplinary research.

Consequently, from the very beginning the Institute has not only dealt with physics (nuclear, atomic, particle, vacuum, surface and quantum physics) but has also conducted research into connected fields (radiochemistry, medical imaging, space research, hydrological research, environmental science, heritage science). Atomki has the highest number of particle accelerators in Hungary.

Research Institute for Linguistics (NYTI)



The basic task of the Research Institute for Linguistics is to conduct research at international standards in the following

fields: Hungarian, Uralic, general and applied linguistics, historical linguistics, phonetics and pragmatics, to compile a Comprehensive Dictionary of Hungarian and maintain its archived materials, to investigate Hungarian dialects and minority languages, and to study language policy issues within European integration. The additional tasks of the Institute include the creation and maintenance of linguistic corpora and databases, the creation of the linguistic foundations of software applications, public services, and drawing up expert opinions. The Institute also performs higher education tasks through the operation of the ELTE-MTA Department of Theoretical Linguistics.

Centre for Agricultural Research (ATK)



The goal of the Centre for Agricultural Research (ATK) is to maintain its leading position among Hungarian agricultural research institutions. This position is due to the Centre's special profile of performing strong basic research and creating varieties and patents that can be used directly in practice to ensure the biological foundations for a considerable proportion of Hungarian arable land. Consequently, it exercises decisive influence on the agricultural sector. The Centre is a significant agricultural science base even at the European level.

Centre for Ecological Research (ÖK)

The Centre for Ecological Research was established in 2012 with the merger of the Balaton Limnological Institute, the Danube Research Institute, and the Institute of Ecology and Botany. In the summer of 2019, the Institute of Evolution was founded and became a member of the Centre. The Centre's staff work hard at integrating the institutes and scientific fields, as it is difficult to address complex environmental challenges in isolation. The researchers do not only conduct research, but they



are also devoted to building bridges between science and society, and, in doing so, take part in the elaborating policy both at the EU and global levels.

The main task of the Ecological Centre is to conduct high-level research on biodiversity and ecosystems, including forest, grassland, lake and river ecosystems. The Centre focuses on ecological research, but a lot of its work is related to the effects of agriculture and forestry on biodiversity, to traditional knowledge of ecology, and to interdisciplinary topics.

As the Ecological Centre is the largest Hungarian institution dealing with ecology, it feels responsible for the task of advising the nation on questions related to biodiversity and nature, and for supporting the development of Hungarian ecology.

Biological Research Centre (BRC)



The internationally recognized Biological Research Centre in Szeged is a prominent Hungarian life science research facility. The four institutes of the Centre founded in 1973, the Institutes of Biophysics, Biochemistry, Genetics and Plant Biology, employ some 260 researchers, whose work is hallmarked by high-ranking international scientific publications and patents. Its research topics include numerous fields in molecular and cell biology, and range from the industrial applications of bacteria, through the controlled improvement of crops, to the problems of human health and environmental protection.

The Centre focuses on basic research, but its researchers are also active

in education and in setting up and managing biotech companies. The standard and successes of the research at the Centre were recognized by the European Molecular Biology Organization (EMBO) with it being awarded the title of EU Center of Excellence in 2000.

Research Centre for Natural Sciences (TTK)



The Research Centre for Natural Sciences conducts multidisciplinary research in the field of natural sciences. The Research Centre and its institutes carry out the tasks determined in its statutes with the Centre focusing on basic research tasks, especially including:

- Organic chemistry
- Materials and environmental chemistry
- Enzymology
- Cognitive neuroscience and psychology

Research Centre for Astronomy and Earth Sciences (CSFK)



The basic task of the Research Centre includes research on astronomy and earth sciences (geography, geology, geochemistry, geodesy, geophysics), the operation of the Hungarian National Seismological Network, conducting basic (exploratory) research, the preparation and publication of research results for application, conducting the theoretical investigations, and carrying out the observatory, laboratory and

field measurements necessary for exploratory research, the creation of scientific devices and methods, scientific analysis and publication of data, the maintenance of observatories and establishing new observatories if necessary. The complex interactive scientific center of the Svábhegy Observatory was opened to the general public at the Normafa site of the Centre in 2019. It features the largest, completely restored historic telescope in Hungary and gives lectures and provides views of the sky during the day and the night.

Centre for Energy Research (EK)



The mission of the Centre for Energy Research is to pursue international scientific research in the field of materials science in order to continuously further Hungarian nuclear safety expertise in the following areas:

- Technical and scientific support for the safe operation of nuclear power plant units in Hungary: deterministic safety analysis, radiation damage, development of reactor diagnostics
- Research on the interaction between radiation (neutron, gamma and electron radiation) and matter, exploration of the biological effects of low-dose radiation
- Development and application of nuclear analytics procedures; radiochemistry, radiation protection and nuclear protection
- Development of nuclear fusion-based nuclear power generation processes, research and development of related technological and physical issues
- Development of space weather measurement systems for monitoring the composition and spectrum of, and changes to, the magnetic field in space
- Research and development of neutron research methods and tools for Hungarian and international use at the Budapest Neutron Center (BNC)
- Utilization of renewable energy sources, hydrogen and high-energy waste, environmental protection in

analytical chemistry and physical chemistry

- Interdisciplinary research on complex functional materials and nanometer-sized structures, exploration and application of physical, chemical and biological principles in integrated micro- and nanosystems, and development of test methods
- Publication and utilization of the acquired knowledge in undergraduate and graduate training, in international and domestic industrial R&D programs, with special regard to the needs of SMEs

Wigner Research Centre for Physics (WIGNER)



The Wigner Research Centre for Physics is one of the most highly staffed research centers of the ELKH. Its mission is to conduct exploratory

research in various fields of physics in Hungarian laboratories, at research sites located both in Hungary and abroad, and to coordinate Hungarian efforts in international projects. Another important aim is to provide theoretical explanations for experimental results, and to discover new phenomena. The Wigner Centre has outstanding results in all these fields.

The priority research fields are as follows: particle physics, nuclear physics, general theory of relativity, gravity, space physics, solid-state physics, statistical physics, atomic and molecular physics, classic and quantum optics, laser physics, laser induced fusion, quantum technology, quantum information technology, and a number of fields in the computation sciences, including computational neuroscience, artificial intelligence, and machine learning. Since 2013, the Wigner Centre has been the home of the world-class Wigner Datacenter.

The history of the Wigner Research Centre for Physics dates back several decades. Its predecessor was the Central Research Institute for Physics (KFKI) founded in 1950, which was replaced by the Wigner Centre and the Centre for Energy Research.

Research Centre for the Humanities (BTK)

The Research Centre for the Humanities (BTK) conducts internationally embedded basic research that meets international standards in the following fields: philosophy, literary studies, art history, ethnography, archeology, history, and musicology.

The seven institutes constituting the BTK are involved in researching and interpreting the whole of the Hungarian past, in the light of the challenges of our time. The Centre's basic task is to explore and maintain Hungarian cultural heritage and thus to strengthen Hungarian identity.



Consequently, research groups are established and maintained both at the central and the institute levels in order to research topics fundamental to the exploration of national identity. The Centre's mission is to introduce the unique historical Hungarian

experience into international discourse, to renew communications with the members of the scientific world both inside and outside Hungary, and also to make the results of research in humanities visible to the Hungarian general public.

Research Centre for Economic and Regional Studies (KRTK)



The Research Centre for Economic and Regional Studies coordinates the work of three institutes: the Institute of Economics, the Institute for Regional Studies and the Institute of World Economics. The Centre conducts theoretical and practical research in the following topics: economy, world economy, spatial processes, social sciences.

Centre for Social Sciences (TK)



The Centre for Social Sciences, as part of the only publicly funded research network in Hungary, conducts basic research in political science, sociology, minority studies and legal studies. Its goal is to reach scientific achievements based on original discovery research, to collect, analyze and publish up-to-date information and data on social phenomena and changes, and thereby contribute to a better understanding of our societies while meeting the highest standards of international research. The Centre is the flagship of Hungarian social science in terms of internationally recognized research outputs and it is open to further academic collaborations both at national and international

scales. The Centre hosts the European Social Survey in Hungary, the most important European research infrastructure in social sciences. The Centre provides open access research databases to the public and publishes academic journals. Its open access journal, Intersections: East European Journal of Sociology and Politics is ranked in Q2 at the Scimago.

ELKH supported research groups

Office for Supported Research Groups

In addition to research centers and research institutes, the Eötvös Loránd Research Network includes more than 150 independent research groups operating in universities and other public institutions. These groups can receive funding for their research in the form of grants that Supported Research Groups or Lendület Research Groups can apply for. Their leaders are university and public institution employees, and their members are researchers employed by ELKH. From an administrative point of view, the groups are operated by the Office for Supported Research Groups (TKI).

The research groups belonging to TKI carry out their research in various fields of mathematics and natural sciences, life sciences, the humanities and social sciences. They provide an organic link between ELKH and major Hungarian research universities, thus laying the foundations for high-level partnerships of excellence.

The research carried out in the groups contributes significantly to Hungarian scientific output. Due to its many practical applications, this can also be used to the benefit of society. Research by several life sciences groups is contributing, for example, to the conservation of biodiversity, the development of region-wide reconstruction programs, and improvements in public health. In addition to successful basic research activities, the research carried out here in the field of natural sciences also helps solve many practical issues, including the lateral stability of self-driving vehicles, water management issues at Lake Balaton, and the development of new composite materials.

Several groups are carrying out essential research in the field of Hungarian history and language. It is worth highlighting work associated with language technology and the publication of archives from the Anjou and the Sigismund eras, which can be regarded as valuable scientific work. In addition, studies are undertaken into many other popular and important social science issues, such as social and generational differences in behaviors detrimental to public health.

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