Research Centre for Natural Sciences
Hungarian Academy of Sciences

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WELCOME

Dear Reader,

You are reading the prospectus of the Research Centre for Natural Sciences Hungarian Academy of Sciences.
In virtue of its Deed of Foundation, the Research Centre for Natural Sciences of HAS (MTA TTK) has carried out multidisciplinary research activities in natural sciences, in the fields of enzymology, organic chemistry, molecular pharmacology, cognitive neuroscience and psychology, as well as materials- and environmental chemistry.
Four institutes of the research centre – namely, the Institute of Materials and Environmental Chemistry, the Institute of Enzymology, the Institute of Cognitive Neuroscience and Psychology, and the Institute of Organic Chemistry – have given priority to disciplines that may be interpreted as three independent entities in the dimensions of human, material and environment. The interaction of these systems has defined the disciplines in a wider sense that are associated with scientific mission of the Research Centre for Natural Sciences, Hungarian Academy of Sciences.
In view of the international trends of research in natural sciences, social expectations, the ongoing research trends and achievements made in the institutes of the Research Centre for Natural Sciences, as well as research focused on these areas and conducted in the research network of the Hungarian Academy of Sciences, the Research Centre for Natural Sciences has fulfilled its scientific mission in the fields of research in health science, materials- and environmental science, respectively. It is common features of these focus areas that they may be cultivated by a complex, multidisciplinary approach, only.

György Miklós Keserű
Director-General

ORGANISATION

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Institute of Materials and Environmental Chemistry

The Institute studies 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 institute is 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. The Laboratory of Environmental Chemistry is an accredited laboratory. The accredited testing fields of the laboratory are: environmental protection analytics**,** mitigation of harm, waste treatment, corrosion protection. They explore also 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 sources.

The main research areas of the institute:

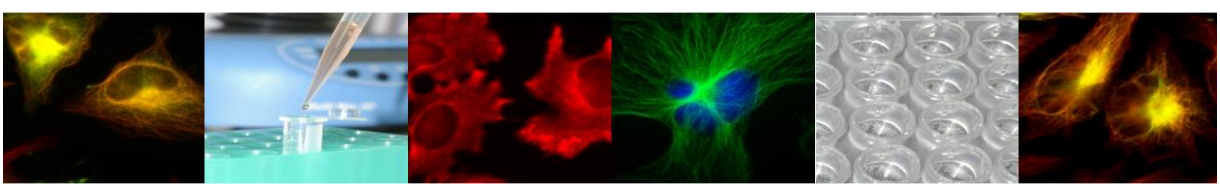
- chemical and interdisciplinary research: materials science and material technology, environmental chemistry.
- structural and chemical characterisation of structural materials
- methods of producing functional materials and possible applications
- renewable energy sources, innovative research on energy storage and recovery processes: development of supercapacitors, developmnet of electrochemical fuel cell anode catalyst
- electrochemical analysis
- surface modifications with plasma chemistry and electrochemical methods, surface chemistry, thin layer design
- production of nanocomposites and bioavailability of composite materials testing citotoxicology
- polymerchemistry, natural and synthetic polymers and their associated systems
- pyrolytic recycling of plastics
- optimal utilization of biomass materials research
- heterogeneous catalysis: development of catalysts, nanoporous silicates
- synthesis of nano- and microparticles, study of microcapsules
- reaction kinetics, dynamics and photochemical research

Institute of Enzymology

The Institute pursues research goals 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 proteomics and bioinformatics.

The main research areas of the institute:

- study of signal transduction in cell
- operation of disordered proteins, structural characterization of their complexes, study of in vivo function of disordered protein chaperones
- study of membrane-proteins
- research of active transport proteins
- study of genome stability and metabolism
- mechanisms of activation of the complement system in molecular structure
- study of processes leading to cancer and neurodegenerative diseases
- study of the role of transmembrane proteins
- enzymes involved in DNA testing
- structural biophysics

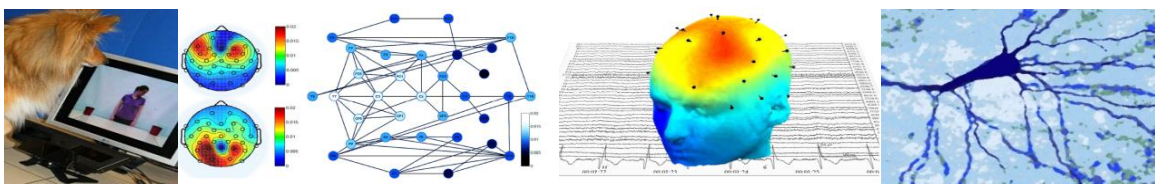


Institute of Cognitive Neuroscience and Psychology

The activity of the Institute concentrates on psychology and related topics of cognitive neuroscience. Research activity covers areas of social-, cross-cultural-, cognitive-, developmental, and comparative psychology and psychophysiology. Much effort is devoted to developing practical applications of basic research achievements. The institute emphasizes collaboration with other branches of natural and social sciences.

The main research areas of the institute:

- sensory memory research in vision and in hearing
- speech understanding research
- acoustic and visual word processing neurocognitive testing
- the role of prosody in understanding and its neural mechanisms
- specific environmental conditions of perception and communication psychology and narrative analysis of psychophysiological methods
- working memory processes in the brain mechanisms of network-based analysis
- in vitro and in vivo analysis of epileptic brain function
- development of the measurement potential area
- in vitro electrophysiological analysis of synchronous population activity in rat and human hippocampus
- the age-related cognitive changes, compensation options and tracking these processes by psychophysiological methods
- parent-child communication and early emotion recognition study, the evolutionary ethology, comparative studies of the basic phenomena of social behavior
- the regular and irregular competition and their social consequences
- narrative and psychological analysis related to the communication of national identity, study of the history of psychoanalysis



Institute of Organic Chemistry

Activities of the institute involve the synthesis of organic molecules, structure elucidation and theoretical investigation. The synthetic activity mostly aims at the preparation of heterocyclic compounds, carbohydrates, and polymers as well as the elaboration of novel methodologies (e.g. organocatalysis, supramolecular synthesis). Investigations by NMR spectroscopy, mass spectrometry and single crystal diffractometry provide substantial approach to the determination of chemical structure. Furthermore, theoretical investigations are carried out in order to rationalize structures and reaction mechanisms.

The main research areas of the institute:

- praparative organic chemistry
- heterocyclic chemistry
- organo catalysis
- supramolecular chemistry
- mass-spectrometry research
- theoretical chemistry