

HUN-REN

Hungarian Research Network







I believe that science not only answers today's questions but also shapes the future. As President of HUN-REN, my goal is to enable Hungarian researchers to excel internationally while contributing to our nation's development and addressing global challenges. Our new research network is built on excellence, academic freedom, and social responsibility, supporting young talent, strengthening international cooperation, and fostering dialogue. Our mission is to ensure that science creates real value for people and communities.

Prof. Balázs Gulyás, President

I believe that technology does not replace humans — but unlocks the potential within them. It creates true value only when it is built on knowledge and science. Artificial intelligence is not the rule of machines, but a tool that empowers us – as individuals, communities, and nations – to rise to new heights. My mission is to ensure that Hungarian knowledge, innovation, and intellectual courage are not only present in the international scientific arena but also shape it. To achieve this, we must build a scientific ecosystem that offers secure career paths, modern infrastructure, and a strong basis for innovation across the HUN-REN network.

Roland Jakab, CEO





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HUN-REN: Pivotal Role in Hungarian RDI

*Driving Research and Innovation
Excellence*

HUN-REN Hungarian Research Network operates under the mandate of the National Assembly of Hungary as an independent entity. HUN-REN is a key element of Hungary's research and innovation ecosystem and serves as the main driving force behind it, collaborating closely with government bodies involved in science policy, universities, and major industrial stakeholders.

HUN-REN encompasses 7 research centres, 8 research institutes, and 101 supported research groups, conducting basic and applied research across the STEM fields and life sciences.

The HUN-REN Headquarters is responsible for managing the operations of the research network and supporting its research activities.

**HUN-REN
HQ**

101
Research
Groups

**HUNREN-
TECH**

7
Research
Centres

8
Research
Institutes



Strategic Vision and Impact

*Catalysing Transformation
through Innovation*

We are a leading research-performing organisation, recognised for our commitment to mission-oriented research and excellence. Through focused, transformative research, we contribute to society's well-being by addressing critical global challenges and improving quality of life in society.

HUNRENTech



HUNRENTech Ltd. is a technology transfer company within the HUN-REN network, established in 2025, designed to help researchers turn scientific results into market-ready, socially beneficial innovations. By offering expert support in intellectual property, business development, and industry collaboration, the company aims to bridge the gap between research and real-world application.

Facts and Figures 2024



5114

NUMBER OF EMPLOYEES



3181

NUMBER OF RESEARCHERS



1180

NUMBER
OF WOMEN
RESEARCHERS



2691

PUBLICATIONS
IN Q1-RANKED
JOURNALS



EUR
102,2M
ANNUAL BUDGET



FIELD WEIGHTED
CITATION IMPACT
1,29



NUMBER OF ACTIVE
INTELLECTUAL
PROPERTY
PROTECTIONS
282



17
NUMBER OF PRESENTLY ACTIVE
BUSINESSES FOUNDED WITH A STAKE
HELD BY RESEARCH INSTITUTES

Our Mission

TOP-TIER R&I ACTIVITY

The mission of HUN-REN is to contribute to the social, economic, and intellectual development of Hungary and the world through cutting-edge research and innovation. It is committed to becoming an internationally recognised research network.

CONTRIBUTION TO SOCIETY

We promote the broad application of research results and advance the innovation value chain, contributing to social development and enhancing economic competitiveness.

MISSION-ORIENTED RESEARCH

We initiate and conduct research that addresses societal and environmental issues.

COLLABORATION

We encourage collaboration among domestic and international members of the research, development, and innovation ecosystem.

LINKING EDUCATION AND RESEARCH

We strengthen connections between educational and research stakeholders.

Our Values

EXCELLENCE

We aim for the highest standards of scientific achievement and professionalism. All our work is conducted ethically, with a focus on quality and strict adherence to scientific principles.

TRANSPARENCY AND EFFICIENCY

We manage Hungary's publicly funded research network responsibly by ensuring that all processes, from funding allocation to research outcomes, are transparent and conducted with utmost efficiency.

SCIENTIFIC FREEDOM

The freedom of researchers is crucial for fostering creativity and innovation. This includes the ability to choose their research topics, methods, publications, and collaborations, as well as to work in an environment free from outside influence — something we are fully committed to supporting.

CONTINUOUS DEVELOPMENT

We are dedicated to professional and organisational development, staying adaptable to the evolving scientific and technological landscape. We are equally committed to personal and professional improvement.

EQUAL OPPORTUNITIES

We are committed to ensuring fairness, equality, and inclusiveness. We place a strong emphasis on advancing gender equality for women researchers and encouraging broader participation of women in science. This principle is also upheld in our application evaluation process.



AI for Impact Programme

*Supporting Research & Innovation
with AI*



As artificial intelligence reshapes the landscape of scientific research, **HUN-REN** is integrating advanced AI capabilities to remain at the forefront of innovation.

The **AI for Impact Programme** is HUN-REN's strategic framework for embedding AI across the entire spectrum of science and innovation. It empowers research, improves institutional efficiency, accelerates the path from discovery to real-world application, and reimagines scientific processes through **AI-first methodologies**.

Empowering Researchers with AI

AI 4 SCIENCE: ENHANCING RESEARCH WITH AI TOOLS AND COLLABORATION

Launched in September 2024, the AI 4 Science Programme **enhances research efficiency** and innovation through state-of-the-art AI technologies. The initiative provides access to tools, expertise, and education to support the full range of needs concerning exploiting AI for the research process facilitated by a wide network of AI Ambassadors.

AI4INNOVATION: ACCELERATING RESEARCH- DRIVEN INNOVATION

AI4Innovation harnesses the power of AI to reinforce the **full research and innovation value chain** — from scientific discovery to applied outcomes. By embedding AI into the processes of idea generation, experimentation, validation, and technology transfer, the initiative helps transform research results into **market-ready innovations** that deliver **competitive advantage**.

AI4EFFICIENCY: TRANSFORMING RESEARCH OPERATIONS WITH AI

AI4Efficiency leverages AI to enhance operational and administrative functions within the research ecosystem. From process automation to intelligent resource management, it improves efficiency and enables researchers and institutions to focus more on impactful science.

AI1SCIENCE: REDEFINING DISCOVERY THROUGH AI

AI1Science, led by **HUN-REN**, pioneers **AI-first methodologies** that accelerate scientific discovery. It aims to reimagine how science is conducted by placing AI at the core of research workflows — developing innovative approaches that **reshape the research process itself**. AI1Science is at the forefront of ushering in a new era of **AI-driven scientific exploration**. From generating new knowledge to autonomously exploring complex domains and automating experimentation, AI is redefining what is possible.

Mission-Oriented Research Highlights

New Hope for Age-Related Brain Health

HUN-REN Biological Research Centre, Szeged

HUN-REN researchers have discovered that removing aged brain cells reduces inflammation and enhances the brain's environment, enabling better blood vessel regeneration by endothelial progenitor cells. Their findings offer promising new strategies to treat vascular damage linked to ageing and related neurological diseases.



AI Enhances Efficiency and Data Management in Hungarian Healthcare

HUN-REN Alfréd Rényi Mathematical Research Institute

Artificial Intelligence is being developed to support early disease detection, treatment planning, and the management of vast amounts of patient data in Hungary's healthcare system. Researchers are building a comprehensive health life-course data platform designed to make complex medical data more transparent and actionable, aiming to improve healthcare delivery and patient outcomes.





AI-System to Monitor Preemies

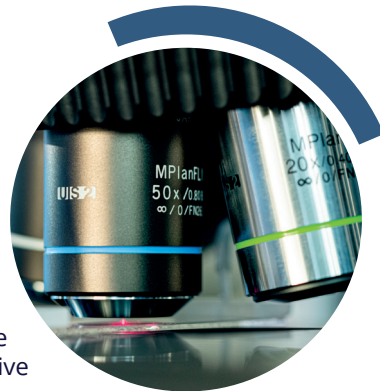
HUN-REN Institute for Computer Science and Control

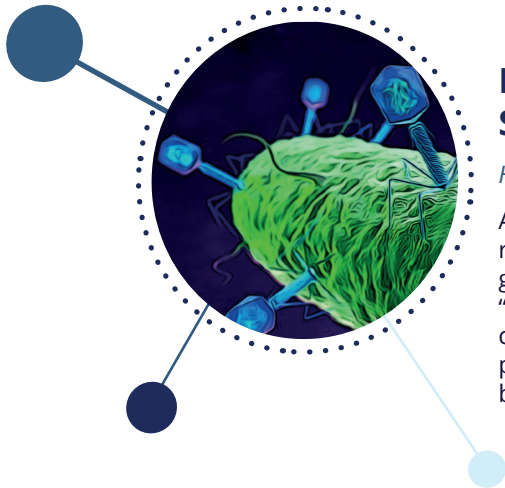
Developing a product line that uses artificial intelligence to monitor the vital functions of premature infants. The researchers also aim to develop an AI-based system that can determine the intensity of the infant's pain based on facial expressions, as well as the tension in the baby's back and hands.

Innovative Cancer Treatment Research

HUN-REN Biological Research Centre, Szeged

Cancer demands increasingly tailored treatments, yet current methods often fall short in precision. At HUN-REN researchers are developing advanced techniques to pinpoint optimal drug combinations for individual patients. Their work is laying the foundation for personalised therapies that are both highly effective and widely accessible.





Novel Means to Combat Superbacteria

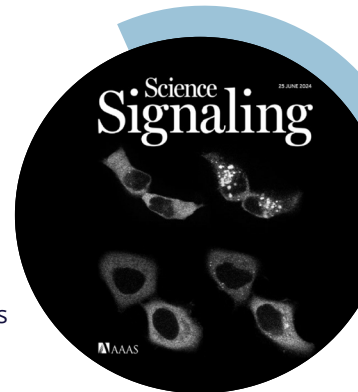
HUN-REN Biological Research Centre, Szeged

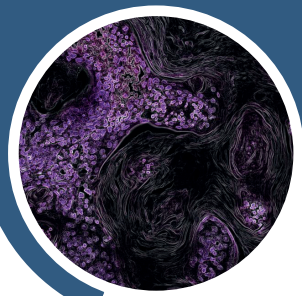
As part of an international collaboration, HUN-REN researchers have created a detailed map showing the global spread of a dangerous hospital bacterium. This “superbug map” enables the design of tailored virus cocktails to neutralise infections quickly, offering a precision weapon in the fight against antibiotic-resistant bacteria.

Targeted Drug Discovery Breakthrough

HUN-REN Research Centre for Natural Sciences

A breakthrough discovery paves the way for more effective drugs with fewer side effects. Revolutionary signal-transduction selective drugs exhibit significantly fewer side effects compared to less advanced active ingredients. The discovery, made by Hungarian and Japanese researchers, enables the development of more targeted drugs with novel mechanisms and broader potential for application.





Bioinformatics Enhances Immunotherapy Predictions

HUN-REN Institute for Computer Science and Control

By analysing large-scale bioinformatics data, researchers at HUN-REN found that the greater the difference between cancer and healthy cells, the more severe the autoimmune side effects of immunotherapy. These insights could help predict patient reactions and make immunotherapies both safer and more effective.

Novel Protein Therapeutic to Prevent Organ Damage

HUN-REN Research Centre for Natural Sciences – ELTE Faculty of Science

Researchers from ELTE and the HUN-REN Research Centre for Natural Sciences have developed EVO24L, a patented protein therapeutic that protects organs from damage caused by oxygen deprivation during events like transplants, heart attacks, or strokes. The breakthrough compound blocks a key inflammatory trigger, offering a new path toward safer treatments and attracting global pharmaceutical interest through the spin-off company Evolveritas.



New Insights into the Human Hippocampus

HUN-REN Institute of Experimental Medicine

HUN-REN researchers have identified and quantified key inhibitory cell groups and synapses within the human hippocampus, a brain region essential for memory and learning. Their findings lay the groundwork for more accurate brain models and could advance research into neurological and psychiatric disorders such as schizophrenia, epilepsy, and Alzheimer's disease.



Illuminating Drug Targets with Light

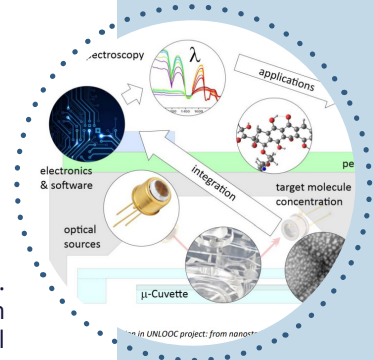
HUN-REN Research Centre for Natural Sciences

A light-driven labelling method developed by HUN-REN researchers precisely maps how drug candidates bind to disease-related proteins. This safe, affordable technology — featured in *Angewandte Chemie* and now being commercialised with Enamine — has the potential to accelerate drug discovery in neurological and cancer-related fields.

Artificial Tissue-Handling Microchips

HUN-REN EK-CER Institute of Engineering Physics and Materials Science

As part of a major European collaboration, Hungarian researchers are developing artificial tissue microchips that replicate human organ functions. These Organ-on-Chip systems offer a powerful alternative to animal testing in early-stage drug evaluation. By integrating advanced sensor technologies, the devices can continuously monitor biological responses to pharmaceutical compounds. The innovation promises safer, faster, and more personalised drug testing — paving the way for next-generation pharmacological research and precision medicine.



New Clarity on 'Brain Fog' in Thyroid Disorders

HUN-REN Biological Research Centre, Szeged

HUN-REN researchers have discovered that standard thyroid hormone therapy (T4) does not alleviate neurological symptoms in some hypothyroid patients because brain regions respond differently to hormone delivery. The findings could lead to more effective, personalised treatments for persistent, brain fog' and related cognitive symptoms.



RNA Mapping Breakthrough

HUN-REN Institute of Experimental Medicine

To determine the full RNA profile of individual neuron types across species, HUN-REN scientists developed a novel method combining fluorescent labelling, laser-capture microdissection, and next-generation sequencing. Applied to reproductive GnRH neurons, the method identified over 13,000 transcripts and revealed 28 genes potentially linked to infertility, offering new insights into brain function and disease.

New AI-Based Metamodelling Boosts Sustainable Agriculture

HUN-REN Centre for Agricultural Research

A new machine learning-based metamodelling approach has been developed to better simulate complex grassland and agricultural ecosystems. By using advanced algorithms like XGBoost, the method overcomes the limitations of traditional ensemble techniques and improves model accuracy under diverse environmental conditions. This innovation could significantly support long-term sustainable agricultural decision-making.



Numerical Models Show Climate Impact on Lake Plankton

HUN-REN Centre for Ecological Research

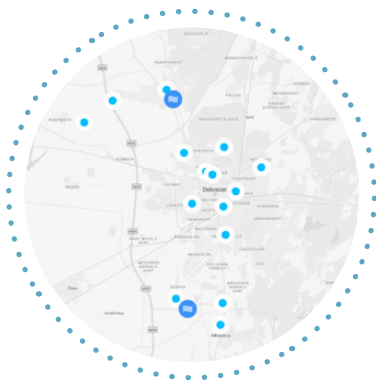
New simulations show that rising temperatures increase the seasonal variability of phytoplankton, potentially destabilising freshwater ecosystems. Using numerical models based on field and experimental data, researchers found that warming amplifies fluctuations in community composition. The findings highlight the importance of integrating ecological modelling with long-term climate and nutrient scenarios to better understand the future of lake ecosystems.



Cutting-Edge Environmental Monitoring Network

HUN-REN Institute for Nuclear Research

Hungary's first nationwide 24/7 automated environmental monitoring network has been launched by HUN-REN researchers in Debrecen. The system tracks changes in air, water, soil, noise, and biodiversity. It generates over 20 million data points per year, enabling researchers to detect environmental changes early and propose timely interventions. The network sets a new standard for integrated, science-driven environmental oversight in Hungary.





Genetic Traces Revolutionise Fish Monitoring

HUN-REN Balaton Limnological Research Institute

Conventional fish monitoring methods often miss rare or elusive species. HUN-REN researchers have introduced an eDNA-based approach that identifies fish through genetic material left in water. The non-invasive method enables faster, more comprehensive biodiversity tracking in freshwater habitats.

New mRNA Vaccine Candidate Targets Swine Threat

HUN-REN Veterinary Research Institute

Mycoplasma hyorhinis causes serious illness in piglets and lacks a commercial vaccine in Europe. HUN-REN researchers have created an mRNA-based vaccine candidate using cutting-edge mRNA technology similar to COVID-19 vaccines, the experimental vaccine represents a promising first step toward effective, antibiotic-free protection in swine health and highlights the potential for advanced biotech solutions in veterinary medicine.





Zero Magnetic Field Laboratory

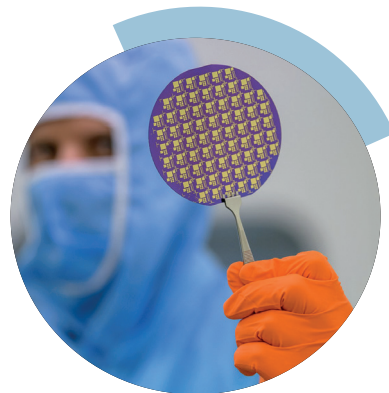
HUN-REN Institute of Earth Physics and Space Science; HUN-REN Wigner Research Centre for Physics

A unique new facility may revolutionise space technology and diagnostics: the Zero Magnetic Field Laboratory developed by two HUN-REN institutes eliminates magnetic field effects. The lab could transform instrument calibration, medical diagnostics, and even astronaut training.

Nano-Powered Protective Sensors

HUN-REN Centre for Energy Research

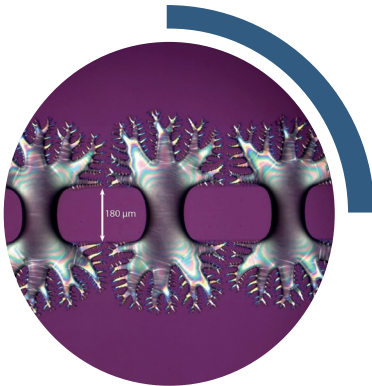
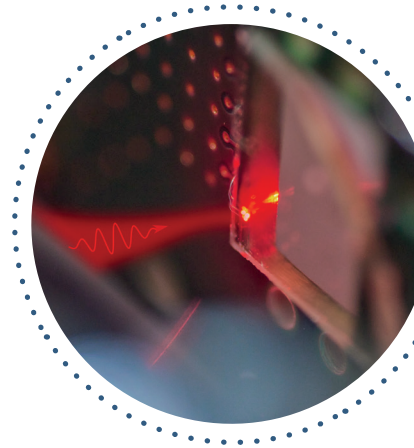
Protecting critical infrastructure and emergency responders often requires fast, mobile detection of invisible threats. Researchers at HUN-REN are developing compact sensors using micro- and nanotechnologies to detect gas leaks, radiation, and mechanical vibrations. These next-generation wearables could become essential tools in high-risk environments.



Ultrafast Currents Driven by Light

HUN-REN Wigner Research Centre for Physics

In a major breakthrough, HUN-REN researchers demonstrated that electric currents in metals can be induced using ultrafast laser pulses, matching the speed of light's oscillating electric field — within a few femtoseconds. Using an ultrathin nanomaterial, the team opened new paths toward ultrahigh-speed logic operations and optical circuits. The breakthrough holds promise for a future generation of computing devices where electrons are moved not by voltage, but by light itself.



New State of Matter Discovery

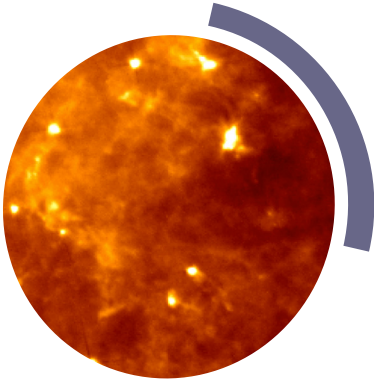
HUN-REN Wigner Research Centre for Physics

HUN-REN researchers discovered a new state of matter where liquid droplets act like active, self-driven particles under an electric field. This unusual behaviour could inspire precision technologies that harness collective motion in soft matter systems.

New Class of Geometric Shapes

HUN-REN-BME Morphodynamics Research Group

The research group discovered a novel, universal class of shapes that tile space seamlessly and without sharp corners. The findings offer profound insights into the geometry of biological tissues and hold potential for innovative architectural designs devoid of sharp corners.



Near-Earth Asteroids Discovery Powered by AI

HUN-REN Research Centre for Astronomy and Earth Sciences

Astronomers at HUN-REN are using a modern telescope with AI-based algorithms to capture digital images and make groundbreaking discoveries, such as detecting near-Earth asteroids. These AI-powered programmes detect asteroids more accurately and quickly than previous classical software.

Stay up to date with the latest scientific breakthroughs and research results from across the HUN-REN network. By scanning this QR code, you can explore news and highlights from our institutes, showcasing impactful discoveries and innovations. Discover how our researchers contribute to solving global challenges and advancing knowledge across disciplines. Visit HUN-REN's homepage and follow the progress of science in action.



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media@hun-ren.hu

