**The Research Centre for Natural Sciences, HAS (MTA TTK) and its research environment**

**Main contact information:**

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The **Research Centre for Natural Sciences, Hungarian Academy of Sciences (RCNS; Hungarian short name: MTA TTK)** is an independent legal entity in the organizational framework of the Hungarian Academy of Sciences (HAS). It was established in 2012 in the frame of the reorganisation of the institutional system of the Hungarian Academy of Sciences and it is merged six former institute of the Academy operating at that time at different locations. Focus areas of research in a transdisciplinary environment provided by RCNS have created optimal conditions for research carried out multidisciplinary research activities in natural sciences, particularly in the fields of health science, enzymology, molecular pharmacology, organic chemistry, cognitive neuroscience and psychology, as well as materials- and environmental chemistry.

The Research Centre for Natural Sciences, HAS has had a great scientific, technical, educational and social mission to fulfil; it is acting as a publicly financed professional research centre in Hungary and on the larger scale in the European Union, too. More than 60% of the employees are researchers, of which approx. 300 have scientific degrees.

RCNS is one of the largest research organizations within the network of Hungarian Academy of Science. The new, state of the art building of the Research Centre which provides internationally acknowledged research environment for all RCNS institutes at the same location has been inaugurated on 15th November 2013.

The aim of the Research Centre is to achieve internationally recognised, significant scientific results; to maintain cooperation with universities and research institutions from Hungary and other countries, as well as with economic and social stakeholders. Our staff is traditionally active in the field of education and scientific training, thus RCNS’ priorities also include taking responsibility for the training of high-level future researchers / scientists.

Core scientific operational departments of the Research Centre includes the [Institute of Enzymology](http://www.ttk.mta.hu/en/intezetek/enzimologiai-intezet/) (director: Laszlo BUDAY), the [Institute of Organic Chemistry](http://www.ttk.mta.hu/en/intezetek/szerves-kemiai-intezet/) (managing director: Tibor SOOS), the [Institute of Materials and Environmental Chemistry](http://www.ttk.mta.hu/en/intezetek/anyag-es-kornyezetkemiai-intezet/) (director: Andras TOMPOS), the [Institute of Cognitive Neuroscience and Psychology](http://www.ttk.mta.hu/en/intezetek/kognitiv-idegtudomanyi-es-pszichologiai-intezet/) (director: Istvan ULBERT), as well as the newly established Core Technologies Centre (head of CTC: Karoly VEKEY) and the Brain Imaging Centre (head of BIC: Zoltan VIDNYANSZKY).

Priority research fields include:

In the field of cellular biology and pharmacology research goals are stretching across multiple fields of science, resulting in interdisciplinary research using the methods of biology, chemistry, physics and informatics at the same time. Structural biological basic research of the institute is directed towards understanding physiological and pathophysiological processes on the scale of molecules and cells. Research topics are continuously extended from structural biology towards system biology to reveal complex biological processes by the utilization of advances in ’omics’ sciences and bioinformatics. Discovery research aims studying the biological background of drug action at molecular level and investigational developments in order to design effective and safe drugs. The research concept is characterized mainly by: discovery of molecular and cellular mechanisms leading to new target-proteins; the invention of novel idea and the disclosure of new indicator molecules in alignment with the overall drug design; clinical trial and diagnosis strategies; the competitive support of the drug discovery process by providing discovery technology platforms, including new experimental models and new imaging methodologies. Research activities in the fields of protein binding as well as metabolism and elimination of drug molecules have been performed for several decades. Another task is the preparation and characterisation of nanosized systems for medical applications.

In the field of organic chemistry RCNS has evolved a highly integrated and focused research portfolio that aim to keep synthetic organic chemistry at the forefront of new and emerging technologies. Currently, the following research activities have been pursued in the area of the synthetic organic chemistry: fragment based drug design and developments, organocatalysis, chemical biology and supramolecular chemistry. Additionally, research involvement in structural chemistry (NMR, MS and X-ray) and theoretical chemistry got additional impetus to foster the progress of organic chemistry research. Because of its current potential, organic chemistry plays and will play a key role in future societal issues like environmental sustainability and health care.

In the research field ofmaterials and environmental chemistry work focuses on functional and structural materials; micro- and nanosized surface layers and solid / liquid interfaces in order to reveal correlations among their chemical composition, structure, properties and methods of preparation. The researchers are involved in research aimed at developing new procedures and methods decreasing environmental impact of technologies. Understanding and interpretation of pollution-induced chemical processes in the atmosphere also belong to the main research topics. Testing fields cover environmental protection analytics, mitigation of harm, waste treatment and corrosion protection. They explore processes important in the development and operation of energy carriers for energy storage and transformation, as well as those involved in the exploitation of renewable energy resources. There is a particular focus is on multidisciplinary research, the vision on future predicts the wide use of applications developed on the basis of fundamental research achievements, which will be used for the benefit of healthcare, car industry, energy production, safety/security and environmental solutions.

The studies on cognitive neuroscience and psychology concentrate on psychology and related topics of cognitive neuroscience. Research activity covers areas of social-, cross-cultural-, cognitive-, developmental, comparative psychology and psychophysiology. Special emphasis is devoted to developing practical applications of basic research achievements. Multidisciplinarity is in the focus via collaboration with other branches of natural and social sciences.

Research related to translational neuroimaging in neuropsychiatric disorders: The RCNS Brain Imaging Centre (BIC) - the first MR centre dedicated for research and development in Hungary - was established in the Research Centre of Natural Sciences of the Hungarian Academy of Sciences in 2014. As a result of the recent infrastructural developments, as of March 2015, all the research infrastructure and expertise that is required for the application and development of the MRI methods at the highest international standards are available in the RCNS BIC. Research and development at RCNS BIC are focused on: (1) Discovery research in cognitive neuroscience, (2) Research on neurodevelopmental disorders, (3) Translational research in neuropsychiatry: research and development of pharmacological MRI biomarkers.

RCNS HAS mission and role in the knowledge triangle - operating as a research institute itself, establishing official collaborations with the most prominent Hungarian higher education actors – such as the Budapest University of Technology and Economics, the Semmelweis University, the Eotvos Lorand University, the Institute of Experimental Medicine of the Hungarian Academy of Sciences and the University of Szeged, and having clear industrial research links and collaborative activities.

Many competitive research projects are hosted by the Research Centre for Natural Sciences of HAS, which is responsible for providing the institutional and implementation framework of all the research groups affiliated to Research Centre (these research groups has been established based on a thorough scientific and administrative review process by the host institute).

The world-class new infrastructure and the co-location of the formerly separately operating institutes provide an excellent knowledge base and incubation environment for multidisciplinary research and educational as well as technologically oriented activities linked to research.

To perform the experiments and analysis, scientists in charge of research projects have laboratory and office spaces of approx. 7600 and 4900 m2, respectively. Available infrastructures at the host institute include but are not limited to the following items: 250 world-class laboratories, 156 chemical hoods, two state of the art NMR equipments, an X-ray diffraction equipment, as well as more than 10 mass spectrometer systems, including a high-performance Q-Trap and a Q-TOF type mass spectrometer. These equipments are available through the infrastructure of the newly established Core Technologies Centre and are compliant with the international standards. Research groups have also access to human resources at the host institute for assisting the management and administrative tasks of the project (such as the Office for Research Funding and Administration with its project management advisory services; the host institution’s financial control services, etc.).

The Research Centre for Natural Sciences HAS gained excessive experience in project management activities, including the administration of several EU Framework Programme projects and other international and national grants. In recent years the Research Centre participated in more than 50 EU-funded and close to 450 projects from national funding (National Research Fund/OTKA, Hungarian Innovation Fund, etc.). Approximately 50% of all research expenditure is covered from these competitive funds.

Since the launch of Horizon2020 EU Framework programme for Research, development and innovation on 11 December 2013, RCNS got involved in the submission of more than 40 proposal, which of those still under evaluation.

In the context of European Research Area scientific activities, another important target of RCNS is the association to ESFRI (European Strategy Forum on Research Infrastructures) activities both at EU and at national level. In this context RCNS has joined several ESFRI initiatives, such as EU-OPENSCREEN /European Infrastructure of Open Screening Platforms for Chemical Biology (since 2013 member of the EU-Openscreen consortium and co-ordination the associated Hungarian national network), ELIXIR/ European Life-Science Infrastructure for Biological Information (member of the initial FP7 consortium), CLARIN/ Common Language Resources and Technology Infrastructure (member of HunCLARIN, the Hungarian national ESFRI network), and finally also linked to EURO-BIOIMAGING (European Research Infrastructure for Imaging Technologies in Biological and Biomedical Sciences) in an active preparatory phase for joint activities.

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