HUNGARIAN ACADEMY OF SCIENCES

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RESEARCH INSTITUTIONS AND THEIR ACTIVITIES

2005

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INSTITUTES FOR SOCIAL SCIENCES AND HUMANITIES

ABBREVIATIONS

Scientific degress:

Ph.D. = Doctor of Philosophy
C.Sc. = Candidate of Sciences
D.Sc. = Doctor of Sciences
C.M. = Corresponding Member of the H. A. S.
O.M. = Ordinary Member of the H. A. S.

PREFACE

"Science is organised knowledge". From among all plausible definitions this statement is the most to-the-point.

Almost two centuries ago, the Hungarian Academy of Sciences was established by the nation in order to cultivate the Hungarian language and to serve science and scholarship. It is a just demand of society that the freedom of this time-honoured national institution of Hungarian science and scholarship be endorsed and enlarged, and the democracy of its internal life strengthened, by legislation without, however, interfering with the autonomy of other institutions cultivating and representing science.

The Act on the Academy of Sciences of 1994 describes it as a self-governing public body that operates as a legal entity in order to perform public duties for science. The main responsibilities of the Academy are to support the cultivation of the sciences, scientific research, and the publication of scientific books and journals; ensure that all society's democratic principles are observed in each and every field of science; evaluate scientific research results regularly, and encourage and assist the publication, dissemination, and utilisation thereof; represent Hungarian science in Hungarian public life and in international scientific bodies; maintain relations and finalise agreements with scientific institutions and organisations of other countries.

The Academy establishes and maintains 47 research institutes, as well as supporting 171 special research groups affiliated mainly with universities. It is the mission of the Academy to expand and enrich the knowledge amassed in the public body and its institutions in order to advance and promote the progress, growth and rise of the nation.

Over and above this, it is our mission of equal importance to ensure that we maintain the state-of-the-art quality of our scientific research in an age of rapid changes.

The present volume would like to provide the reader with useful information on the activities of the research network of the Academy.

Budapest, 1st September 2005

Attila Meskó
Secretary General

Count István Széchenyi (1791–1860) founder of the Academy in 1825

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INSTITUTES FOR NATURAL SCIENCES

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Scope of activities

The mandate of the Institute is to investigate viral, bacterial and parasitic diseases of farm animals and fishes by using both classical and state-of-art molecular biological approaches. The overwhelming part of the work is basic research. In particular, molecular and genetic aspects are increasingly emphasized. However, the duties of the Institute also include the improvement of diagnostic and vaccination methods, and participation in different forms of graduate and postgraduate training, promotion of international collaborations, informing the public about scientific achievements, and assisting in the technological transfer of research results for application purposes. At present, the Institute, as an internationally acknowledged site of basic research, continues to consolidate its position as a national resource of new knowledge applicable in prevention of infectious animal diseases.

The main building of the Institute

Research aims and topics

Most of the research is concentrated on studying the genetic material and proteins of various pathogens. Among the viruses, primarily adeno-, herpes-, paramyxo-, and certain avian tumor inducing viruses are investigated. Among the bacteria, members of *Escherichia, Pasteurella, Salmonella, Bordetella* as well as *Mycoplasma* genera are studied to gain information especially about viru-

lence characteristics. An important direction of the research is the elaboration of modern diagnostic methods based on the detection of nucleic acids or proteins of different infective agents. It is also important to study the relationship between virulence and antigenic composition of the pathogenic organisms. Basic research activities on fish parasites are related to the etiology of diseases and to the biology of myxosporean species. Environmental health aspects of certain infections are also investigated. A brief overview is given below about the research activity in the three main areas.

Virology projects

- Molecular epizootiology and genetic engineering of Newcastle disease virus for the elaboration of better vaccines.
- The genome analysis of fish, reptilian, avian, and mammalian (cattle, monkey, squirrel) adenoviruses to study adenoviral evolution, to produce diagnostics, vaccines and gene delivery vectors.
- DNA based (PCR) detection of the pathogens of tick-born diseases.
- The study of the proteins of chicken anaemia virus expressed in bacterial vectors.

Bacteriology projects

- The pathology of *Mycoplasma bovis*; improvement of diagnosis; the mycoplasma infection of birds; elaboration of vaccines against mycoplasma.
- The interaction of different bacteria and viruses in the pathology of atrophic rhinitis; study of the nose deformations in pigs with computer tomography.
- Enteric bacteriology, foodborn zoonoses (salmonellosis, colibacillosis): the genetic basis of growth and colonization inhibition in *Salmonella*; gene transfer in the development of *Escherichia coli* pathotypes; *E. coli* toxic and adhesion virulence and antibiotic resistance genes.

Fish parasitology projects

- The development cycle, host specificity and infection pathomechanism of fish parasitic myxosporeans; phylogenetic studies.
- Correlation between migration ability and *Anguillicola* infection in eel.
- Survey on parasitic infections and diseases of fishes in Lake Balaton and Small Balaton water-reservoir.

Postgradual and gradual training

There are generally about 12 PhD students supervised by scientists of the Institute on the subject of molecular virology, bacteriology and fish parasitology. Lectures on veterinary microbiology, molecular evolution, bioinformatics and fish diseases are regularly given at the Szent István University, Faculty of Veterinary Sciences, Budapest. Numerous veterinary, zoology and biology students make their diploma work in the Institute.

BALATON LIMNOLOGICAL RESEARCH INSTITUTE

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Scope of activities

The Institute was opened in 1927 and since 1951 it had belonged to the Hungarian Academy of Sciences. The Institute has two departments. The Department of Hydrobiology is involved in the ecological research of Lake Balaton, the largest lake in Central Europe. Due to the activities of the institute Balaton became one of the most intensively studied lake of the world and has had an ecologically sound water quality protection program. The Department of Experimental Zoology concentrates on the cellular bases of neuronal regulation in invertebrates, combining neuroanatomical, neurochemical and eletrophysiological techniques, but it also deals with the physiological effects of organic polluatants and their effect on neuronal regulation.

Partial view of the institute

Research aims and topics

The two Departments of Hydrobiology (Aquatic Botany, Aquatic Zoology) aim to determine the role of different factors in lake eutrophication and the optimal strategy of the reversal of this process, to monitor the biological diversity of the lake, to clarify interactions in aquatic ecosystems, and to make proposals for the conservation of biodiversity.

The main topics of hydrobiological research are the following:

- Phosphorus metabolism of the lake
- Ammonia, nitrate and urea uptake by phytoplankton
- Characteristics and ecological effects of dissolved humic substances
- Seasonal and long-term changes in phytoplankton
- Distribution and photosynthesis of cyanobacterial picoplankton
- Factors influence on growth and toxicity of filamentous blue-green algae
- Zoology of the tributaries
- Composition and quantity of the littoral macrobenthos
- The littoral food chain
- Production and respiration of planktonic, epiphytic and epilithic crustaceans
- Population dynamics and early development of fishes
- Biomanipulation by fishes

The Department of Experimental Zoology aims to study the comparative neurobiology of signal molecules and their receptors in the central and peripheral nervous systems of model invertebrates, the physiological and membrane effects of antoropogenic pollutants and blue-green algae toxins on aquatic animals, and to monitor the toxic pollution of living organisms of Lake Balaton and its catchment area.

The main topics of the department are the following:
- Colocalization and cotransmission of signal molecules
- Neurochemical characterization of signal molecules and their receptors
- Effect of neuropeptides on membrane currents and ionic channels
- Synaptogenesis and embryogenesis of the chemical specificity of neurons
- Molecular neurobiology of secondary messengers
- Neurobiological effects of algal toxins on the transmitter and receptor systems of aquatic organisms
- Effects of organic pollutants on the neuronal regulation of aquatic organisms

The research vessel "Balaton"

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The main building and the Medical Gene Technology Division of the Institute

Scope of activities

The Institute was established in 1952 as a member of the research institute network of the Hungarian Academy of Sciences and it is currently the only institution in Hungary dedicated exclusively to basic medical research. Over the last decade the Institute has evolved into a premier neuroscience center with a focus on understanding neurotransmission, learning and memory, anxiety and depression, epilepsy, and neural control of the endocrine and immune systems. Institute scientists have adopted a farsighted basic strategy of using multidisciplinary approach-

es that combine the best of traditional methods with cutting-edge technologies. They are now especially well known for developing and applying state of the art cellular and molecular neuroanatomical-neurophysiological and neuropharmacological methods of analysis.

The Institute occupies about 9,000 square meters of laboratory space with a staff of about 150, including 60 researchers. The Medical Gene Technology Division is an important recent addition that includes vivarium facilities for 20,000 mice and 3,000 rats. Institute research and educational activity is facilitated by a group of about 30 Ph. D. students, 60 undergraduates, half a dozen visiting scientists, and a similar number of visits to foreign laboratories by Institute students and scientists. Three Institute scientists are members of the Hungarian Academy of Sciences, and four high impact international journals have their chief editor's or section editor's offices in the Institute.

The Institute is focused on a range of topics at the gene, molecular, cellular, systems, and behavioral levels with foci in pharmacology, endocrinology, cellular and network neurobiology, development, and behavioral neurobiology.

The Institute collaborates with over 100 labs in 18 countries.

The Institute has trained 43 PhD students and provides research opportunities for over a dozen young scientists (equivalent of postdocs).

The reputation of the Institute is reflected by the fact that in 2000, the European Commission ranked the Institute second in a broad competition for the "Center of Excellence" title that involved over 200 applications.

Functional neuroanatomical studies

- Anatomical, physiological and pharmacological studies of cannabinoid receptor mediated retrograde signaling in the central nervous system.
- Quantitative voltage gated ion channel localization, synaptic physiology of short-term plasticity.
- Changes of neuronal circuits in animal models of epilepsy and in the temporal lobe of human epileptic patents.
- Combined anatomical and physiological analyses of rhythmic electrical activity in the septohippocampal and thalamocortical systems.

Pharmacological studies

- Synaptic and non-synaptic communication between neurons.
- Features of neurotransmitter release under physiological and pathological conditions.
- Receptor mediated pre- and postsynaptic modulation of neurotransmitter relase.
- The role of purinergic receptors in signal transmission using transgenic mice.
- Ischemia-induced neurochemical and pyhsiological changes in live brain slices.

- Imaging reactive oxygen species during experimental ischemia in the central nervous system.
- Regulatory function of neurotransmitter uptake systems.
- Imaging intracellular Ca_2+ in individul nerve cells.
- The role of adenosine in the neuroimmune interactions.
- Bidirectional connection of noradrenergic transmission and cytokine production.
- Drugs of abuse in the rat olfactory system: the role of reward mechanisms in sensory coding.
- Modulatory functions of nicotinic receptors in the dendrites and spines of hippocampal neurons.
- Dendritic scaling of local regerative activity and its modulation by alpha-adrenergic receptors.
- Antidepressant actions on the function of ionotropic glutamate receptors: the mechanisms of interaction.
- The interplay between uptake carriers and ionotropic receptors.
- Multidisciplinar studies toward the development of fast and space-unlimited 3-dimensional scanning technologies: understanding of network activity during drug effects.

Endocrine neurobiological studies

- Physiology and hypothalamic regulation of metabolism, stress and reproduction.
- Chemical identity, plasticity and synaptology of hypophysiotrophic neurons and their neuronal afferents.
- Modulation of gene expression in hypothalamic neuroendocrine centers by steroids, thyroid hormones, neurotransmitters, neuropeptides and cytokines.
- Molecular mechanisms of thyroid hormone, glucocorticoid and estrogen actions in the brain.
- The translational and post-translational processes of type II denominate (D2) and the molecular regulation of T3 generation in the brain.
- The pathomechanism of non-thyroidal illness syndrome, neurodegeneration and neuroprotection.
- Regulation of neuroendocrine centers of the human brain.
- Development of novel drugs for neuroprotection and treating mental disorders.

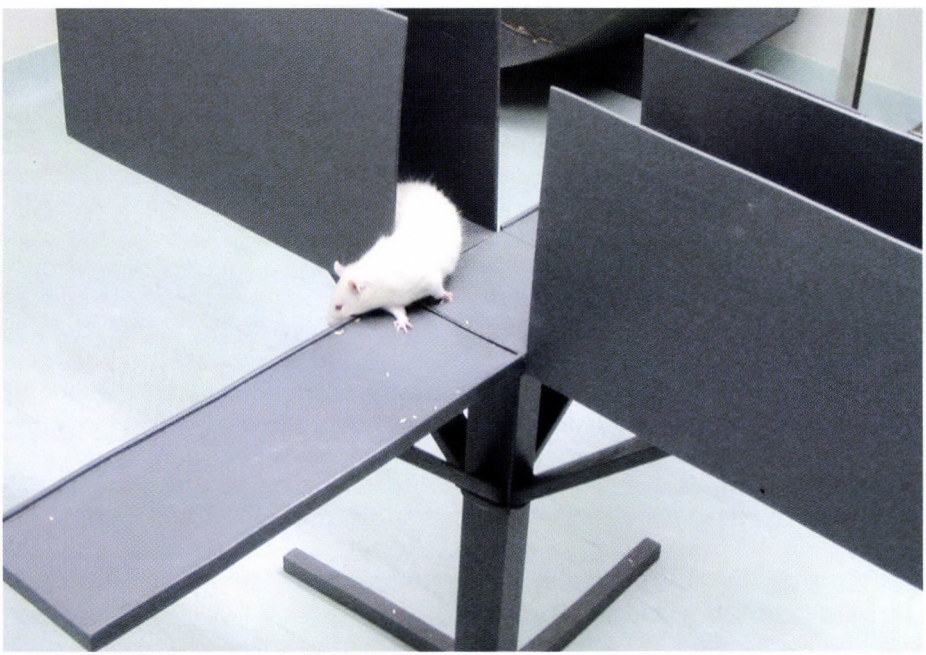
Gene technological and developmental neurobiological studies

- Uncovering the common and distinct molecular and genetic bases of the multi-functional GABA signaling system by studying its molecular components, primarily the GABA-synthetic enzymes: their expression, regulation of their genes and the mode of their action in adult and developing brain and also in different embryonic tissues.
- Investigating the role of the cell adhesion molecule N-cadherin in developmental processes of the nervous system including neuronal path finding, formation of synaptic connections and in neuronal plasticity.

- Developing and utilizing transgenic approaches to genetically modify well defined neuronal cell types and circuits and signaling pathways in mice in order to better understand their role in brain function, development and disease.
- Studies on the *in vitro* neurogenesis using immortalized neuronal progenitor cells derived from embryonic mouse brains.
- Selection and characterization of implantable neuronal stem cell populations and studies on the *in vivo* neuron production after implantation of neuronal progenitor cells into different regions of adult mouse brains.

Behavioral neurobiological studies

- The study of the interactions between glucocorticoid production and aggressive behavior, with special emphasis on hypoarousal-driven abnormal aggression.
- Investigations regarding the behavioral, endocrine and autonomic effects of traumatic stress exposure. Building of a new model.
- Studies on the involvement of cannabinoid neurotransmission in anxiety and schizophrenia, with an emphasis on stress-induced changes.
- Investigations on the role of vasopressin in acute and chronic stress. Comparison of psychogenic stressors and disease models.



Elevated plus-maze, test used in anxiety research

AGRICULTURAL RESEARCH INSTITUTE

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The Brunszvik mansion, rebuilt in Neo-Gothic style between 1872 and 1875, is now the headquartesrs of the research institute

Institute profile

The profile of the Agricultural Research Institute of the Hungarian Academy of Sciences covers an integrated spectrum of complex research ranging from basic and methodological problems to applied research, including practical applications. The fundamental goal is to develop new generic plant genotypes to satisfy the needs of the future, based on the internationally acknowledged plant gene pool accumulated over the last half century in Martonvásár and using up-to-date genetic, physiological, cell and reproduction biological, func-

tional genomic, biotechnological, plant breeding and crop production methods. A new scientific department was set up in 2005 to support, expand and intensify the genomic research already underway in the institute. It is responsible for carrying out the genomic research required for the improvement of plant breeding methods, for providing the genomic background for molecular breeding, and for the development of new genomic products. The investigations in the institute also cover production technologies and crop environments, the maintenance of the agroecological equilibrium, the preservation and improvement of genetic variability, the production of raw materials for healthy nutrition, durable plant stress resistance, and an improvement in seed safety, all aimed at satisfying the criteria of sustainable development. This state-run institute contributes to research on the genotype × environment × society interaction and to the stability of this interaction. In addition to this complex research programme, institute staff play an active part in undergraduate and postgraduate education, in scientific cooperation with Hungarian and foreign institutions and in the practical introduction of scientific results and technical knowledge. A new stage in the development of the Martonvásár innovation chain came in 2004, when the Hungarian Academy of Sciences became the majority owner of the Martonseed Company.

Research aims and topics

1. Plant genetics research

- Use of functional genomic methods in studies on the expression of genes influencing the regulation of abiotic stress adaptation in cereals, aimed at gene isolation and gene mapping.
- Gene expression studies. Investigations into programmed cell death and its correlation with stress adaptation.
- Demonstration of DNA sequences occurring in the wheat genome in small numbers of copies by means of fibre FISH and PCR *in situ* methods.
- Mapping and fine mapping of the QTLs of properties responsible for early spring adaptability in cereal species.

2. Plant cell and reproduction biology research

- Molecular cell biology studies on *in planta* and *in vitro* fertilisation and early embryo development in cereals using the functional genomic approach.
- Investigations on the mechanism of egg-cell activation; development of plant clones from egg-cells.
- Studies on the role and symptoms of programmed cell death during the formation and maturation of the male and female gametophytes and during the sexual processes and microspore embryogenesis of plants.

- Investigations into the molecular regulation of *in vitro* androgenesis using various ultrastructural and immunocytochemical methods.
- Development of dihaploid plants of microspore origin for breeding purposes.
- Micromanipulation of wheat egg-cells.

3. Plant physiology research

- Investigation of physiological and biochemical processes involved in the abiotic stress adaptation of cereals, and studies on how defence mechanisms develop.
- Studies on interactions between heavy metal (Al, Cd, Zn, Hg) tolerance and phytochelatin synthase activity in crops.
- Analysis of the flowering biology and physiological effects of UV-B radiation in maize.

4. Cereal gene bank research

- Collection, preservation and maintenance of the genetic pool of maize. Morphological description and agronomic testing of the sources, varieties, populations, synthetics and lines collected and studies on how they are related to each other.
- Broadening the collection of wheat and related species. Determination of the diversity available for major morphological and agronomic traits and of how these are inherited.
- Incorporation into cultivated wheat of gene complexes responsible for agronomically useful properties from related species in order to create new basic breeding stock (prebreeding).

5. Molecular breeding research

- Molecular marker-assisted selection for the incorporation of new genes ensuring biotic stress resistance.
- Association studies on cereal species to determine the allele frequency of genes influencing adaptation.
- Studies on how plant transformation systems can be used in cereal breeding.
- Incorporation of certain storage protein genes from the wheat variety Bánkúti 1201 into modern genotypes using marker-assisted selection.

6. Research on cereal chemistry and quality

- Research on the storage protein composition of old Hungarian wheat varieties; determination and isolation of new and mutant genes.
- Biochemical, technological and molecular genetic studies on factors determining the endosperm structure of wheat grains.
- Improvements in the yellow pigment content of durum wheat.
- Increase in the efficiency of whole plant utilisation in feeding by improving the chemical quality and digestibility of maize.

- Breeding of maize hybrids for various end-uses (sweetcorn, cornflakes, waxy).

7. Plant stress resistance research

- Studies on the host plant – pathogen relationship, the genetic background of resistance and the efficiency of resistance genes. Incorporation of new, effective resistance genes into genotypes with good agronomic properties.
- Development of basic maize breeding stock resistant or tolerant to abiotic and biotic stress factors. Research on the chilling tolerance of maize.
- Research into genotypes resistant to the toxin-producing *Fusarium* spp. prevalent in Hungary in order to improve production and food safety.
- Utilisation of haploid cultures and *in vitro* cell selection for the development of cereals tolerant of heavy metal and oxidative stress.

8. Maize breeding research

- Increase in the frequency of dominant genes responsible for favourable agronomic properties in source populations using recurrent selection methods.
- Use of exotic gene sources to select inbred lines with excellent specific combining ability.
- Improvement in the harvest index and grain filling period and rate of maize without a change in the length of the vegetation period by increasing the durability of the leaf area.
- Development of maize genotypes tolerant of environment-friendly herbicides effective in microquantities by incorporating resistance genes.
- Breeding of silage and grain maize hybrids competitive on Hungarian and export markets.
- Development of maize hybrids which can be grown using cost-saving, environment-friendly technologies and which use ecological sources efficiently.

9. Cereal breeding research

- Breeding of winter wheat varieties with excellent milling and breadmaking quality and which can be successfully grown under agroecological conditions similar to those in the Carpathian Basin.
- Breeding of winter-hardy, high quality winter durum wheat varieties which can be marketed both in Hungary and abroad and provide satisfactory raw material for pasta-making.
- Breeding of spring and winter oat genotypes suitable for human consumption and animal feeding.
- Research on triticale and barley genotypes for various end-uses.

10. Crop production research

- Use of growth analysis, ecophysiological studies and stability analysis in long-term experiments to achieve the sustainable devel-

opment of maize and wheat production.
- Use of growth models for yield prediction and to investigate the spatial variability and time processes of yield formation.
- Research on the agronomic responses of maize hybrids and wheat varieties at the plant stand, individual plant and plant organ levels.
- Site-specific measurement and regulation of major yield-determining factors in field crop production experiments.
- Analysis of phosphorus effects and after-effects in long-term fertilisation experiments set up on chernozem soil with forest residues.
- Improvement in the efficiency of N fertilisation by analysing the N utilisation of maize hybrids and wheat varieties.

11. Agroecological research

- Research into hulled diploid and tetraploid wheat suitable for organic farming.
- Studies on the effect of the most important components of global climate changes on the yield components, abiotic and biotic resistance and chemical quality of cultivated plants.
- Investigations into the potential environmental effects of genetically modified plants.
- Testing and selection of cereal varieties and genotypes with durable resistance, making them suitable for organic farming.

One of the largest phytotrons in Europe allows plants to be grown under controlled conditions

PLANT PROTECTION INSTITUTE

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The view of the Institute

Scope of activities

The Institute is the research centre for plant protection and it is involved mainly in basic research in the fields of plant pathology, entomology, ecotoxicology, pesticide chemistry, herbology and disease resistance of crop plants. In addition to the basic research, most of the individual scientists are involved in postgraduate training, applied research as well as in innovation.

Research aims and topics

The aim of plant protection research is to reduce the crop yield losses by

modern management of diseases, insects and weeds, which are harmful in the field. An additional aim is to help environmental protection by creating environmentally safe and sound methods of plant protection. In fact, the final aim of our activities is to understand the biological basis of environment-friendly pest management. Accordingly, research is carried out in order to understand the biology of plant disease agents, insects and weeds, the physiology of diseased crops, the mechanisms of disease and insect resistance, problems of ecotoxicology as well as resistance of pests to pesticides. Research also covers the genetic manipulation of crop plants to create resistant cultivars, reduction of pesticide use in agriculture, the development of selective pesticides and seeking for alternative methods of pest management which are environmentally safe and sound.

Plant Pathology

- Molecular aspects of interspecific interactions in the genus Phytophthora.
- Molecular taxonomy of Fusarium genus, Fusarium toxins.
- Interactions of antagonistic microorganisms as potential biocontrol agents.
- Mycological, pathological and ecological aspects of forest decline.

Physiological and Molecular Aspects of Plant Disease

- Host-pathogen relationships in bacterial diseases. Early induced general resistance to bacterial pathogens.
- Characterisation of viruses infecting crop plants. Physiology of virus infected plants.
- Wheat rust resistance.
- Role of oxygen free radicals in necrotic disease symptoms and the action of antioxidants in disease resistance.
- Biochemical immunisation of cultivated plants.
- Study of biotransformation steps of the formaldehyde cycle with special reference to the stress syndrome.

Biotechnology

- Phytoplasma detection and identification by DNA-based techniques.
- Construction of micro-organisms for biological control of plant diseases.
- Use of genetic transformation to introduce resistance into plants.

Insect Pest and Insect Physiology

- Influence of biotic ecological factors on environmentally safe plant protection methods.
- Study of the spread of population dynamics of insects with respect to climatic changes.
- Pheromone biology of agricultural pests previously unapproachable because of methodological problems.
- Hormonal mechanisms controlling development and reproduction of insects.

Insect Ecology

- Research of the functioning and food web structure of agroecosystems.
- Analyses of the data from long term monitoring networks.
- Development of biological control techniques.
- Establishment of taxonomical and faunistical databases.
- Conservation biological studies in natural parks and nature reserve areas.
- Behavioural ecological and autecological studies.
- Life history and reproductive biology of predatory arthropods.

Ecotoxicology and environmental anaysis

- Monitoring of the effects of pesticides on the environment and non-target organisms.
- Testing the side effect of pesticides on beneficial organisms.
- Development of immunodetection systems for environmental monitoring.

Chemical Aspects of Pest Control

- Development of new selective anti-insect agents.
- Design and synthesis of selective antifungal agents.
- Design and synthesis low-dose herbicides and herbicide safeners.
- Natural compounds as potential pest and disease control agents.

RESEARCH INSTITUTE FOR SOIL SCIENCE AND AGRICULTURAL CHEMISTRY

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View of the main building of the research institute

Scope of Activity

RISSAC is the scientific centre in Hungary for soil science, agrochemistry and soil biology. The Institute is responsible primarily for fundamental research in these fields with significant applied research, education, advisory and information activities, and extensive national and international cooperation. RISSAC is the coordination centre of numerous national and international programmes. The institute was established in 1949.

Research Objectives and Topics

Soils represent a considerable part of the natural resources of Hungary. Consequently, their rational utilization, conservation and the maintenance of their multipurpose functionality have particular signifi-

cance both for the national economy and environment protection.
The efficiency of soil functions (conditionally renewable natural resource; media for biomass production; primary nutrient resource of the biosphere; storage of heat, water, plant nutrients and pollutants; natural filter; high capacity buffer media; gene reservoir) is determined by the integrated impacts of soil properties, which are the result of soil processes. The main task of sustainable land use and rational soil management is the control of soil processes: mass and energy regimes, abiotic and biotic transport and transformation and their interactions.

The elaboration of the scientific basis for these actions is the main task of the Institute:

1. Qualitative and quantitative characterization of soil resources.
2. Quantification and prediction of soil processes for their efficient control.
3. Development of scientifically based, rational plant nutrition.
4. Prevention and reduction of soil pollution and its unfavorable environmental consequences.
5. Analysis of the role of micronutrients in soil processes.

Soil Science

1. Quantitative characterization of spatial (vertical and horizontal) and temporal variabilities of soil properties (soil mapping, soil monitoring) with the application of up-to-date GIS facilities (in the recently established GIS Laboratory), geostatistical analyses and remote sensing.
2. Identification of various soil function and their multidisciplinary evaluation from the viewpoints of sustainable biomass production, land use and environment protection.
3. Description, quantification and modeling of the mass and energy regimes of soil, their determining and influencing factors and mechanisms for an efficient prediction and control

Agrochemistry

1. Determination and quantification of the spatial and time variabilities of the various forms of plant nutrients in soils; status and dynamics of plant nutrients in the soil - plant roots micro-environment; the up-to-date evaluation and characterization of the "plant nutrient supply" function of soils and possibilities of its regulation.
2. Determination of the nutrient uptake and fertilizer response of the main cultivated crops and - on this basis - the development of the modern environmentally and economically sustainable plant nutrition system and advisory service based on soil tests, plant analyses, precision techniques and long-term field experiments.
3. Prevention and reduction of soil pollution and its unfavorable agricultural and environmental consequences.

Soil Biology and Biochemistry

1. Development of standard and applicable techniques by using appropriate soil microorganisms or processes as possible bioindicators of the soil functioning and the soil degradation.

2. Monitoring ecological status of soils at various natural, industrial and agro-ecosystems.

3. Study of the interrelations between the microorganisms and higher plants, agricultural crops at various biotic and abiotic environmental conditions by using rhizotechnological tools for soil protection.

4. Development of bioremediation technologies for rehabilitation of contaminated areas.

INSTITUTE OF ECOLOGY AND BOTANY

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The former manor house of Count Vigyázó in the middle of the richest botanic garden of Hungary is the central building of the institute of Ecology and Botany

Scope of activities

Basic and applied research in the field of ecology, botany and hydrobiology. Research is carried out in the following topics:

- Organisation and dynamics of biocoenoses;
- Biodiversity patterns at various scales;
- Hydrobiology of running and standing waters and wetlands;
- Ecological effects of climate- and land use changes;
- Conservation biology and restoration ecology;
- Exploring and utilising new plant resources;
- Investigation and analysis of natural vegetation in Hungary;

- As a special task, the maintenance and development of the collections of the Botanical Garden.

Governmental funding ensures the functioning of the Institute and the Botanical Garden, but does not cover the expenses of research itself. It covers the salaries of the permanent researcher staff, and partly the purchase of laboratory devices and the infrastructure of the Institute. It also support the development of databases of the Botanical Garden.

Major national and international research projects coordinated by the Institute

ILTER

The International Long Term Ecological Research Network (ILTER) consists of research sites and scientists, dedicated to multi- and interdisciplinary long-term and large spatial scale ecological research and monitoring. The development of the Hungarian LTER Network started in 1994 with the initiative and coordination of the IEB. Now it consists of three sites /Sikfőkut, Kiskun and Lake Balaton/ representing the characteristic biomes of the country and meeting the minimum site standards of ILTER. The Institute directly manages the Kiskun LTER site allocated in the Danube-Tisza interfluve region, where the central ecological problem is the impact of global environmental changes on the biocoenoses. The Hungarian LTER Network became partner of the ALTER-Net Network of Excellence (EU Framework Programme 6) with the leadership of the IEB.

META

Mapping the present vegetation of Hungary is a long debt of Hungarian botany. Only the National Research Grant (NKFP) in 2001 made it possible for the IEB to launch this huge task. The mapping project will be accomplished by the end of 2005 with the help of 250 Hungarian botanists who will spend altogether 7000 days in the field. The GIS-based vegetation map is Europe's largest vegetation database. This data source will facilitate the development of Hungarian landscape ecology and predictive modelling, will help nature conservation practices, and enrich the knowledge-base of environmental education.

Hungarian Forest Reserve Program

The Institute is responsible for scientific co-ordination of the Hungarian Forest Reserve Program of the Ministry of Environment and Water. Within the Program, 63 forest reserve sites were legally designated to preserve old-growth and semi-natural forests and also to ensure long-term research of natural forest ecosystems. The strictly protected core area (3600 ha) is left to natural development without silvicultural management; the protected buffer zone (9500 ha) is designated for experimentation. Our most important research partners are University of West Hungary, Eötvös

Loránd University, University of Pécs, "Vásárhelyi István" Nature Conservation Group, Directorates of the National Parks, and the Forest Research Institute. These studies play a principal role in understanding natural processes, conserving biological diversity, and developing the methods of sustainable and close-to-nature forest management.

The research activity of the Hungarian Danube Research Station Department

Hydrobiology of running waters

Research is based on the experiences gained during the long-term survey of the previous decades: basic patterns of the river biota; material cycling of the different river sections; impact of environmental factors (natural or human induced hydrological regime) and the structure of the biotic community. A long-term task of the Station is the hydrobiological monitoring of the Szigetköz area. The latest studies of water and sediment chemistry, fito- and zooplankton, macrophytes, macroinvertebrates, fish populations and amphibians are all closely related to the functional aspects of biodiversity, river fragmentation, functioning of the river system and adjacent wetlands.

Hydrobiology of standing waters and wetlands

Most of the research of standing waters and wetlands is carried out

The most spectacular point of the Danube: the Danube-Bend

at the Fertő-Hanság region. The investigations of the structure and function of communities and on the effects of environmental factors focus on two major habitat types of Lake Fertő: the open water surfaces and the reed belt. The hydrobiological monitoring of small lakes and constructed wetlands in the Hanság area serves mainly the reconstruction goals of nature conservation.

The Hungarian Danube Research Station takes part in the implementation of the EU Water Framework Directive, mainly in the elaboration of methodology for biomonitoring and the problem of reference sites.

The collections of the Botanical Garden Department

The Department maintains the richest living plant collection in Hungary, having more than 12000 taxa ordered to the following collections:
- Systematic collection
- Tropical collection
- Dendrological collection
- Collections of rock garden and bulbiferous plants
- "Plants of the Bible" special collection

The research activity of the Department of Plant Ecology

Organisation and dynamics of biocoenoses

The studies aim to establish the theoretical background of effective nature conservation. Researches focus on the stability and vulnerability of food chains and the relationship between fine-scale pattern and process of vegetation

Taxonomic studies

Taxonomic and phylogenetic studies by traditional and molecular methods contribute to the assessment of biodiversity. Specialists on lichens and tropical *Rubiaceae* species carry out these investigations.

Ecological effects of climate- and land use changes

These studies - focusing on the Kiskunság region - are performed mostly in international collaboration. They include subsequent phytosociological surveys, vegetation and biomass mapping, monitoring of invasive species, climate simulation field experiments, which aim at monitoring and explaining the changes in ecosystem structures and functions to support sustainable management and land use.

Conservation biology and restoration ecology

Due to the structural changes of agriculture, large areas are abandoned. Restoration ecology can help the development of seminatural vegetation in these fields. Beyond increasing biodiversity, the developed management practices (mowing and seed sowing) decrease the cover of alien weeds, including ragweed (Ambrosia artemisiifolia), the

most important allergenic plant species.

Exploring and utilising new plant resources

Plants, especially members of the Lamiaceae family, contain a lot of compounds that are potentially row materials for medicines. Isolation of new compounds and comparison of compound content between cultivated variates are done at the Department, using the experimental field of the Botanic Garden.

Exploration and analysis of natural vegetation in Hungary

In order to increase the scientific knowledge on the Hungarian vegetation heritage we study the landscape historical changes of the vegetation, and also its recent pattern, dynamics, landscape ecology and regeneration potential.

Climate change simulation experiment in the Kiskun LTER site, near Kecskemét

BIOLOGICAL RESEARCH CENTER

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Postal address: H-6701 Szeged, P. O. Box 521.
Telephone: (36) 62-599-769 or 599-600
Telefax: (36) 62-432-576 and 433-188
General director: Dénes DUDITS, O. M.
E-mail: Dudits@nucleus.szbk.u-szeged.hu

The Biologial Research Center of the HAS in Szeged

Scope of activities

Basic research in molecular, cellular and developmental biology in he field of genetics, biochemistry, enzymology, plant biology and biophysics. The interdisciplinary research activities are supported by central laboratories with facilities in DNA chip technology, protein analysis (MALDI-TOF) bioinformatics, DNA sequencing and synthesis. In addition to generation of novel knowledge, researchers are engaged by production of intellectual properties that can be used through a technology transfer company Szeged Biopolisz Innovation and Service Ltd. Participation in organized scientific postgradual training, higher education and work of the International Training Course. Publication of the scientific results. Closest possible cooperations with related institutes of the Hungarian Academy of Sciences, universities, and other Hungarian and foreign research institutions. Methodological training of young scientists.

The Biological Researh Center of the Hungarian Academy of Sciences gained the "Center of Excellence" title from the EU in 2000.

BRC INSTITUTE OF BIOPHYSICS

Address: H-6726 Szeged, Temesvári krt. 62.
Postal address: H-6701 Szeged, Pf.521.
Telephone: (36) 62-433-465
Telefax: (36) 62-433-133
Director: Pál ORMOS, C. M.
E-mail: pali@nucleus.szbk.u-szeged.hu

Scope of activities

Basic research aiming at the elucidation of the operation of biological systems on physical grounds. Studies focusing on the processes of biological energy conversion, membrane biophysics and neurobiology using modern physical, chemical and biological methods. Research on the self-organization ability of matter and studies on the regulation processes in living matter primarily by physical methods.

Research aims and topics

Studies in membrane bioenergetics

- Physical characterisation of the function of proteins based on myoglobin. Studies of protein dynamics and the details of the relationship between structure and function.
- The mechanism of light energy conversion in retinal proteins. The energetic relationships of the protein motion and charge transfer.
- Spectroscopic and photoelectric studies of the visual and photosynthetic apparatus of Chlamydomonas.
- Dynamics of the electron transfer in proteins, particularly in cytochrome c and azurin. Effect of the protein structure on the rate of electron transfer.
- Implementation of high time resolution (10 ns) infrared spectroscopy for dynamic studies.
- Single molecule manipulations by laser tweezers; dynamic studies of the DNS molecule.
- Nanobiotechnology. Design and construction of microscopic optomechanical and optoelectronic devices by photopolymerisation. Biological application of micromachines manufactured and driven by light.
- Technical applications of bacteriorhodopsin: development of bioelectronic and nonlinear optical devices.

Studies of the microbial gas metabolism

- Determination of the missing data for the molecular characterization of the photosynthetic bacterium *T. roseopersicina*.
- Development of a gene transfer system for *T. roseopersicina*; site specific mutagenesis studies.

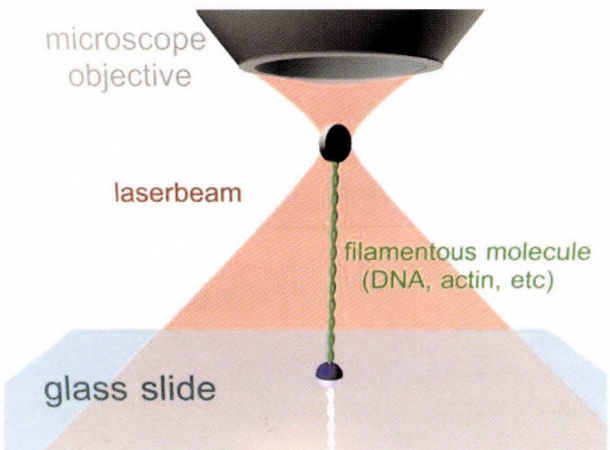
- Investigation of the proteins participating in the Ni metabolism, Ni transport and storage, and Ni incorporation into proteins of *T. roseopersicina*, by molecular biological and biophysical methods.
- Development of a gene transfer method for the molecular investigation of hyper-thermophils.
- Biochemical, biophysical and molecular biological characterisation of the thermostabile methanotroph isolate and the methane monooxigenase (MMO) enzymes found within.
- Implementation of the biogas intensification system for practical applications.

Studies of membrane structure and dynamics

- Transmembrane proton pumping by a membranous molecular motor: the vacuolar proton-ATPase.
- Transmembrane electron transport and redox activity in plasma membranes: the plant plasma membrane b-type cytochromes.
- Protein insertion, folding and assembly in membranes and on membrane surfaces.
- Membrane dynamics and protein-lipid interactions in native membranes.

Studies in molecular neurobiology

- Cellular basis of neurodegenerative disorders.
- Experiments on the *in vivo* model of the blood-brain barrier.
- Complex morphological, biophysical and molecular biological characterization of nervous tissue.
- Effect of gonadal steroids on neuro-glial plasticity and neuroprotection.
- Studies of the transport processes in the brain.
- Cell adhesion molecules and the neuro-glial plasticity



BRC INSTITUTE OF BIOCHEMISTRY

Address: H-6726 Szeged, Temesvári krt. 62.
Postal address: H-6701 Szeged, Pf.521.
Telephone: (36) 62-599-654
Telefax: (36) 62-433-506
Director: György PÓSFAI, D. Sc
E-mail: bktitk@brc.hu

Scope of activities

Basic research using various modern methods applicable in natural sciences, studies of nucleic acids, proteins and lipids and their complexes on different organizational levels. The studies are aimed at better understanding of the chemical and physicochemical nature of living matter, its changes, regulation of processes taking places in living matter and laws governing life phenomena. Emphasis is on projects with potential practical applications in medicine and biotechnology.

Research aims and topics

1. Membrane-lipid and molecular stress biology projects

The role of membrane physical state in stress perception and signaling; regulation and molecular architecture and function of chaperones

2. Neurobiology projects

- *Structural and functional analysis of opioid (morphine) receptor system: molecular basis of the heterogeneity*
- *Molecular mechanisms of opioid tolerance/dependence*
- Design, synthesis and radioactive labelling of biological active peptides
- Construction of mouse models of human neurodegenerative and cardiovascular diseases

3. *Eukaryotic molecular biology projects*

- Regulation of intracellular protein breakdown
- The role of cytokines in immune defense and in autoimmune diseases
- New mechanisms in eukaryotic transcription regulation
- Studies on key proteolytic complexes in cell cycle regulation
- Structure, expression and regulation of genes coding for extracellular matrix proteins

4. *Nucleic acid research projects*

- Sequence-specific DNA recognition by type II restriction endonucleases and modification methyltransferases
- In vitro evolution studies on enzyme thermotolerance and stability
- Genome engineering of prokaryotic cells; role of mobile genetic elements in the evolution and adaptation of bacterial genomes

INSTITUTE OF ENZYMOLOGY

Address: H-1113 Budapest, Karolina út 29.
Postal address: H-1518 Budapest, P. O. Box 7.
Telephone: (36-1) 2793-100
Telefax: (36-1) 4665-465
Director: Peter FRIEDRICH, O. M.
E-mail: friedric@enzim.hu

The main building of the institute

Scope of activities

Basic research aimed at elucidating the role of enzymes and other proteins in biological processes, regulation of these processes at molecular level, the structure-function relationship of proteins. Improvement of experimental methods and development of their theoretical basis.

Research aims and topics

- Molecular mechanisms of learning and memory
- Calpain system in health and disease
- Plasmamembrane and intracellular receptor proteins of lysophospholipid mediators

- Structural and functional characteristics of natively unfolded/genetically misfolded proteins and the involvement of their aberrant associations in neurodegeneration
- Prediction of gene structure and alternative splicing
- Evolution of multidomain proteins
- Mechanisms of action of serine oligopeptidases
- Analyzing and predicting the structures of proteins and their complexes by means of simulation and various bioinformatics approaches
- Structure, function and evolution of intrinsically unstructured proteins
- ABC transporters: structure, function and their role in multidrug resistance and genetic diseases
- Role of Modular Organisation in Folding and Function of Proteins
- Protein complexes of DNA repair and the pathway of thymine-less apoptosis
- Activation and regulation of the multidomain serine proteases of the complement system (C1 and MASPs) involved in the innate immunity of vertebrates
- Relationship of protein flexibility to stability and function

BRC INSTITUTE OF GENETICS

Address: H-6726 Szeged, Temesvári krt. 62.
Postal address: H-6701 Szeged, PO. Box. 521.
Telephone: (36) 62-599-681
Telefax: (36) 62-433-503
Director: István RASKÓ, D. Sc. (medicine)
e-mail: rasko@nucleus.szbk.u-szeged.hu

Scope of activities

Basic research on the mechanisms of heredity and on the processes regulating and influencing the manifestation of hereditary traits on molecular and various other organizational levels by the means of the methods of functional genomics. Teaches and disseminates the science of genetics at high standard.

Research aims and topics

Molecular genetic changes during oogenezis

- Genetic and functional interactions between genes participating in protein phosphorilation/dephosphorilation during oogenezis.
- Indentification and characterization of genes and gene families playing role in germ line development.
- Molecular genetic characterization of cell sub-populations of innate immunity.

Genetic regulation of chromatin structure

- The role of higher order chromatin structure in the regulation of expression of homeotic genes.
- Efficient tissue and cell specific delivery of artificial chromosomes.
- Construction of artificial chromosome vectors for gene therapy, gene therapy in animal model with therapeutic artificial chromosomes.

Signaltransduction, cell communication, apoptosis

- Characterization of genes participating in cell ploriferation during oogenezis and tumorous growth.
- Map-based cloning of genes of symbiotic nitrogen fixation in alfalfa and molecular genetic studies of signal molecules in *R. meliloti* participating in legume induction.

- The understanding of molecular biological basis of galectin-induced apoptosis in the immune system.

Molecular human genetic studies

- Population genetic studies by the means of mitochondrial DNA and Y chromosome specific markers from ancient bones.
- Identification of molecular genetic susceptibility factors in complex diseases.

Innate immunity
- Genetic control of blood cell development and the cellular immune response in *Drosophila melanogaster.*

DNA repair, mutagenezis and carcinogenezis
- Investigation of the molecular mechanism of DNA lesion bypass and its connection to checkpoint regulation.
- To gain insight into the function of yeast and human genes playing role in DNA repair, mutagenesis, and carcinogenesis.

Population genetic and phylogenetic studies

- Population genetic studies of different insect species by the means of mitochondrial DNA markers.
- Phylogeography and phylogenetics of oak gall wasps.
- Population genetics of the great bustard, a highly endangered bird species in Hungary.

BRC INSTITUTE OF PLANT BIOLOGY

Address: H-6726 Szeged, Temesvári krt. 62.
Postal address: H-6701 Szeged, P. O. Box 521.
Telephone: (36) 62-599-714
Telefax: (36) 62-433-434
Director: Imre VASS, D. Sc
E-mail: nbititk@nucleus.szbk.u-szeged.hu

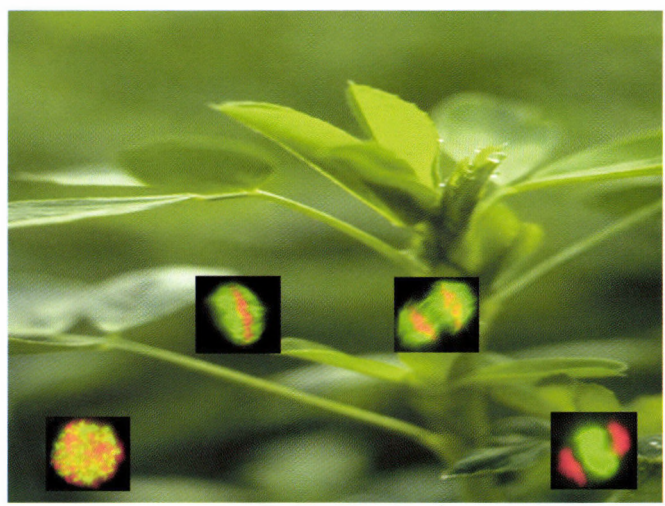
Scope of activities

Basic research for the identification of genes and molecular mechanisms which determine the development, light perception and utilization, as well as environmental stress responses of plants. Exploration of biotechnical approaches to produce plants with enhanced agronomical value. Teaching the results and methods of plant molecular biology in the framework of graduate and postgraduate programs.

Research aims and topics

Light as energy source, environmental stress factor and information carrier in plants

- Studies on photosynthetic light energy utilization and oxygen evolution
- The structure and function of the Photosystem II reaction center complex
- The structure of photosynthetic light harvesting complexes and



The phases of cell cycle in alfalfa cells

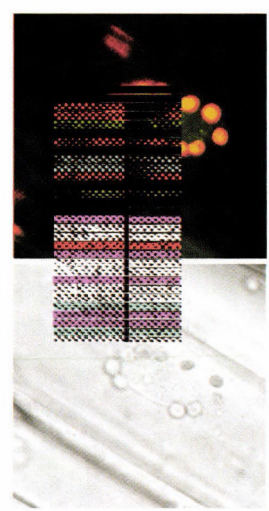
dynamic structural changes of lipid-protein macrodomains
- The damaging mechanisms of visible and ultraviolet light
- UV-induced gene expression in cyanobacteria
- The mechanism of temperature adaptation of plant membranes
- Identification of genes required for the regulation of the plant circadian clock
- The influence of phytochrome photoreceptors on the function of plant circadian clock
- Studies on the mechanism of nuclear localization of phytochromes

Identification and characterization of genes and proteins involved in stress tolerance of plants

- Identification of stress-induced genes by T-DNA mutagenesis and differential gene expression profiling in *Arabidopsis*
- Application of DNA microarrays to study the expression profile of *Arabidopsis* genes with regulatory functions
- Identification of genes and proteins effecting drought tolerance in wheat by using functional genomics and proteomics approach
- Detection of reactive oxygen species involved in mediation of stress-induced damage in plant system
- Identification of genes and proteins induced during defence against oxidative stress
- Studies on stress-related responses of plants by monitoring photosynthetic activity parameters
- Studies on the role of non-coding micro RNAs in stress responses of plant cells.

Regulation of the plant cell division cycle

- Identification of the key elements, which participate in the regulation of stress- and hormone-induced signal transduction
- Functional characterisation of plant histon-dependent kinases and their genes
- Application of functional genomic and proteomic approaches to study the main regulatory components of plant cell cycle
- Study of embriogenesis, as a developmental process closely related with the cell cycle
- The effect of stress factors on cell cycle followed by cell division markers



Nuclear localization
of phytochromes in tobacco cell

INSTITUTE OF NUCLEAR RESEARCH

Address: H-4026 Debrecen, Bem tér 18/c
Postal address: H-4001 Debrecen, P. O. Box 51
Telephone: (36) 52-417-266
Telefax: (36) 52-416-181
Director: Rezső LOVAS, C. M.
E-mail: rgl@atomki.hu
Home page: www.atomki.hu

The main building of the institute

Mission statement

The institute is devoted to
- basic and applied research in atomic, nuclear and particle physics,
- the applications of physical methods and knowledge in other fields of science (materials research, environmental and earth sciences, biological and medical research etc.) and in solving practical problems (for industry, agriculture, medicine etc.),
- developing techniques and instruments for basic and applied research,
- taking part in higher education.

Research program

Researches in subatomic physics and in applied nuclear physics

- Study of few-body problems in quantum mechanics. Analytical and numerically exact solutions

of quantum mechanical problems and their application to atomic, solid state, nuclear and subnuclear physics.
- Experimental and theoretical study of exotic nuclear systems and states, such as
  - nuclei outside the stability region and near the nucleon dripline,
  - highly deformed nuclear shapes,
  - special resonances, exotic types of nuclear decay,
  - the formation of nuclear clusters,
  - the neutron skin and neutron halo phenomena.
- Study of nuclear reactions relevant to astrophysics.
- Participation in the analysis of experiments at the accelerators of CERN, preparations for the participation in subsequent experiments.
- Study of multiple jets with perturbative quantum chromodynamics.
- Measurements of nuclear data for nuclear techniques.
- Production of isotopes and labelled compounds for medical purposes.

Basic and applied research in atomic physics

- Electron- and X-ray spectroscopy and theoretical studies related to special effects appearing in ion-atom collisions, such as
  - multiple collision phenomena,
  - rare and higher order processes.
- Study of effects of atomic physics, surface physics and plasma physics generated by the beam of multiply charged heavy ions produced in an electron-cyclotron resonance (ECR) ion source.
- Study of the electronic structure of surfaces, micro- and nanolayers by Auger- and photoelectron-spectroscopy.
- Study of the magnetic and structural properties of superconductors of high transition temperature.
- Study of the properties of nanostructured alloys and composites produced by mechanical techniques.

Research of the environment, in earth sciences and archaeology

- Investigation of the composition and propagation of atmospheric aerosol contaminants.
- Examination of heavy metal environmental contamination with ion beam analysis.
- Studies in isotope hydrology, investigation of the sensitivity of natural water reserves against contamination.
- Studies related to the safety analysis of nuclear waste depositories.
- Investigation of the propagation of atmospheric radon and of its presence in the human environment.
- Geochronological studies with the potassium-argon technique.
- Archeometry with the radiocarbon technique, characterisation of

archeologicals finds by their trace element composition.
- Trace element studies on geological and biological samples with a scanning proton microprobe.

Development of methods and instruments

- Further development of accelerator based analytical methods (PIXE, DIGE, RBS, etc.).
- Radiation-hardness tests of electronic components.
- Studies related to the optimization of the parameters of semiconductor and scintillation particle detectors.
- Development of electronic signal processing instruments and detector systems.

KONKOLY OBSERVATORY
(founded by Miklós Konkoly-Thege in 1899)

Address: H-1121 Budapest, Konkoly-Thege út 15–17
Postal address: H-1525 Budapest, P. O. Box 67
Telephone: (36-1) 391-9322, (36-1) 391-9360
Telefax: (36-1) 275-4668
Director: Lajos G. BALÁZS, C. Sc. (Physics)
E-mail: balazs@konkoly.hu
Homepage: http://www.konkoly.hu

Scope of activities

Carrying out observational astronomical studies, mainly related to the physics of the variable stars, galactic structure, solar activity and the terrestrial upper atmosphere. These tasks imply operation of the internationally recognized observational network developed during the last three decades. A very important task is the development of the national astronomical information system, including the observatory's library.

The main building of the Astronomical Institute (Konkoly Observatory) of the HAS (designed by Gyula Sváb) and János Pásztor's sculpture: "Sie itur ad astra"

Research aims and topics

Studies concerning the behaviour of variable stars: investigation of multiple periodicity and period changes of pulsating variables, as well as research on stellar activity of various time-scales. Studies related to the galactic structure and physics of interstellar matter with an emphasis on the star-forming processes. Studies of the upper atmosphere of the Earth and Mars with space-borne equipment. Studies on solar activity, investigation of the problems of sunspots and prominences.

Variable stars

A better insight into the physics (mechanism of light variation, processes occuring in the stellar atmosphere) and evolutionary status of the variable stars.

Solar physics

Research on the active regions, kinematics of spots, spot-groups, prominences and flares.

Galactic astronomy

Studies of galactic structure and processes of star formation in Milky Way, mainly from the observational point of view.

Upper atmosphere

A better insight into the physical condition of planetary atmospheres (Earth, Mars), correction of the atmospheric models.

Miscellaneous

Other minor topics which have been succesfully studied, mainly in the fields of interdisciplinary and/or space research, in cooperation with the staff of other institutes.

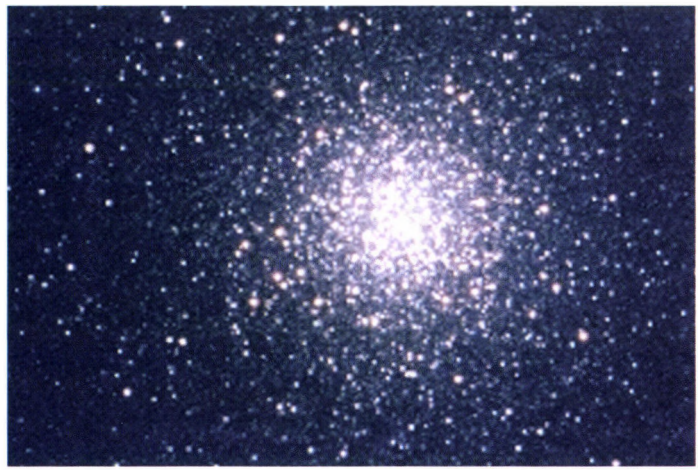


Image of the M3 globular cluster taken with the CCD camera attached on the RCC telescope

GEOGRAPHICAL RESEARCH INSTITUTE

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Postal address: H–1388 Budapest, P. O. Box 64
Telephone: (36-1) 309-2628
Telefax: (36-1) 309-2690
Director: Ferenc SCHWEITZER, D. Sc. (Geography)
E-mail: schweitf@helka.iif.hu

Scope of activities

Development of theoretical bases and methodology for physical, human and regional geography, studies on spatial processes and interrelationships; temporal and spatial survey of the interaction between man and environment; assessment of factors of the geographical environment with a special reference to natural and socio-economic resources and to the emerging socio-economic problems in Hungary and within its distinct territorial units (natural macro-, meso- and microregions, districts and administrative units); international cooperation; documentation and propagation of research achievements (through volume of studies, periodicals and other publications in Hungarian and foreign languages).

Research objectives and topics

The Institute has a staff and infrastructural equipment to successfully meet the European professional requirements.

Priorities should be given to the following topics:

In the field of physical geography:

- the analysis of the geographical consequences of global natural processes;

- studies on the use of domestic natural resources and environmental issues;
- investigations into the degradation of the natural environment and related local tensions.

In the field of human (social and economic) geography:

- International processes exert an increasing impact on social and economic development fostering interregional relations, thus upgrading comparative studies in geography. This new approach to spatial processes renders a closer co-operation between physical and human geographers indispensable.
- With the turn of the millennium a growing emphasis has been placed on the assertion of regional an local interests, requiring a more exact knowledge of the resources and endowments within the particular spatial units. There has been a growing demand in complex studies on territorial units and settlements of various hierarchical levels. International comparative studies might be instrumental in "bringing closer" different regions to each other.

Information about nature, society and economy - on global, regional and local levels - serves geographical learning properly only when the former is organised in an adequate geographical information system (GIS). An internal computer network has been developing continuously under the supervision of the *department of cartography*. Based on the system built so far the publication of a series of maps showing the changing ethnic pattern in the Carpathian Basin was launched in the mid-1990's (Transylvania, Slovakia, Transcarpathia). These activities are to be continued (map sheets on Croatia and Slavonia, Voivodina, Burgenland). In the present decade a development of GIS in the physical and human domains is to be going on.

The *library* serves research, education and culture and scope of its activities has expanded since 2000 (due to the application of Tinweb Opac and Geobase systems). Now it is part of the nation-wide information system (through the EISZ). As a center of education and culture it promotes a rapid dissemination of the scholarly achievements by the Institute.

1. A comprehensive research of recent and paleomorphological processes, of regional and local phenomena; landform assessment and environmental analysis; interpretation and evaluation of human impacts

- Engineering geomorphological and environmental survey of the high bluff stretching along the Danube River and endangered by landslides.
  The river valley between Dunaalmás and Mohács (at a ca 250 km length) is flanked by a high steep

bluff of 20 to 40 m height posing landslide hazard. Sometimes these slides and slumps cause serious material and financial damage to settlements, industrial establishments, farming areas. A complex geomorphological survey and assessment is under way in delimitation, evaluation and classification of the sections along the valley with environmental hazard. Thematic mapping of engineering and environmental impact of slides and slumps can be instrumental in the preparation of masterplans for settlements.

- Geographical investigations into natural, social and economic processes in relation with flood control in study areas along the flood plains of rivers in the Alföld (Great Hungarian Plain).
  In the course of studies on hydrogeographical processes emerging as a combined result of human intervention and extreme climatic conditions there is an actual task of geomorphological consequences of river regulation and flood control measures taken in the 20th century. The survey to be implemented in international cooperation has a special reference to flood plain evolution of rivers.
- Involvement of up-to-date geomorphological methods in the medium-term studies comprising the surroundings of the Paks Nuclear Power Plant to identify areas of increased radioisotope concentration.
- Study of late Cenozoic formations in the Carpathian Basin aimed at the identification of paleoclimatic, lithological and paleogeographic events for stratigraphic and geochronological purposes. The main subtopics are the following: a) A major ecological event during the Upper Miocene–Lower Pleistocene: desertification of the partial basins of the Paratethys and Carpathian Basin; b) A new approach to the interpretation of loess formation and evolution of fluvial terraces; c) Paleogeography of the Holocene related to archeological findings. This international activity is run in the framework of the INQUA and also form part of several bilateral programmes (in projects established with Austrian, Croatian, Russian, Chinese institutions).
- Landscape geography of Hungary: geology, mineral resources, relief, climate, hydrology, soil and vegetation cover of the North Hungarian Mountains to be summed up in a monograph as a volume in the series "Landscapes of Hungary".
- Planned in an international cooperation Paleogeographic Atlas of the World is to present late Pleistocene paleogeography of the southern hemisphere in a series of thematic maps. Compilation and design is supported by UNESCO IGBP Global Change Programme (PAGES), INQUA and by bilateral cooperation projects.

Complex geomorphological research and mapping are to be continued

after 2001: geomorphic evolution of the Carpathian Basin with the interpretation of changes in climatic morphology, neotectonism, and those brought about by river regulation and flood control measures. Results are to be presented by a new geomorphological map of Hungary at 1:500 000 scale under preparation. Mapping areas affected by mass movements and their classification are going on with a previous intensity.

2. *Analysis of trends in transformation of the natural environment to be performed in study areas*

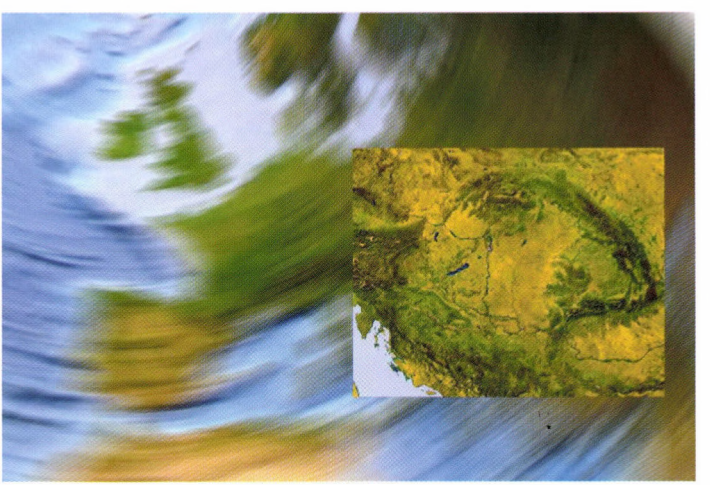
- Aridification in the Carpathian Basin. Investigations into the physico-geographical consequences of an assumed climatic change.
- Studies on the above physico-geographical processes are continued in the framework of the MEDALUS IV programme (in cooperation with the experts from Mediterranean and other EU countries).
- One of the objectives of the research programme is the identification and mapping of environmentally sensitive areas. Criteria of the liability to aridification are investigated in study areas located in the Kiskunság, shown in maps, stored in GIS, and the resulting regions are delimited also using GIS methods.
- Another project within the MEDALUS IV programme is purposed for the application of the MEDRUSH model in a medium-sized catchment the largest part of which is situated within the area most affected by aridification. Parameters of the model are to be established by a detailed field survey. This research is aimed at predicting the changes in physico-geographical components under conditions of the assumed climatic change (scenarios for 1–2 decades and for a century) in comparison with the southern European trends.
- Studies on soil erosion. After having completed the survey in the northern catchment of Lake Balaton a project was launched to investigate the role of soil erosion and of the related water pollution in the siltation and contamination of the lake. The project is to be accomplished with a survey of the applicability of USLE models.
- An analysis of changes having taken place in state of the environment of Lake Fertő and its medium-term forecast (an Austro-Hungarian project on the territory of the national park). The project is targeted to establish the extent to which environmental pollution of agricultural source poses a hazard to the ecological balance of the lake.

3. *Socio-economic transformation in Hungary and the related European trends (a comparative human geographical analysis)*

- Relationship between the socio-economic changes and transfor-

mation of the urban structure. Studies on Budapest are focused on the identification of socio-economic effects of privatisation (housing market, industrial structure). Comprehensive studies encompass different levels of urban hierarchy (cities, medium and small towns). Since 2001 these comparative studies have included sustainability of urban green zones and theoretical and methodical issues of urban living spaces.

- An EU project launched in 2001 deals with the social rehabilitation of declining urban quarters
- An emphasis is put on the social geographical investigation of social tensions in the framework of a broader issue of the emerging fields of tension. These investigations include social effects of large-scale technical establishments, regional and structural pattern of unemployment, various aspects of international migration.
- A project in international cooperation is to reveal interrelatedness of nature conservation, tourism and local social conflicts.
- Historical and political geographical investigations include ethnic geographical studies of Hungarian minorities in the Carpathian Basin, the presentation of the geographical background of the ethnic conflicts in the Carpatho-Balkan region, analyses of past ethnic geographical studies and mapping.
- Historical geographical studies have been carried out since 2000 and span a period between 1918 and 1950 focusing on international migrations that had affected Hungary. The two major issues are Hungarians escaping from the successor states of the Austro-Hungarian Monarchy and to the home country (after First World War) and ethnic Germans expatriated from Hungary (after Second World War).



GEODETIC AND GEOPHYSICAL RESEARCH INSTITUTE

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The main building of the Institute

Scope of activities

Basic research in geodesy and geophysics, establishment and operation of geophysical observatories in the fields of seismology, geodynamics, geomagnetism, ionosphere and atmospheric electricity, support for institutions to solve problems in geodesy and geophysics, participation in international organizations and projects.

Research aims

Geodesy: the field of interest includes geodynamic investigations for studying the structure of the Earth's interior and global and local processes in the Earth's crust, devel-

opment of instruments and measurement methods for this purpose, modeling of the gravity field of the Earth. The Institute operates the Sopron Geodynamic Observatory. Research into mathematical methods to be used in earth sciences and geoinformatics helps this aim, too.

Geophysics: The main research field is "Earth electromagnetism", in a broad sense: from the investigation of electromagnetic structure of the solid Earth to the study of structure and processes of the near-Earth space. The following inter-related domains and their interactions are investigated: Sun, interplanetary field, magnetosphere, ionosphere, atmosphere, electromagnetic structure of the solid Earth (on near-surface-, crustal and mantle scales, especially beneath the Carpathian Basin and neighbouring regions), Earth's core. The research is based on observatory data (mainly on data of the Széchenyi István Geophysical Observatory near Nagycenk, operated by the institute) and field measurements.

Seismology: its task is to operate the Hungarian seismological observatory network, to determine the focal parameters of earthquakes in Hungary and in its neighborhood, macroseismic investigations, to update and archive the database of earthquakes recorded by Hungarian seismological stations and participation in international networks. On this basis the research field covers the study of structure and physical processes of the solid Earth.

Main topics

Global and local geodynamic processes: are studied using gravimeters, extensometers and tilt measuring instruments. The recorded data lead to considerations concerning the Earth's internal structure and tectonic processes in the Hungarian territory (Fig.1.). Special emphasis is laid on the continuous increase of the accuracy of the measurements, on the development of instruments and on the effects of environmental parameters on measured data and their accuracy. This research is based on data obtained in observatories in Hungary and in neighboring countries in the framework of international cooperation. The results of this research can be practically used in locating the sites of dangerous industrial plants.

Modeling of the Earth's gravity field. New methods led to get a more reliable litospheric density model in the Pannonian Basin. The results of local gravimetric measurements are used to study the local parameters of the gravity field; thus they contribute to scientific research connected to the preparation of the measurement of the new high order-leveling network in Hungary.

Development of GPS measurements. New methods are being developed and introduced into the processing of GPS measurements which apply the information offered by the International GPS Service for Geodynamics - precise coordinates of IGS stations, precise ephemerides of clock errors of satellites - with pos-

sible highest accuracy. Advantages from the use of time differences are also incorporated into this processing method, which are only insufficiently taken into account in present processing methods. This research will lead to software at a scientific level.

Research of processes leading to landslides. In the framework of international cooperation (Austria, Germany, Italy, China, Greece) and in an interdisciplinary effort, test areas are investigated where processes are leading to landslides and to rock collapse. Geodetic and geodynamic measurement methods will be developed for this purpose; recorded data are to be interpreted for the detection of interrelations between processes, which lead to landslides. The practical benefit of this research is realized in catastrophe protection (EU5 "OASYS" project).

Deformation and movements of objects. In the frame of EU5 "SAMCO" project new measurement methods are developed for the investigation of deformations and cyclic movements of dangerous industrial objects, building, bridges, etc. and for the health and seismic risc assessment of structures.

Mathematical methods in geodesy. The wavelet transformation of the covariance function of signal and noise leads to new results in analyzing geodetic time series (e.g. that of pole wandering). The transfer characteristics of trigonometric filtering are studied, too. The application of time series analysis in geodesy gives an answer to the question about the future trend of geologic processes. The Gauss-Jacobi combinatorial adjusment is applied to solve the 3D transformation problem with 7 parameters, and it is also demonstrated that the combinatorial algorithm gives the same solution as the conventional linear Gauss-Markov model.

Development of photogrammetric methods. The importance of photogrammetric methods has significantly increased nowadays; that is why new image processing methods and photogrammetric programs are to be developed which are able to solve the new tasks of measurement techniques.

Near-Earth Space Physics. Long- and short term variations of solar activity, solar wind parameters and geomagnetic activity. Modeling and observation of solar wind – magnetosphere – ionosphere energy coupling. Effects of near-Earth space to the global changes and human activity, often referred to as space weather and climate. Study of magnetospheric waves (ULF, VLF), field line resonance, upstream waves. Contribution to the global geomagnetic field modeling. Ionosphere – neutral atmosphere coupling. ELF wave propagation in the Earth-ionosphere waveguide. Electro-optical emissions in the upper atmosphere. Climate change-related ionosphere- and atmospheric electricity studies. Maintaining networks and participating in coordinated campaigns of magnetic, telluric, whistler, ionosphere sounding, atmospheric electricity, radiowave

propagation and Schumann-resonance measurements (such as SEGMA, OERSTED, CHAMP, INTERMAGNET, SWENET, EUROSPRITE, etc.)

Solid-Earth Electromagnetism. Investigation of electromagnetic structure of the Earth beneath the Pannonian Basin and neighbouring areas by means of geo-electromagnetic methods at various scales: (1) from crustal to mantle structures (lithospheric and asthenospheric investigations) by means of magnetotellurics, geomagnetic deep soundings, tellurics; (2) near-surface geoelectric-electromagnetic investigations, in order to be able to get improved images of subsurface (with various, e.g. environmental applications). Research includes both theoretical and practical approaches, possible bio-geo interactions, and also Near-Earth Space Electromagnetism aspects.

Development of the national seismological network. The aim of this activity is to record at high level of resolution the seismic events of the Pannonian basin and in the same time to observe all the significant earthquakes worldwide. For this purpose beside the already existing short periodic stations a network of very broadband instruments is also in operation. The records of newly installed very broadband seismographs through the Internet are available for interested institutions within the country and worldwide.

Study of the Earth rotation from geological to sub daily time-scale. The aim of this research field is to investigate temporal variations of geodynamical properties and development of the Earth-Moon system due to tidal friction. In the frame of this topic in decadal - sub daily time-scale the influence of geomagnetic phenomena, seismicity, meteorological processes on Earth rotation vector is also investigated.

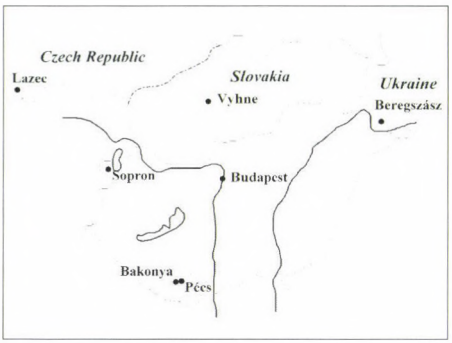
Paleoquakes and historic earthquakes. The determination of the focal parameters of these quakes is important from the point of view of the seismicity of the Carpathian Basin. A database is being planned which will include all paleo-, historic and recent earthquakes observed in the Carpathian Basin. The data will be available in a space informatics system.

Focal mechanisms. Having completed the database of Hungarian earthquakes areas will be identified where the type of the earthquakes is similar. Having determined the moment tensors of these areas, the directions of stresses will be obtained which govern recent tectonic processes in the Pannonian Basin.

Seismic tomography is applied and developed for a better knowledge about the Pannonian Basin. Using seismographic records, the velocity distribution is determined in the Earth's crust and upper mantle together with the velocity contrasts. Using complete waveform inversion the determination of hypocenters and focal mechanisms of earthquakes can be made more accurate in order to achieve a better idea

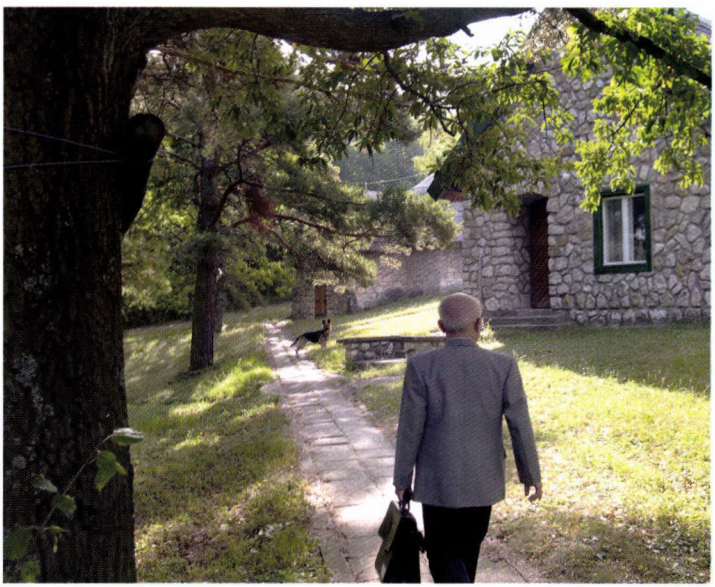
about the tectonic conditions in the Pannonian Basin.

Seismic risk. Beside the traditional probability based seismic risk evaluations it is now necessary to compute synthetic seismograms for the vicinity of potential earthquake foci and for endangered settlements in their area to obtain more reliable seismic risk values. A two- and three-dimensional pseudo-spectral method is applied for the computation of synthetic seismograms, which allows taking into account local tectonic and geophysical conditions.



Extensometric network for the investigation of recent tectonics in the Pannonian Basin

Streckeisen broad seismometer



'Absolute geomagnetic house' in the Széchenyi István Geophysical Observatory, Nagycenk

INSTITUTE FOR GEOCHEMICAL RESEARCH

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Scope of activities

Basic research in the fields of mineral- and petrogenesis, formation of mineral deposits, isotope, organic and environmental geochemistry. Researches of magmatic, sedimentary and metamorphic rock-forming processes aim at the better understanding of the lithosphere and the geological evolution of the Earth's crust in Hungary and in its wider environment. Geochemical processes of formation and accumulation of certain raw materials (hydrocarbons, subsurface waters as well as ore and other mineral deposits) are also investigated. In the field of environmental science, geochemical processes proceeding in certain geospheres and at their boundaries are studied in order to constrain geochemical cy-

cles of certain bioessential and toxic elements, with special emphasis to protection of soils, subsurface water resources and cultural heritage.

Research aims and topics of the Institute

With respect to the research topics, continuity as well as opening of new research directions play essential role in the research strategy of the Institute. The main fields described below have been regarded as an appropriate framework for the scientific activity, in which the topics are closely and inseparably connected, easy to plan and follow.

Complex geochemical researches on the formation of minerals, rocks, mineral deposits and fluids in the Earth's lithosphere

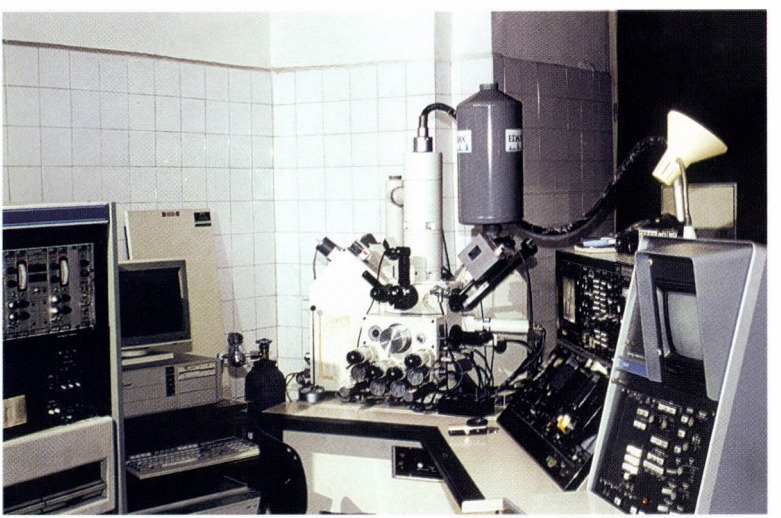
The lithosphere beneath the Carpathian Basin is characterized by specific, anomalous physical properties. Its geochemical research comprises the following directions:

- characterization of the geochemical processes in the lower crust and upper mantle by geochemical features of Tertiary volcanic formations and of their xenoliths and fluid inclusions.
- Reconstruction of processes and their geological, physical and chemical conditions taking place during weathering, soil and sediment formation, diagenesis and metamorphism in typical main tectonic units/geological formations of Hungary and in the surrounding Alpine-Carpathian-Dinaric-Hellenic system.
- For realizing the tasks mentioned above, results of theoretical, methodological and regional studies in the fields of major and trace element geochemistry, isotope geochemistry, rare-earth-element geochemistry and mineralogy, geothermometry and geobarometry and phyllosilicate (clay minerals, etc.) mineral structural and-chemical researches have been applied.
- Organic geochemistry of oil genesis: determination of thermal alterations in function of various organic facies.
- Paleoclimatological researches applying complex methods of isotope geochemistry, mineralogy and petrology.

Geochemical investigations on the state and changes of the environment

- Study of sorption, accumulation and migration of bioessential and toxic trace elements in soils and sediments in various geochemical systems, by laboratory experiments and researches on natural model areas (interrelations of trace metals and clay minerals, organic matter and clay mineals). The investigated trace elements are deliberating by weathering and soil-forming processes and by anthropogenic (contaminating) effects.
- Geochemical analysis of the optimal geological conditions for waste disposal, and study of sedi-

mentation, sorption and migration of nuclear waste.
- Application of isotope-hydrogeochemical methods for the determination of origin, flow dynamics and eventual mixing of subsurface waters aiming at the protection of subsurface drinking water resources found in vulnerable geological environments.
- Study of organic molecular composition of thermal waters rich in organic matter, with special reference to the determination of reaction mechanisms of degradation processes.
- Geoarcheometry: determination of origin and/or technology of monuments, archeological finds (marble, limestone, other rock types, ceramics, glasses, etc.).
- Study of anthropogenic weathering processes of building materials used for monuments.



JEOL Superprobe 733 electron microprobe for analyses of chemical composition of mineral phases and microtexture of rocks

CHEMICAL RESEARCH CENTER (CRC)

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The view of the research center

The research teams of the Chemical Research Center have carried out pioneering work in several fields of science in Hungary. These topics include the preparation of organic compounds labeled with radioactive isotopes and their application in the interpretation of reaction mechanisms; theoretical studies in gas chromatography, investigation of the isomerization and cracking reactions of hydrocarbons, study of liquid phase catalytic reactions; studies of molecular and crystal structure: application of infrared, Raman and NMR spectroscopy, mass spectrometry, X-ray diffraction; investigation of liquid phase polymerization processes and degradation of polymers; research in bioorganic chemistry, nuclear chemistry and radiation chemistry.

Following a reorganization process aimed at modernizing the thematic and institutional structure of researches, five research institutes have been formed within the Center in 2004, as follows:

- Institute of Biomolecular Chemistry,
- Institute of Surface Chemistry and Catalysis,
- Institute of Material and Environmental Chemistry,
- Institute of Structural Chemistry,
- Institute of Isotopes.

The essential mission of the Research Center is to conduct highly innovative, interdisciplinary research in the fields of chemistry and related areas, focusing on chemical structure and reactivity relationships.

The main task of the Center is the advancement of fundamental knowledge on

- chemistry of biosciences, with emphasis on drug design based on revealing the role of biomolecules in physiological processes, and synthesis of biomaterials,
- chemistry of nanosciences, aiming at the study of new catalysts, surface coatings, interfacial phenomena, nanoparticles, microporous and mesoporous materials, new polymeric materials, ceramics, and composites,
- chemistry of environment, studying the processes of green chemistry. Special attention is given to nuclear safety and safeguards.

Activity of the Research Center covers further, applied researches and development in various fields of chemistry, and chemical and pharmaceutical industry in order to introduce scientific results into the practice. It undertakes contract research works and analytical measurements for industrial partners and governmental laboratories. One of the institutes of the Center (Institute of Isotopes) keeps tracking the production and transportation of radioisotopes providing a mean for their central and prompt retrievability in the country.

The Center exploits the multidisciplinary character of the researches conducted and brings together scientists with different backgrounds.

The Chemical Research Center incorporates the Center of Excellence on Biomolecular Chemistry and the Hungarian network of Excellent Centers of Nanosciences maintained by the European Community. The Center takes part in 15 European research projects, recently.

Some of them are as follows:

- Creating competitive edge for the European polymer processing industry driving new added-value products with conducting polymers,
- Chiral expression and transfer at the nanoscale,
- Expanding the durability of stainless steel under microbiological conditions,

- Stratosphere-climate links with emphasis on the UTLS-SCOUTO3,
- Novel surface engineered counterface systems for prostheses application,
- A generic plasma-arc process for toxic waste destruction with co-generation of high value construction materials,
- Waste management and recycling of WEEE-process. Integrated thermochemical treatment of halogen-containing materials.

The institutes of the Center take part in and coordinate several large scale national research projects, e.g.:

- Medichem: Development of new therapeutic compounds and diagnostic methods based on validated target molecules,
- Building up focused compound libraries targeting at transport proteins,
- Molecular biological application of uracil-DNS endonuclease,
- Drug design by using validated target molecules of great importance for the national health,
- New fused nitrogen heterocycles,
- Enantioselective synthesis of ergoline alkaloids and analogues,
- Development of nanocomposite drugs to increase the therapeutic efficiency of proteins,
- Reduction of the adverse environmental effects of catalytic technologies by developing new, supported nickel catalysts,
- Instrument installation for the examination of structural transformations and the complex kinetics of adsorption and catalytic mass-transport processes,
- Technologies for aluminium-based nanocomposites,
- Nanoferritic and ceramic dielectric systems for telecommunication accessories working on mm wavelength,
- Development and application of functional surface layers for biochemical and chemical systems,
- New application of nuclear analytical technics to investigate the autentity of art objects:
- Archeometric application of cold neutron based prompt gamma activation neutron analysis,
- The integrated infrastructure initiative for neutron scattering and muon spectroscopy,
- Preparation of new additive for wastewater and sludge treatment by processing the refuse of the ore enrichment factory at Rudabánya, Hungary,
- Environmental friendly, marketable product development and environmental researches in the aluminum industry,
- Processing of hazardous wastes by thermal plasma technology in Hungary,
- Single screw extruder/internal mixer to prepare samples for the study of polymer structure and properties,
- Development technology and equipment for the regeneration of active carbon beds used for the purification of air contaminated by volatile organics,
- Development of a combined pilot plant technology for the purifica-

tion of ground water contaminated by chlorobenzenes.

The Research Center maintains fruitful international relations. Research cooperations are conducted with 74 research laboratories throughout the world. In 2004, 104 (43 per cent of the total) journal papers summarized the results of the common projects.

The Research Center runs several common laboratories with universities and is strongly involved in higher education. Approximately 40 PhD students are preparing their theses at the Center.
64 research associates are permanent lecturers at different universities.

The Research Center has a staff of 453, incl. 252 research scientists. The total scientific output is represented by 340 scientific publications in 2004, among them 233 papers in journals referenced by Science Citation Index.

The main research areas and topics are given by institutes, as follows.

CRC INSTITUTE OF BIOMOLECULAR CHEMISTRY

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One of the main goals of the research activity of the Institute is the elaboration of new preparative methods to allow the synthesis of new types of organic compounds and, thereby, to recognize the essential physiological functions of some known and unknown target molecules. In the preparative organic chemistry the following topics seem to be the most promising ones:

- recognition of new reagents, with particular interest to organometallic syntheses,
- elaboration of new synthetic strategies (e.g. application of orthogonal protective groups),
- accomplishment of stereoselective procedures, particularly in the field of natural compounds,
- synthesis of new ring systems and exploring their reactivity,
- synthesis of derivatives active in antiviral, multidrug resistance inhibitory, and neuroprotective compounds areas.

Three types of organic molecules are in the focus of the investigations: new heterocyclic systems, oligonucleotides, and oligosaccharides. Research of synthetic heterocyclic chemistry is concentrated to two main fields: natural organic compounds (mostly ergolin, oxaindole and indoloquinolizidine alkaloids) and polyfused unsaturated skeletons of intercalating ability.

Major aims of the biomolecular research in the Institute are as follows:

- in addition to semi-rational approaches, design of potentially neuroprotective, target subtype-specific leads in combination with binding, functional and mechanistic studies based on 3D structures of biomolecular complexes,
- disclosure and characterization of new targets within the CNS,
- elaboration of novel neuroprotective strategies which are targeted against the modulatory pathways related to epilepsy, ischemic tolerance, cognitive enhancement and light-adaptation,
- study of the allosteric control of recombinant receptors,
- development of methodological tools to characterize protein structures such as the exciton-sonde,

extension of the analytical toolbox to study mechanisms of drug action including fast-kinetics, high-resolution detection of spatio-temporal signals by simultaneous application of imaging and electrophysiological techniques, quantitative luminometry of antioxidant effects, quantitative spin-trapping of free radicals, induction of enzymes using human liver cells in culture.

The current research topics are as follows:

Preparation and glutathione S-transferase isozyme inhibitory study of molecules carrying a 2-amino-7-mercaptomethyl-undecane backbone

Synthesis and biological study of new amphetamine type molecules

Synthesis of potential drugs labeled with 14C and 3H

Study of ring opening reactions of benzologues of pyridazine with the involvement of palladium-catalyzed cross-couplings

Study of sigmatropic rearrangement transformations of zwitterionic heteroaromatic compounds

Selective reduction of hetaryldienes for obtaining phenothiazinyl derivatives with multidrug-resistance inhibitory activity

Synthesis of recoverable catalysts and their application by fluorous methods

Development of novel organocatalysts and their use in asymmetric synthesis

Total synthesis of natural compounds and their biologically important derivatives with ergolin skeleton aiming at producing cyclo-clavine, containing condensed cyclopropyl ring, dihydrosetoclavine and dihydroisosetoclavine

Synthesis of new compounds with polycyclic indole or other nitrogen containing skeleton with selective activity on muscarinic receptors by computer aided design

Allosteric regulation of GABAA receptors by neuroactive steroids

Receptor activation: development of a dynamic *in silico* model for channel opening

Binding study of Imatinib mesylate on AGP genetic variants

New methods (isoelectric focusing, capillary electrophoresis, fluorescence labeling, HPLC, CD) for the determination of variant-composition in clinical AGP samples

Studying self-assembly of polyene compounds by CD spectroscopy: recognizing structural elements of supramolecular organization

Research on the design, synthesis and *in vitro* characterization of new, potentially neuroprotective compounds

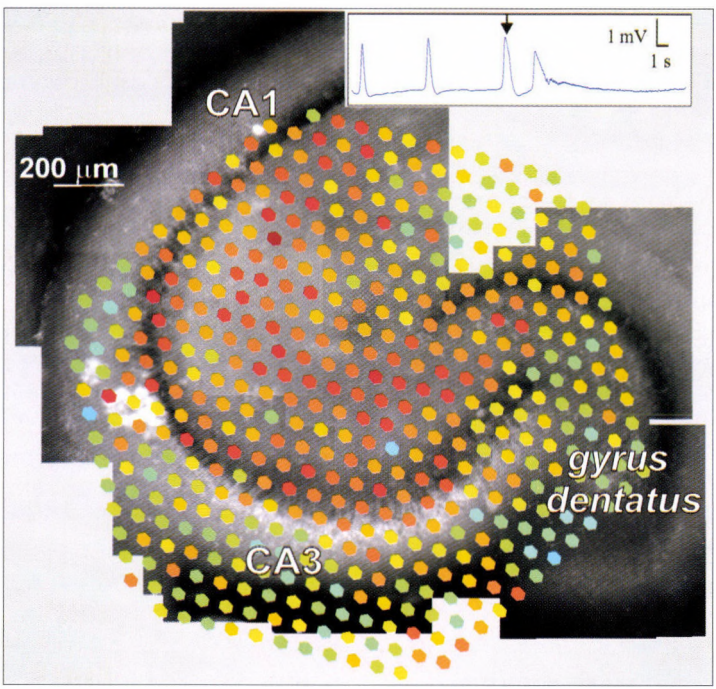
Building up of focused compound libraries targeting transporter proteins (Transporter Explorer)

Functional measurements on GABA and Glu transport inhibitors in combination with the development of fluorescence detection-based screening techniques

Investigation of the effect of glucocorticoids on the inducibility of CYP enzymes

Study of inducibility of UDP-glucuronyltransferases and transport proteins,

Study of the use of hepatocytes, as models in the activation of xenobiotics in Ames-test
Study of the accumulation and photodynamic effect of sensitizers devised in international collaboration in *in vitro* tumor cell cultures
Study of the effect of free radicals and cellular signal transduction pathways on the regulation of tumor and neuronal cell attachment
Testing and development of chemometric methods (classification and replacement tests for HPLC systems, comparison of variable selection methods, evaluation and prediction of chromatographic data)
Prediction of biological activities from molecular structures
Search for free radical parameters to be used in the therapy and prognosis of canine lymphoid tumors
Syntheses of glycosaminoglycan oligosaccharides
Orthogonal protection
Glycosylation methods
Synthesis of glycosidase inhibitors



Spatial potential distribution (signed by colored hexagons) detected on rat brain slice in an in vitro epilepsy model

CRC INSTITUTE OF SURFACE CHEMISTRY AND CATALYSIS

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The main research fields of the institute are as follows:
- nanostructured materials,
- self-assembled nanolayers,
- surface characterization and modification,
- heterogeneous catalytic reactions.

The main aspects of the research strategy in the nanoscience field are as follows:
- novel approaches of nano-sized particles and layers by surface and interface characterization,
- modeling uniform nano-systems by sophisticated surface spectroscopy for molecular level understanding of the active surface,
- elucidation of surface reaction pathways for the modification of certain properties (e.g. smart coatings).

Creating nanostructuring surfaces and nanostructured coatings and interfaces in films using top-down and bottom-up processes offer great potential for designing and developing next generation materials and structures for applications. One of the main challenges in this area is to devise strategies that integrate nanoscale superstructures (e.g., nanoparticles, nanotubes) and their assemblies with conventional technologies via traditional and newly evolving variants of techniques such as vapor deposition, laser alloying, and combinatorial approaches.

The chemistry and physics of surfaces and interfaces are among the most challenging and exciting areas of condensed matter science. Moreover, advances in the technology of surface modification have a fundamental impact of industries in such diverse fields as telecommunications, petroleum, superconductivity, computer science, minerals and chemicals.

Self-assembled monolayers (SAMs) on organic interfaces provide a unique link between the science of organic surfaces and technologies. SAMs are model systems for the study of organic and biological interfaces and are of technical interest for the fabrication of sensors, transduc-

ers, protective layers, for lubrication, and as patternable materials.

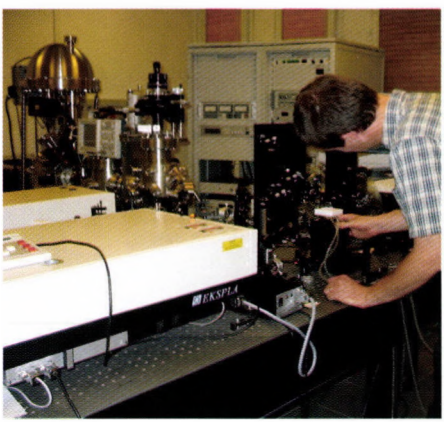
Research on heterogeneous catalysts is focused to the knowledge about the optimum surface restructuring that is necessary for the stability of the active sites, functionalizing the surface and development of multi-functional catalysts.
The main fields are as follows:
- modification of the nano-environment in catalytically active materials,
- low temperature oxidation,
- heterogeneous catalytic activation of carbonyl compounds,
- asymmetric heterogeneous catalysis.

Catalytic materials studied are as follows:
- supported nano-structured mono- and multi-metallic clusters,
- anchored metal complexes,
- multicomponent metal oxides,
- micro- and mesoporous materials.

High-throughput experimentation and combinatorial material science for the preparation and testing of different new catalytic materials are preferably applied approaches.

The current research topics are as follows:
Functional nanolayer by surface modification - self assembly, inhibition, sol-gel, Langmuir-Blodgett and CVD
Investigation of phosphonates as environmentally friendly components in water-soluble coatings
Applicability of the sol-gel process used to produce magnetic hexaferrite composites
Increase of the efficiency of Langmuir-Blodgett layers by addition of various metal-ions applied in the subphase. Inhibition of microbial adhesion by chiral molecules applied in nanolayers
Study of pinhole-free diamond layers by CVD technique
Carbon nanotube functionalization by development of chemical and physical methods
Development of characterization methods of the functionalized carbon nanotube
Investigation of polymer-carbon nanocomposite dispersion
Investigation of the chemical and physical properties of carbon nanotubes by using theoretical approaches
Investigation of the local surface energy by using modified AFM sensors
Development of new nano-mechanical and nano-tribological investigation techniques
Development of nano-abrasive techniques based on scanning-probe-microscopy
Mechanistic studies on oxidase and oxygenase models
Study of catalytic bleaching with metal complexes
Studies on the modification of supported metal catalysts and support materials by tin tetraalkyls. Investigation of the formation of nanolayers and surface species by spectroscopic methods
Studies on the CO oxidation over various supported catalysts. Develop-

ment of highly active, highly selective and stable catalysts for selective CO oxidation in the presence of hydrogen
Investigation of the full oxidation of methane and other hydrocarbons, such as propane and propylene and selective oxidation of propylene to propylene oxide
Research on the hydrogenation of activated ketones in the presence of cinchona-Pt catalysts. Preparation of new types of catalysts containing anchored metal complexes and their testing in asymmetric hydrogenation reactions
Application of methods of combinatorial catalysis and high-throughput experimentation both in the oxidation and selective hydrogenation reactions. Optimization of the activity and selectivity of catalysts and the determination of the optimum reaction conditions
High-pressure DRIFT spectroscopic examination of the catalytically active acid and metal sites in H- and Pt/H-zeolites
Selective catalytic NO reduction over Pt, Co-mordenite
Preparation of wide-pore metallosilicates from delaminated zeolite [Fe]-, and [Ti]-MCM-22 by thermal treatment or pillaring
Preparation of zeolite membrane catalysts by solid-state recrystallization of layer silicates, chemical modification and examination of the membrane catalyst in the oxidation of paraffins
Development of novel Ni/zeolite bifunctional catalyst for selective hydrocracking and isomerisation of straight-chain paraffins in Diesel oils
Preparation of mesoporous nickel silicate catalysts and their examination in the hydrogenation of aromatics
Synthesis, structural and photocatalytic properties of mesoporous titania
Preparation of composites from macroporous and/or mesoporous materials and zeolites
Development of novel catalysts for the total oxidation of air polluting emissions, such as ammonia, carbon monoxide and hydrocarbons
Frequency-response studies of sorption gas transport in carbon nanotubes
The skeletal isomerization of butene over ferrierite catalysts
Biomolecular adsorption at liquid/air and liquid/solid interfaces



Sum Frequency Generation Spectrometer for in situ investigations of interfacial phenomena

Surface studies of surfactant mixtures and polymer-surfactant mixtures
Characterization of nanostructured Ti and TiO_2 surfaces by electron spectroscopy
Characterization of surface nanostructures by XPS and UPS, and investigations of their gas adsorption properties by SFG spectroscopy

Atomic Force and Scanning Tunneling Microscope for study of surfaces and nano-structures

CRC INSTITUTE OF STUCTURAL CHEMISTRY

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Director: Miklós KUBINYI, D. Sc.
Home page: http://www.chemres.hu

The main goals of activity of the Institute are as follows:
- to conduct fundamental research in different fields of the forefront of structural and theoretical chemistry, and
- to lend support to the respective structural researches within and outside the Research Center in the framework of scientific cooperations.

The unique instruments in the Center (e. g. Sum Frequency Generation Spectrometer, Atomic force Microscopes, Scanning Tunneling Microscopes and Electronmicroscopes, X-ray Diffractometers, Electron Spin Resonance Spectrometers, LC MS and Mass Spectrometer with Ion Chromatograph, ORD-CD Spectometer with LC etc.) serve the purposes of both the research laboratories at the Academy and universities.

The main research fields are as follows:
- surface and interface studies,
- solute-solvent interactions,
- supramolecular studies,
- reaction mechanisms of elementary processes,
- study of biosystems and development of bioanalytical methods.

The current research topics are as follows:
ESR study of the magnetic properties in paramagnetic fullerenes and nano-structures
Spin-label investigation of the structure and dynamics in proteins, spin-trapping studies of reactive oxygen species
ESR study of the co-ordination and chemical equilibria for biologically important ligands to transition metals
ESR study of the catalytic properties in iron (III) doped zeolites
Photoinduced processes in self-assembled systems
Effect of microenvironment on the fluorescent properties
Effect of anions on the deactivation of excited aromatic compounds
Emission spectroscopic studies of pulsed Nd: YAG laser generated carbon plasmas
Graphite ablation by an Nd: YAG laser using a graphite oven in order

to prepare carbon nanostructures (fullerenes and nanotubes)

Raman spectroscopic studies of carbon nanotubes, analysis of their vibration spectra and geometry

Introduction of new NMR methods in the structure determination of organic and bioorganic compounds

NMR study of metal-organic compounds with supramolecular structures

Investigation of medical and biological applications of infrared and Raman spectroscopy and microscopy with special respect to medical diagnostics and different aspects of biochemical research

Study of surface properties of nanostructural materials, thin films, LB-films and catalysts by special methods of infrared and Raman (emission, reflection, surface enhanced, resonance Raman and FT-Raman) spectroscopy

Introduction and improvement of conditions for application of coupled chromatographic and vibrational spectroscopic techniques (HPLC/FT-IR, GC/FT-IR, TLC/Raman) in organic chemical analysis

Development of the joint application of IR-LD measurements and quantum chemical DFT calculations to enhance the reliability of vibrational analysis

Investigation of the structure and vibrational spectra of medium-sized (15-40 atomic) organic molecules (e. g. various heterocyclic and condensed polycyclic compounds) and detailed interpretation of their spectra supported by theoretical calculations

Laboratory and open path FTIR spectroscopic study of atmospheric pollutants, with special respect to recent validation methods of the European Union

Application of experimental and theoretical methods of vibrational spectroscopy for solving structural and analytical problems of self-assembled supramolecules, potential drugs, organic compounds, synthetic proteins, etc.

The role of radical-molecule complexes in the kinetics of gas-phase elementary reactions and atmospheric photochemical processes

Kinetics and thermochemistry of the reactions $CH_3C(O)CH_2$ + HBr and CH_3CO + O_2; investigation of the formation, stabilization reactions of the molecular complexes taking part in the reaction systems

Determination of the photolysis quantum yields of acetone under tropospheric conditions at 308 nm; investigation of the effect of water to assess the formation and role of acetone---H_2O complexes

Study of the effect of hydrogen-bonded complexes on photophysical and photochemical processes

Study of the temperature dependence of the kinetics of complex-forming reactions in photolytic alcohol-solvent systems (starting with iso-propanol + n-hexane). Assessment of the molecular mechanism of complexation (single-step or complex mechanism, the pre-requisites for the electron transfer, etc.)

Synthesis and structure determination of different heteroatomic chlatrates and metal complexes

Isostructurality study of clathrates of trinaphtyl- and triphenylsylanoles and their carbon analogues

Structural and thermochemical investigation of metal complexes of thiourea

Study of phosphacycloheptadecane derivatives and their clathrates

Synthesis, X-ray diffraction and multinuclear NMR-spectroscopic analysis of self-assembled organotin(IV)-complexes

X-ray diffraction analysis of photochemically active metal complexes

Investigations of the solvent associations of large space-filler and pore-former C3 symmetric compounds (single crystal X-ray diffraction and thermoanalysis, TG and DSC)

Determination of absolute configuration of biogenic amines

Biomolecular model compounds such as cyclodextrines and derivatives

Determination of absolute configuration of compounds from resolution of alpha-phenylethylamines and of oxazolidinones prepared by carbamate cyclizations

Structural role of H-bonded water molecules in the crystals of alicyclic beta-aminoacids, investigation of heat affected water loss

Crystallization of a human protein

Experimental investigation of the structure of liquids and amorphous materials: comparative studies for non aqueous solutions containing Be^{2+}, Li^{+}, Ca^{2+} and Mg^{2+} ions by X-ray- and neutron diffraction, computer simulation and quantum chemical methods

Structure of liquids at extreme thermodynamic conditions: investigation of structural changes of hydrogen bonded networks in simple alcohols and amides, their solutions, moreover structural studies of aprotic dipolar liquids (DMSO, acetonitrile, DMF) in pressure range 1 bar-3kbar by X-ray diffraction

Structural studies of iron containing complexes in solutions by X-ray diffraction and quantum chemical theoretical methods

Further development of MassKinetics software, and its application to predict mass spectra of peptides and other organic compounds

Study of gas-phase ion structures, its energetics and reactivity (CID)

Development of mass spectrometric methods for the investigation of inherited metabolic disorder related compounds using on-line solid-phase extraction

Application of liquid chromatography combined with tandem mass spectrometry to study the apolar fraction of human blood

Investigation of methylation processes occurring on DNA chains by means of mass spectrometry

Development of desorption electro spray (DESI) methods for diagnostic purposes

Theoretical study of the dynamics of the $O + C_2H_4$ reaction

Theoretical study of the vibrational spectra of the complexes of Ru with bipyridyl and Ru with phenantroline

Development of GRID technologies for speeding up reaction dynamical calculations

Further studies in the field of energy partitioning
Search for new methods for treating the problem of additivity and interference of interactions
Theoretical studies of the adsorption of small molecules on transition metal single crystal surfaces
Supramolecular structures in solutions
Structural studies of water-acetonitrile solutions
Study of the UV photodissociation of CH_2BrCl molecule by theoretical methods
Mechanistic studies on the reactions of carbon dioxide and alcohols yielding dialkyl-carbonates
Theoretical study of catalytic hydrogenation in aqueous solutions by theoretical calculations
Revealing the mechanism of organocatalytic reactions by theoretical calculations

Laboratory of Mass Spectrometry

CRC INSTITUTE OF MATERIALS AND ENVIRONMENTAL CHEMISTRY

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The main research areas of the Institute are as follows:
- materials chemistry,
- environmental chemistry.

Materials chemistry

The research in materials chemistry in IMEC is aimed at revealing chemical aspects of materials science and technology, a typical scientific field of interdisciplinary nature. In this context, special attention is devoted to correlations among composition, micro- and macrostructure, properties and synthesis/production of functional and structural materials. Models include self-organizing surface layers, surface coatings of special properties, functional microgels, different polymers and copolymers, micro- and nanostructured monolithic and composite materials, metallic structural materials, and also micro- and nanosized ceramic powders and ceramics produced from them.

The main research topics are as follows:

Formation of nanolayers in ion and plasma beams
Synthesis of micro- and nanosized materials in thermal plasmas
Mechanism and kinetics of electrochemical and corrosion processes
Synthesis of metal complexes and studies on their biomedical applications
Studies on correlations among structure, property, synthesis and processing of commercial polymers
Synthesis and characterization of novel polymeric systems
Studies on correlations among synthesis, structure and properties of novel polymer composites

Environmental chemistry

Research in this field is aimed at generating chemical knowledge and developing new methods of environmental protection to decrease environmental impact due to human

activities. The research topics cover new analytical methods and devices to be used in complex environmental systems, studies on decreasing the environmental effects of energy production both from traditional and renewable sources, processing of wastes and hazardous materials, and development of new materials, processes and technologies of minimum environmental impact.

The main research topics are as follows:

Pyrolytic and chemical recycling of plastic wastes
Utilization of biomass materials by thermal methods
Research in environmental technologies
Research on the more efficient utilization of solar energy
Processing of halogen-containing organic materials and vitrification of hazardous wastes in thermal plasmas

RF thermal plasma reactor for materials synthesis and waste processing

CRC INSTITUTE OF ISOTOPES

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Entrance of the Institute of Isotope and Surface Chemistry, Chemical Research Center

The Institute contributes to the following main research fields of the Chemical Research Center:
- surface chemistry and catalysis,
- nuclear and isotope chemistry.

Research activity of the Institute is focused on the field of surface science and catalysis, and nuclear chemistry, with special emphasis on the multilateral cooperation of the two fields: application of nuclear techniques in the surface chemistry and utilization of the knowledge gained by nuclear chemistry in surface chemistry and catalysis.
In the last years the interest in surface chemistry and catalysis increased towards nanoparticle containing catalyst systems. In this peri-

od the application of Mössbauer spectroscopy methods gained increased interests, as well. In nuclear sciences cold neutron researches and development of novel methods of nuclear safeguard have been emphasized. The latter is motivated by demands of defence against nuclear terrorism and requirements formulated in the Additional Protocol to the Agreement between Hungary and the International Atomic Energy Agency in the framework of the Treaty on Non Proliferation of Nuclear Weapons.

Surface chemistry and catalysis

The main concern is relation between the structure of the catalyst, in particular, the surface structure and the catalytic properties. The research topics are as follows:
Preparation of nanostructured model catalysts, mono- or bimetallic clusters, atomic/molecular level investigation of their morfology and electron structure and their structural changes (restructuring, segregation etc.)
Study of the metal/oxide interfacial interaction in chemisorption of CO, NO, CH_4 and other hydrocarbons
Investigation of relations between surface composition, electronic state, adsorption ability and catalytic activity of zeolite supported mono- and bimetallic catalysts in CO hydrogenation including PROX, oxidative dehydrogenation of methane in the presence of N_2O and reaction of environmental interest (e.g. decomposition of NO_x)
Study of synergism on supported bimetallic nanoparticles prepared by different (including colloid chemical) methods in C-H activation (e. g. CH_4 homologation), oxidation of CO or hydrocarbons, hydrogenation of dienes
Investigation of the effect of catalyst modification by adspecies on chemo- and regio selectivity in selective hydrogenation reactions
Study of molecular structure - catalytic properties relationships in metal/MO_x and WO_x systems to reveal the role of sulfur uptake in hydrodesulfurization and hydrodeoxidation
Study of hydrogenolysis, isomerisation, aromatisation, dehydrocyclisation of hydrocarbons on supported and unsupported catalysts and the dependence of catalytic characteristics of mono- and bimetallic (Pt-Pd, Pt-Ir, Pt-Ge, Pt-Sn, Rh-Ga, Ir-Ca) catalysts on the chemical composition and physical properties

Nuclear and isotope chemistry

Research topics cover nuclear analytical and chemical research and study of fissionable nuclear materials as follows:
Development of PGAA technique: improvement of the selectivity and sensitivity, development of portable version. Extensive study of elemental composition of archaeological, geological, catalyst and industrial samples
Extension of PGAA techniques for the study of fissionable nuclear materials (fissionable materials, fis-

sion products, materials for transmutation by accelerator driven systems or 4th generation reactors
Development of new techniques for studying materials with cold neutrons (Mössbauer-spectroscopy with sources excited by neutrons)
Determination of Pu content of Pu-Be sources by gross and coincidence counting of neutrons. Detection of fissionable materials in smuggled samples using neutron-interrogation techniques with measurement of delayed neutrons. The goal of these works is to determine the fissionable content of unknown composition (confiscated, discovered) samples for national safety control
Analysis of nuclear material of unknown origin (illicit trafficking). Determination of isotopes of uranium and other actinides, analysis of trace elements
Assessment of nuclear material collected on filters and swipes or contained in other safeguards related samples
Analysis of long-lived radionuclides in environmental samples
Study of the laser ablation technique
Research topics cover interaction of ionizing radiation and matter (gam-

Ion current plasma spectrometer combined with mass spectrometer for analyzing trans-uranium isotopes

ma and electron irradiation) as follows:

Study of the kinetics of radiation induced chemical reactions (hydrocarbon reactions, reactions of inorganic and organic substances, polymerization in aqueous solutions and in organic solvents)

Radiation purification of wastewaters

Synthesis of hydrogels and new functional polymer supports for various biomedical and environmental applications

Development of new dosimetry systems using optical absorption, emission or conductivity readout for radiation technological, medical and environmental applications

New solid-state dosimeters, development of LET dependent dosimeters

Radiation resistance of optical and electronic devices with aiming at the development of radiation resistance tests

Materials science

Polymerization kinetics studies on some acrylic and methacrylic esters by pulsed radiolysis and design of new polymer composites

KFKI ATOMIC ENERGY RESEARCH INSTITUTE

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Scope of activities

The main activities of the institute, according to its foundation document and in accordance with the atomic law of Hungary, are research and development in reactor physics, fuel behaviour, thermohydraulics, health physics, real time information and operator aid systems, reactor simulation, deterministic and probablistic analyses of reactor safety, safety aspects of the transport and storage of nuclear material, severe accident analysis, radiation damage of materials, fracture mechanics, risk assesment, analytical chemistry, reactor diagnostics and leak detection

Further important research and development activities are in the deterministic and probablistic analysis of dangereous industrial systems, in the environment protection, in risk assesment, in analytical chemistry, physical chemistry, acoustic emission methods, in reactor-electronics and in space electronics.

Operation of the Budapest Research Reactor, according to the atomic law and other regulations, operation of the cold neutron source, organization of the national and international utilazation of the research reactor, including the relevant technical activities, research and development in the field of neutron radiography, neutron reflectometry, neutron activation analysis and study of the biological effects of radiation belong to the activities as well.

Organization of the emergency prepardness at the site, providing the technichal basis for emergency perpardness and nuclear accident management of the country, operation and continous development of the environment monitoring system of the site are important as well.

Participation in gradual and post gradual education.

Research aims and topics

Reactor physics

- investigations in reactor safety
- research of new fuel types
- new methods for spent fuel handling (transmutation)
- calculations for Generation IV reactors

Fuel and reactor material studies

- small scale severe accident experiments
- investiagtions of the corrosion speed on the surfaces of NPP equipment with the aim to determine the optimal water chemistry parameters
- pressurized thermal shock (PTS) studies
- fuel studies for Generation IV reactors

Thermohydraulics

- investiagtion of the possible use of CFD codes in reactor safety studies
- feedwater loss experiments (on PMK experimental device) for the validation of the steam generator models, used in thermal hydraulic system codes
- validation research in thermal hydraulic system codes
- investigations for Generation IV reactors

Development of opeartor aid systems for nuclear power plants

- development of the critical safety function monitoring system
- joining the core monitoring and the reactor protection systems
- development of the information system in the crisis center of the Hungarian Atomic Energy Authority

Simulation studies for nuclear power plants

- development of a joint two-phase 1D thermal hydraulic - 3D reactor physics system
- elaboration of a new finite difference lattice Boltzmann system

- investigation of the phase transition process in finite systems – by two phase flow experiments

Health pysics and environmental research

- development of action supporting softver for nuclear accidents
- estimation of the environmental effects of fossile electricity production
- dose mapping in space electronics

Material studies

- resaerch of the liquid structure of partially solving fluids
- investigation of the effects of mechanical stresses on general corrosion
- applying neutron radiography for the investiagtion of large objects, usual in industry
- material studies for fusion equipment and Generation IV reactors

Scientific and technical utilization of the Budapesi Research Reactor

- development of the research equipment at the research reactor
- development of new neutron polarizers
- more effective inclusion of the scientists from the European Union into the reaserch at the reactor
- more effective use of the time of flight spectrometer

KFKI RESEARCH INSTITUTE FOR PARTICLE AND NUCLEAR PHYSICS

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Scope of activities

Fundamental experimental and theoretical research in high energy nuclear and particle physics, heavy ion physics, plasma physics, physics of cooled atoms, space physics, nuclear solid state physics, materials sciences, computational neuroscience, application of physics in biology. Applied research and development in the field of laser techniques, ion beam microanalysis, space electronics, fast data processing, optical and X-ray spectroscopy. Most of the institute¢s work is connected with the so called "big sciences", which are realized within the framework of international cooperations. The Institute is the host institution of the Hungarian Association EURATOM - Hungarian Academy of Sciences participating in the fully co-ordinated Europena programme for the development of useful fusion energy.

The Computer Networking Centre is working as a department of the institute. Its responsibility includes the management of the local campus network, the connection to the wide area networks and providing information services to the whole campus. It also operates the "Budapest" LHC Grid system of 100 processors recognized by CERN as a Tier-2 one node. The institute is entitled to act as a Certificate Authority for the Hungarian community for Grid research.

Research aims and topics

Ultrarelativistic heavy ion physics and particle physics

The fact that Hungary is a member state of CERN basically determines the main trends of research of the institute. Research topics:

- research for quark-gluon-plasma in the CERN NA49 experiment and in the PHENIX experiment (RHIC, Brookhaven)
- development of hardware elements for the planned CERN LHC experiments (ALICE, CMS)
- participation in the LHC Computing Grid Project
- data analysis for the L3 and OPAL experiments (LEP)
- investigation of relativistic heavy ion collisions in GSI-Darmstadt

Thermonuclear plasma physics and laser physics

- pellet-plasma interaction
- plasma turbulence studies
- development and utilization of various neutral particle beams including accelerated Lithium-beam and laser blow-off for plasma diagnostics
- keep in touch activity in Inertial Fusion Energy
- the collisions and interaction of atoms and molecules with the laser radiation.

Space physics

- Scientific interpretation of the data from former and ongoing space missions (VEGA, PHOBOS-2, ULYSSES, SOHO, CLUSTER, CASSINI).
- Development of on-board devices, software and ground support equipment for future space missions (VENUS EXPRESS, OBSZTANOVKA, STEREO, BEPI COLOMBO)
- The institute provides infrastructure and manpower for the Hungarian CLUSTER Data Centre and for the Expertise Centre for ROSETTA Lander software system.

Theoretical physics

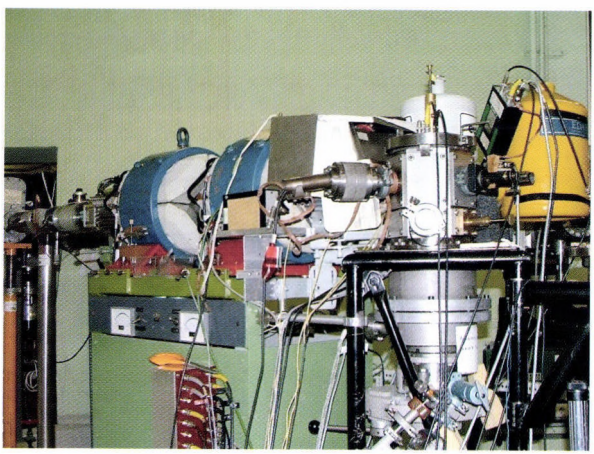
- Relativistic heavy ion collisions
- Elementary particle interactions: quark confinement, Higgs-particle, W decay.
- Quantum field theory: integrable models, lattice models.
- General relativity and gravitation: new solutions of Einstein¢s equation, black hole final states, quantum gravitation.
- Few-body problem in nuclear physics.

Materials science

- Utilization of methods of nuclear physics to determine the structure of materials and of microscopic processes determining the macroscopic properties (semiconducting thin layers, surfaces and interfaces in thin magnetic layers, fundamental processes in ion implantation, defect structures in semiconductors and insulators, porous systems with extended internal surface). The recently installed Molecular Beam Epitaxy (MBE) device opens new perspectives in this field
- Development of the methodology of nuclear condensed matter physics mainly based on the institute¢s accelerators recently upgraded with a proton microbeam, Mössbauer- and positron annihilation laboratories as well as on external synchrotron radiation laboratories. The methods are based on (partly in situ) ion beam analytical techniques, on resonant and non-resonant interaction of gamma or synchrotron radiatiton and of positrons with condensed matter.
- The application of various nuclear methods including the proton microbeam for elemental mapping and for the analysis of archeological and fine art objects.

Computational neuroscience and nuclear biophysics

- Mathematical modeling and simulation experiments of the functional organization of the hippocampus.
- Multicompartmental single cell modeling considering the time-dependent kinetics of different ionic channels
- Theoretical investigation of the mammalian olfactory system
- Study of the concentration, distribution and binding of essential (or toxic) trace elements in proteins and enzymes in order to clarify their structure and function by combining special nuclear analytical techniques with biochemical separation processes.



The Molecular Beam Epitaxy (MBE) device

The proton microbeam of the 2 MV Van de Graaff accelerator

RESEARCH INSTITUTE FOR TECHNICAL PHYSICS AND MATERIALS SCIENCE

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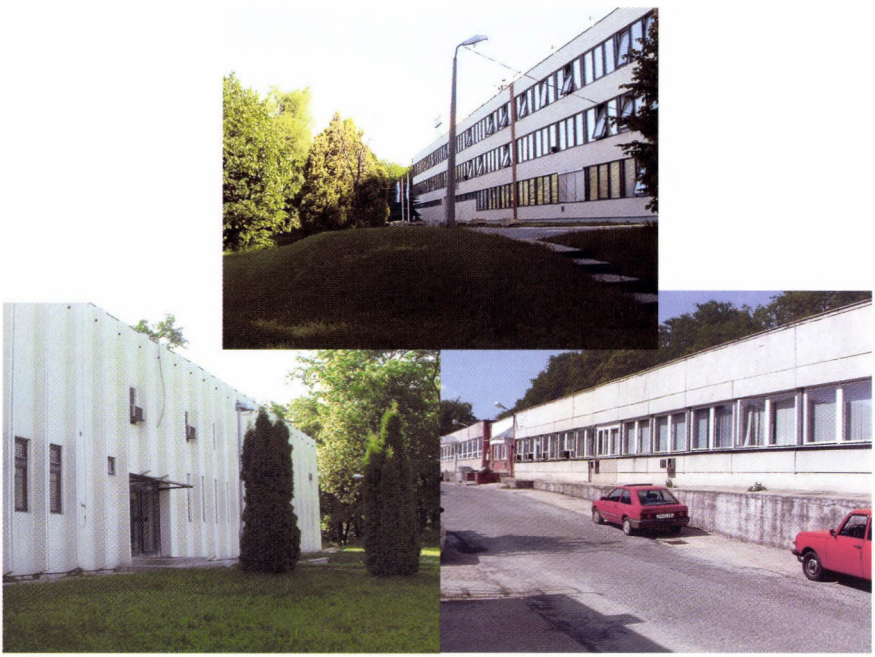


General research building

The institute in its present form was organized in 1998 at the KFKI Campus by a merger of the Research Institute for Technical Physics and the KFKI Research Institute for Materials Science with a *mission* to perform basic, targeted and applied research in modern materials science with a focus on complex functional materials, integrated micro-nano-devices and systems, for basic physical, chemical and applied research and the development of experimental techniques for preparation, modification, and structural analysis of materials. Intense partic-

ipation in undergraduate and graduate education at major Hungarian universities, scientific contacts with SME-s and with other industries are of high priority.

The institute (main building on top), with a scientific staff of eighty, and a technical/financial staff of fifty, has four scientific departments, which are described as it follows:
The main efforts of the STRUCTURAL RESEARCH Department are directed in the exploration of atomic processes, taking place in thin films, small particles and surfaces during growth, thermal treatment, ion bombardment and solid state reactions. For this purpose we use methods like transmission (analytical: EDS, also EELS from the end of 2005 and high resolution) electron microscopy, AES in combination with depth profiling and EPES in our own laboratories and STM/STS, X-ray diffraction, Scanning electron microscopy and FIB as well as XPS in co-operation with other laboratories of the institute. We grow thin films by thermal or e-beam evaporation and DC- sputtering in both HV and UHV systems.

The main topics are as follows:
- Atomic models for structural and morphological development of one and two-component thin films and composites
- Nanocomposite coatings: structure and properties
- Phase analysis of nanostructures, development of methods.
- Process Diffraction program for analysis of diffraction patterns.
- Nitride based and other wide band gap semiconductor structures, defect engineering and contacts.
- Molecular Dynamic simulation of the atomic mixing of bilayers
- Determination of the electron mean free path by EPES and surface correction.
- AES depth profiling.
- Investigation of ion induced surface damage by plasmon spectroscopy.
- Ion bombardment effects on surface morphology.
- Gold nanocrystals. Their catalytic effects investigated by XPS.
- Self organized nanostructures of FeSi, growth and properties.
- Medical implants. Optimization of the surface structure.
- Ion guns and ion milling. TEM sample preparation, cross section samples.

Microtechnology Department

Research and development of physical, chemical/biochemical sensors and integrated systems:
- MEMS and MEMS related technology, with special emphasis on development of Si CMOS compatible processes for monolithe integration.
- Development and applications of near IR light emitting diodes and detectors.
- Solar cells and their competitive technology.
- Acoustic wave devices and their application.

Fundamental research on:

- sensing principles
- novel materials and nanostructures
- novel 3D fabrication techniques
- ion-solid interaction for supporting MEMS development.

Device and material characterization

Photonics Department

The technology of generating and harnessing light and other forms of radiant energy whose quantum unit is the photon. The science includes light emission, transmission, deflection, amplification and detection by optical components and instruments, lasers and other light sources, fiber optics, electro-optical instrumentation, related hardware and electronics, and sophisticated systems. The range of applications of photonics extends from energy generation to detection to communications and information processing.

- ellipsometry
- Makyoh topography
- magnetic and induced current measurements
- measurement of fundamental optical properties
- spectral sensitivity of detectors and sensors
- liquid phase epitaxy
- cardiologic diagnostic and modeling

Nanotechnology department

The research activities range from the atomic level characterization and modeling of individual nanostructures, growth of carbon nanotubes and carbon nanotube type nanoarchitectures, nanometer scale FIB machining, through the use of nanostructures in high performance ceramics, nanocomposites and sensors to the modeling of complex processes of interaction and self organization. The Nanotechnology Department is active in several basic domains of the emerging nanotechnology:

- Carbon nanostructures
- Natural photonic crystals
- SPM/STM/STS & computer simulation
- SEM/EDS/FIB
- Silicon nitride
- Carbon nanotube ceramic composites
- Biocompatible ceramics
- HIP sintering
- Driven lattice gases
- Evolutionary prisoner's dilemma games
- Analysis of folk music and birdsong
- Non-equilibrium phase transitions

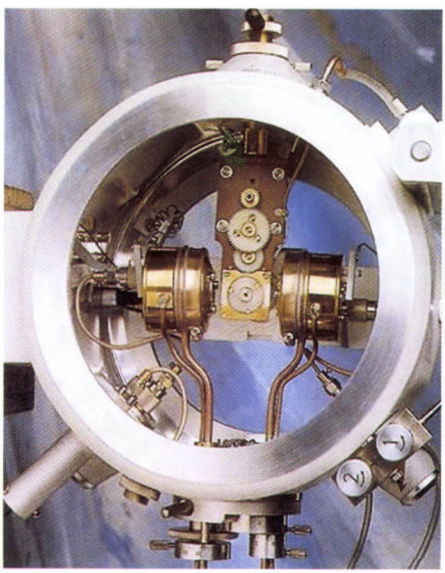
The institute aims at acting as a regional centre in the following areas:

- micro- and nanotechnology in conjunction mainly with informatics and telecommuni-cations,
- integrated and micromachined sensorics
- research of thin films and lower dimensional structures with their applications
- structure analysis with tools handling nanoscopic dimensions, especially, in diverse forms of electron microscopy and in ion beam techniques

In addition to basic studies funded by the Hungarian Academy of Sciences and the National Fund for Basic Research (OTKA), MFA became partner in seven consortia in 6th Framework program of the European Union, runs and participates in two NATO projects. Heads one and is part of thirteen further consortia for technology-oriented research projects funded jointly by the Government of Hungary and by the targeted enterprises. Also, as a daily exercise for its technology labs, MFA runs some small scale production and delivers chips for pressure transducers, SAW filters for TV, and sintered ceramic parts for products of GE Lighting.

List of major projects: European Commission, 6th Framework

- NENAMAT, Network for Nanostructured Materials, SSA
- SEMINANO, SEMICONDUCTOR NANOCRYSTALS, NMP4
- NAPILIS, Nanocomposites for Piston/Liner Systems, NMP3
- INNOVATIAL, Innovative processes and materials to synthesise knowledge-based ultra-performance nanostructured PVD thin films on gamma titanium aluminides, IP, NMP3
- FOREMOST, Fullerene-based Opportunities for Robust Engineering: Making Optimised Surfaces for Tribology, IP, NMP3
- CADRES, Co-Ordination Action On Defects Relevant To Engi-



Extreme low-energy ion gun for artifact-free surface layer removal

neering Advanced Silicon-Based Devices, IST
- BIOPHOT, Complexity and Evolution of Photonic Nanostructures In Bio-Organisms: Templates for Material Sciences, STREP, NEST.

NATO Science for Peace

- Opto-electronic devices based on the protein bacteriorhodopsin
- Surface Acoustic Wave Devices on Ceramics (CERSAW)

National Research and Development Programmes (NKFP)

- Development and application of functionalized surfaces for specific biochemical and chemical systems
- Nanotechnological material modification and metrology
- On-site analysis of underground water and soil with micro- and nano-sensing systems
- Development of high resolution bioelectrical imaging for the source-activity of brain: Investigation of the placticity of brain

Thematic R&D programs in the field of applied research (AKF):

- Intelligent physiological state-monitoring and remote control system
- Removal of low concentration hydrocarbon polution
- Laser-writing logistic codes in metal objects and its read-out by electromagnetic method
- Measurement of electromagnetic compatibility in closed space
- Development of new generation ion guns and ion milling devices
- Multispectral imiging reflectometer

RESEARCH INSTITUTE FOR SOLID STATE PHYSICS AND OPTICS

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Home page: http://www.szfki.hu

The building of the institute

The Institute hosts the KFKI Condensed Matter Research Centre (KFKI-CMRC), an organisation founded by four academic research institutes to co-ordinate the research activity in the field of condensed matter physics and application at the KFKI campus. In 2000, the KFKI-CMRC has been awarded by the title "Centre of Excellence" by the European Commission within the 5th Framework program.

Scope of activities

Basic research in the field of *theoretical and experimental solid state physics*, including the physics of condensed materials, nanostructures, thin films and surfaces and also in the field of *theoretical and experimental optics*, including the physics of optical crystals, non-linear and quantum optics as well as laser physics.

Applied research, including the development, study and applications of specific *new materials,* new *test methods,* new *optical crystals, thin film devices* and *lasers.*
Development of *unique research methods* concerning basic research activities.
Graduate and postgraduate *education.*

Research aims and topics

Theoretical solid state research

- *Theoretical study of strongly correlated systems:* Properties of low-dimensional magnetic models, using both analytical and numerical methods. Low dimensional fermionic models, especially the one and two dimensional Hubbard and t-J models.
- *Theoretical study of complex systems:* Phase transitions and scaling. Numeric research of systems with stochastic dynamics. Quantum-many body systems. Non-linear systems; calculation of important - mainly non-linear - properties of gases exhibiting Bose-Einstein condensation.
- *Theoretical study of electronic states in solids:* Development of band structure methods. Stability of structures and surfaces, elastic properties from first principles. Magnetic properties of surfaces. Properties of spin- and charge density waves. Strongly correlated electron systems. Superconductivity in mezoscopic systems.

Experimental solid state research

- *Investigations of non-equilibrium alloys:* Study of the macroscopic magnetic properties and the characteristics of the local atomic environments in order to clarify their relation in melt quenched bulk spin-glasses and granular structures. Study of formation of the nanophases with special magnetic properties; formation of nanocrystals from the amorphous state in different processes. Besides the magnetic studies, the samples will also be investigated by calorimetry, Mössbauer spectroscopy, and other methods.
- *X-ray diffraction:* Synthesis and structural studies on high charge state C60-alkali polymers. Structural studies of alkaline-earth-metal C60 compounds, especially concentrating on the superconducting compositions. Experimental study of the atomic structure and chemical bonding by the combined use of x-ray diffraction and infrared spectroscopy. Field theoretic study of first order phase transformations. Experimental and theoretical study of atomic resolution X-ray holography. Theoretical study of atomic level imaging of small non-periodic systems.
- *Electron crystals:* Study of the ground state collective excitations and the origin of the non-Fermi-liquid behaviour of the metallic phases in organic conductors by measuring superconductive properties and NMR parameters.

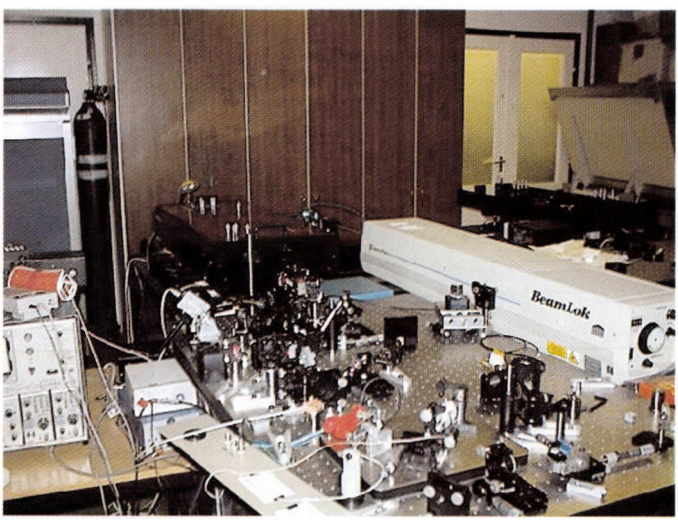
- *Liquid crystal research:* Study of pattern forming instabilities in nematic and smectic liquid crystals induced by different applied fields (electric, magnetic, temperature, concentration and velocity gradient). Synthesis of deuterated liquid crystals and polymers and their study by 2H NMR spectroscopy. Synthesis and study of ferroelectric liquid crystals formed by bent shaped molecules. Light induced reorientation and alignment of dye-doped liquid crystals. Rheological investigations of liquid crystals.
- *Metal physics*: Investigation of metal-hydrogen and carbon-hydrogen systems (in-situ measurement of H content, study of the electronic structure of hydrogen, the H-H distance and hydrogen mobility). Research in the field of spin electronics on electrodeposited nanostructures: study of giant magnetoresistance (GMR) in nanoscale magnetic/non magnetic multilayers tunnelling magnetoresistance (TMR) in ferromagnet/insulator/ferromagnet nanostructures. Study of hydrogen diffusion behaviour in steels by electrochemical permeation technique. Research on soft magnetic nanocomposites prepared by rapid quenching and ball milling for understanding magnetic coupling phenomena and the application of such materials in electronic devices.
- *Neutron spectroscopy:* Neutron diffraction and inelastic scattering investigations of short and medium range ordering, nanoscale structure and atomic/molecular interactions in metals, alloys and composits, as well as in soft and liquid materials (solvents, suspensions gels, ferroliquids, micelles etc). Strain distribution, texture and surface properties in model and real materials and objects with industrial relevance, medium and short range structure of amorphous semiconductors. Study of atomic resolution neutron holography and neutron optical phenomena (e.g. standing waves). The development of novel neutron physical devices and technologies, installation of new experimental stations
- *Neutron diffraction:* neutron powder diffraction studies of crystalline systems of technological importance (laser crystals, zirconium based alloys, nanocrystalline magnetic materials). Refinement of the crystalline structure by Rietveld analysis. High resolution neutron diffraction investigations of residual stresses and texture. Structural studies of liquids and amorphous materials by neutron diffraction. Development and extended application of inverse methods, mainly of the Reverse Monte Carlo method, for modelling structural disorder. Basic and applied research in the field of neutron radiography. Development of instruments for neutron diffraction and neutron radiography.

Theoretical optical research

- *Non-linear and quantum optics:* Quantum state engineering and reconstruction. Non classical light, non-linear optical processes. Cavity quantum electrodynamics and atom optics. Quantum informatics. Oscillator systems, molecules, atom traps.

Experimental optical research

- *Interactions of intense laser fields with matter:* Experimental revealing and theoretical interpretation of the fundamental photon-electron interaction processes induced by superintense, ultrashort laser pulses. The measurement of quantised spectra for both high energy photoelectrons and high harmonic light beams. Development of attosec light pulses from the latter beams.
- *Laser physics:* Modelling of basic processes of gas discharges and gas lasers by means of Monte Carlo simulation. Development of high power UV gas lasers using cathode sputtering in segmented hollow cathode discharges. Development of gas discharges with new geometry. Research on optimum output coupling of microdisc lasers. Investigations of the electrolyte cathode atmospheric glow discharge; plasma light emission mechanisms and plasma-electrolyte interface processes. Investigations of the optical parameters of noble metal and dielectric thin layers by means of attenuated total reflection (ATR) method. Development of the optical STM.



Setup for generation of ultrashort laser pulses

- *Laser applications:* Development of diode laser pumped solid state lasers by using new active materials with broad absorption band. Development of optical measuring devices for the determination of size distribution, concentration and electrical charge of particles of submicron and micron size. Application of these instruments in environment monitoring and medicine. Development of experimental equipment for the generation of entangled photon states. Determination of quantum efficiency of photodetectors using entangled photon pair, without standards. Preparation of various hydrogenated and hydrogen-less carbon nanostructures and films by plasma enhanced chemical vapour deposition (PE-CVD) and pulsed laser ablation (LA) methods. Investigation of the structure and various properties of these materials by Raman scattering, optical absorption in both visible and infrared regions, photo-luminescence and electric conductivity. The application of a femtosecond pumpe-probe measuring system for time resolved spectroscopy of semiconductor nanostructures as well as biological and chemical samples. Linear and non-linear optical studies of photonic crystal structures and nanostructures. Submicron material processing of diamond like carbon films with femtosec pulses.
- *Optical thin films:* Theoretical and experimental investigations on the performance of chirped dielectric mirrors such as bandwidth, smoothness of dispersion function and stability. Investigation of the optical coating materials and their deposition technology used in femtosecond laser mirrors. Development of optical coatings for diode pumped solid state lasers. Development of low loss laser mirrors for UV metal vapour lasers.
- *Crystal technology:* Growth of pure, doped and nano-periodic structured non-linear optical (NLO) crystals by melt and high temperature solution techniques. Characterisation of the crystals by chemical analytical, microscopic, etching, optical and absorption spectroscopic methods. Study of physical properties important in the NLO applications as a function of material parameters (stoichiometry, dopants): nonlinear optical processes, photorefractive and photochromic phenomena, and photoemission.
- *Crystal physics:* Investigation of the real structure and physical properties of crystals. In particular, studies of the effect of dopants, growth and irradiation induced real structure on the photorefractive, photochromic, dielectric and spectroscopical properties, including also magnetic resonance.

Graduate and postgraduate education

The scientists of the Institute take part in the graduate and postgraduate education at the following universities in Hungary:

- Budapest University of Technology and Economics, Eötvös University of Sciences, University of Pécs, University of Szeged, University of Debrecen. Research activity of about 30 - 35 PhD students is supervised regularly by scientists from the Institute.

ALFRÉD RÉNYI INSTITUTE OF MATHEMATICS

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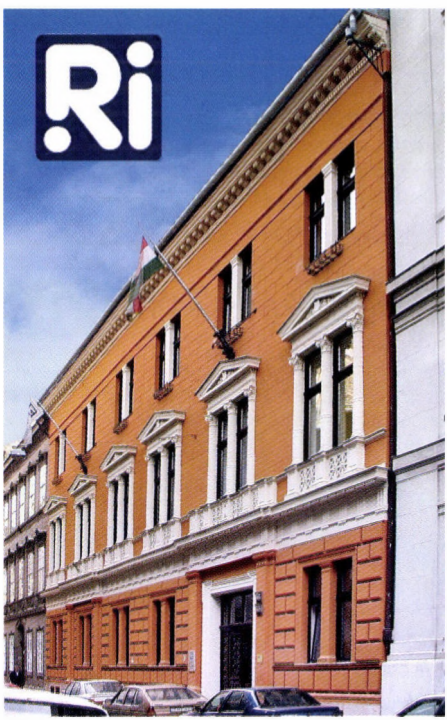
About the Institute and its activities

The principal purpose of the Institute is to perform high level research in mathematics and its applications, concentrating on theoretical studies inspired partly by the internal development of mathematics and partly by applications of mathematics in other sciences. The scientific output of the Institute is well certified by the research papers published by its research fellows in leading international mathematical journals. The Institute also participates in applied research by cooperating with industrial enterprises.



In addition to research, the Institute provides active support for mathematics education from the undergraduate level to graduate and beyond, as well as aims to contribute to progress of mathematical culture in general. In particular, its research fellows teach at various universities of the country, participate in postgraduate education and provide for professional development of mathematicians working at other institutions. Starting the academic year 2001/2002 a new PhD program has been launched by the Institute jointly with the Cental European University.

To promote high level research and education, the Institute often hosts programs of shorter duration such as workshops and conferences, summer schools, as well as regularly scheduled seminars. It also organizes postgraduate courses, publishes textbooks and offers visiting research positions.

Research topics pursued include

- Algebra
- Algebraic geometry
- Algebraic logic
- Approximation theory
- Cryptography
- Discrete mathematics
- Functional analysis
- Geometry
- Information theory
- Mathematical statistics
- Number theory
- Probability theory
- Set theory
- Statistical physics
- Topology

More information about the Institute and its activities can be found at *http://www.renyi.hu*

COMPUTER AND AUTOMATION RESEARCH INSTITUTE

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Fields and activity at the Institute

SZTAKI is a base of informatics, in the broad sense, a national research centre of information technology, computer science and their related fields. Primarily, the technical-scientific and mathematical issues of informatics are investigated, with consideration and attention to fields related to the above fundamental questions, potentially endowing them with incentive, disciplinary bases. Above pursuing comprehensive basic- and applied research, the transmission of the acquired particular experience to R&D, system design and system integration, furthermore, to consulting and software development is a major obligation.

Research aims and themes

Mathematics and computer science

In *combinatorial computer science* research is focused on the constructive integration of combinatorics, computer science and further branches of science. The aim is to achieve novel scientific results, applicable in practice as well, in the fields of graphs and hypergraphs, communication networks, theoretical computer science, algebra and algebraic logic. The same is true in connection with research in *stochastic systems* where financial mathematics and research related to the statistical examination of hidden Markov-chains are emphasised.

As to the field of *operations research*, we intend to proceed with the study of the theory of equilibrium systems, and smooth optimisation, as well as with the examination of optimisation algorithms of large systems and the investigation of differential algebraic equations. From among the problems of decision systems, the mathematical foundation of models applicable in multi-attribute group decision support, furthermore, solving problems of environment protection are highlighted.

In *symbolic computation* research on the algorithmic exploration of the structures of group-representations and modulus is to be continued. In the field of the *mathematics of internet*, its algorithmic relations, data-mining tools are investigated for the analysis of network traffic. Research and application of *cryptographic algorithms* are also regarded an important area.
Research is carried out in *bio-computing*, primarily in *molecular* and *membrane (cellular) computing*. The aim is to develop unconventional, powerful computational models inspired by molecular biology and biological phenomena.

In the *machine learning* field, the research on *reinforcement learning algorithms* is in the foreground with a number of potential applications.

Information Technology

In the field of *Analogic CNN* (Cellular Neural/nonlinear Network) *computing or cellular wave computers*, basic research activity is continued on the complexity of analogic spatio-temporal computers, the physical implementation of analogic cellular computers, the theory of analogic cellular algorithms, and on integrated multi-modal sensing-computing-perceiving, analysing and navigation systems. From among the potential application areas, here, telepresence-added, ultrasound-based heart diagnostics and modular, multi-sensor perception, surveillance and identification are emphasised.

Bi-i (see figure below) is an extraordinarily high-speed, compact, standalone, industrial vision system utilizing state-of-the-art sensors and processors. Its core technology is the

ultra-high-speed, bio-inspired Cellular Neural Network (CNN) based cellular visual microprocessor chip, developed by IMSE CNM, our partner academic research institute in Seville, Spain. The Bi-i vision system can capture and process up to 50,000 images in a second. The previous Bi-i vision system won the Product of the year award at the Vision 2003 Industrial Fair in Stuttgart.

In *distributed systems* research goes on in the further development of digital library architectures and semantic web-based services.

In *Grid systems* research is done in the following themes: scaling of information systems, flexibility of checkpoint mechanisms, monitoring of Grid systems and graphical program-development.

Research, design and monitoring activities in *computer networks* are considered crucial tasks also in the future, with special emphasis on network safety issues.

High-resolution digital restoration of movie pictures is a new R&D field at the Institute for correcting all different errors and damage of the pictures and sound of old, possibly worn out films.

Automated control systems

Systems and control theory serves as basic science in automated control systems. Accordingly, we deal with the state-space theory of linear multi-variable systems, their relation-theory, as well as the formal optimal synthesis of robust control. Our algorithms to be elaborated in connection with the theoretical problems of model-based fault-detection, control, and system reconfiguration are applied in designing control systems for road vehicles (as illustrated) and aircrafts. New methods are elaborated for the fault detection of *distributed real-time control systems* and the validation of their operation, which can be applied in the new security system at the Nuclear Power Plant, Paks.

In the field of *analysis and control of nonlinear process systems*, the starting point of our research is the thermodynamics-based, mechanics-analogue Hamiltonian description of process-systems. We intend to deal with the hierarchical decomposition-based modelling and control of compound, complex nonlinear process-systems.

In a common research project with Knorr-Bremse Research and Development Centre, integrated electronic break and anti-roll stabilisation systems are developed for increasing the yaw-roll stability of road vehicles.

Research is continued in *computer vision and geometric modelling*, in the segmentation of scanned multiple point regions, fitting of surfaces and surface-groups and the application of geometric constraints in the interest of improving reversed objects.

These processes are expected to be employed, first of all, in the car industry and medical applications.

In *production informatics* our efforts are concentrated, on the one hand, on introducing the latest results in informatics in order that all the essential data related to production should be available and manageable, in a controlled, user-dependent way. On the other hand, in *engineering and management intelligence*, techniques are investigated which are appropriate for running complex technical and economic systems operating in varying environment burdened with uncertainties. Special emphasis is laid on *artificial intelligence* and *machine learning* (intelligent manufacturing and business processes and process chains, hybrid artificial intelligence methods, constraint satisfaction, agent-based approaches, techniques based on reinforcement-like learning) for realising *real-time, cooperative production structures and enterprises.*

Inland and foreign contacts

First in the line is the distinguished title of *Centre of Excellence* granted by the EU, the significance of which is manifested primarily in the increased prestige diffused by the title, and consequently, in its influence. From among the over-seas research grant organisations Office of Naval Research, USA; National Science Foundation, USA; US Army Research Office (ARO) are highlighted.

Continuing the successful participation in the V. Framework Programme of the EU with more than 30 projects, the Institute did a good start in the *VI. Framework Programme*, by being involved in about 20 projects, till now.

Our results achieved in the *National Research and Development Programme* are also encouraging: in a significant ratio of the projects supported in the IT category the Institute acts as a coordinator or consortium member. The areas incorporate among other things: vehicle fleet management; sensing computers and telepresence; safe and optimal operation of complex industrial systems; digital techniques for the restoration of movie-films; digital enterprises, production networks; information security technology and data insurance; demand-driven information tools and systems of information society; semantic integration technologies; natural language modelling based on self-organising machine learning; topographic investigation of the cornea; real-time, cooperative enterprises; autonomous aerial survey and navigation; etc.

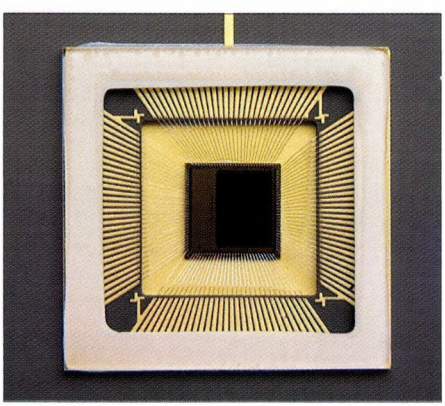
The above enumeration suggests that the interdisciplinary research and development of informatics and other branches of science (material-, life- and social sciences, mathematics, artificial intelligence, system and control science, automation, operations research) are concentrated on, which may strengthen the Institute's fame for a long period ahead. Our cooperation with outstanding large companies, such as

GE, MATAV, MOL, Nuclear Power Plant, Paks, Knorr-Bremse is broadened also through the above projects, and similarly, the participation of some small enterprises ensures that our results should get publicity in the widest possible circle.

Educational activity

Gradual and post-gradual *university education* has always been regarded as an important task associated with research, and pursued as an essential condition for future-shaping. We continue our educational activity with the following national universities (using their Hungarian abbreviations): BME, ELTE, BKÁE, VE, PTE, ME, PPKE. Generally, about 30 Ph. D. students do research at the Institute, under the scientific leadership of our colleagues. Above the co-operation schemes up to now (part-time employment of our researchers, associated departments, and co-operation in establishing faculties in informatics), we intend to devise new forms of co-operation (common chairs, possibly common doctoral schools), though our educational activity is approaching the limits of our capacity.

The new formations, e.g., *Hungarian Info-Bionic Research Centre, Hungarian GRID Competence Centre, Regional University Knowledge Centre on Advanced Vehicles and Vehicle Control, Research and Technology Council on Mobile Communication,* established by industrial firms, universities and research institutions, including SZTAKI, demonstrate the fruitful university-academy-industry co-operations.



The Bi-i vision system with the CNN chip

INSTITUTES FOR SOCIAL SCIENCES AND HUMANITIES

ARCHAEOLOGICAL INSTITUTE

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The scope of the Institute

The activity of the Institute targets the archaeology of the Carpathian Basin and the historically related areas, and the historical Hungary. The Institute aspires to span with its research activity the entire period from the Neolithic to the Late Middle Ages. In an international aspect this means, first of all, research in Central Europe (in all periods), South-eastern Europe (in the Neolithic and the Middle Ages) and Eastern Europe (in the Migration Period and the Conquest period). The study of the Roman Period is logically extended to the entire territory of the Roman Empire. Our colleagues also take part in research into the history of prehistoric religions and the Roman

period and medieval numismatics. The Institute helps the publication of the results by editing the annals of the Institute called *Antaeus*, a monograph series the *Varia Archaeologica Hungarica*, and other books and monographs. The researchers of the Institute frequently publish papers in reputed scientific periodicals of other countries and some monographs were also edited abroad. The financial background of the research programs is provided by numerous OTKA and three NKFP two Széchenyi grants.

Scientific objectives and topics of the Institute

Archaeological Topography of Hungary

The Institute accepted this program to be one of its central projects at the time of its foundation. It is a work of national importance, which is scientifically justified and necessary for the protection of archaeological sites. Ten volumes have already been edited, and three are being prepared on the sites of Békés, Fejér and Pest counties. Although originally tThe topographical work was planned to be is indispensable for certain official tasks that other institutions do not undertake, this situation has changed in th last few years: partly because the archives of sites became the task of the KÖH, partly because the colleagues at County Museums are fairly engaged with the excavations preceding motorway projects. In this way, the further investigations have somewhat slowed down.

Archaeological research into prehistoric societies and settlements

The researchers of prehistory take part in international programs first of all with the intensive multiaspectual study of smaller territories. Since 1995, a The project aiming at the recognition of the settlement history of seven thousand years has been pursued in the Kerka valley in flourishing co-operation with scientists from the neighbouring Austria and Sloveniahas been finished. The result of This work, which offereds the possibility to sketch the history of the territory between the western basin of the Balaton and the Mura region, will be published as the next (28.) volume of Antaeus. A monograph on one of the sites from the 6th Millennium BC was also published in 2004. The excavations of a seven thousand five hundred years old settlement at Szentgyörgyvölgy - Pityerdomb uncovered the archaeological traces of an until then unknown archaeological formation. An international prehistoric project has been launched in the region of Kalocsa as well. The late Copper Age cemetery of Budakalász is being analysed in co-operation with the Archaeological Institute of the ELTE and the Hungarian National Museum, monographs are being compiled on the Neolithic transformation and the dispersion of Neolithic religious concepts, the social structure of the late Neolithic based on cemetery analyses, and on cultural processes in the early and late Bronze Age. Each a monograph of finds serves the better understand-

ing of the Iron Age, that is the culture of the Scythians and the local Celtic tribes.

The Roman Empire and its borderline territories

Beside the geographically divaricate territories, a similarly diverse research field characterises the work of the scientists who are engaged in this period. Beside the study of the settlements and the ceramics of the autochtonous population of the province, an internationally acknowledged research is pursued in the field of ornamental pottery, Samian ware and Roman coins. The investigations at Almásfüzitő provide new information about the interrelation between the Celtic population and the Roman conquerors, while the settlements of Zalalövő and Zalabaksa open a view into the world of Roman villas and roadside settlements. A colleague studies the life of the Roman period barbarians in Eastern Hungary. Roman period studies are pursued outside Hungary as well: the researches of the Institute have been conducting excavations at San Potito in Italy for one and a half decade, and the internationally esteemed Nubiologist of the Institute has been studying the African manifestations of the late Roman - early Christian culture. A significant and succesful exhibition on the Koptic period in the Budapest Museum of Fine Arts has been organised by this colleague, it will open in March 2005.

Avars, Hungarians and their neighbours

The colleagues studying this topic work in a close partnership: several research fellows study the settlement history of the Carpathian Basin and the neighbouring territories in the 7th - 10th centuries, analyse the social processes of the area and their interrelations. In the near future, summary publications can be expected in the field of the eastern and south-eastern contacts of the Avar tribes, the ceramics in the Avar period and the Árpádian Era, the analysis of the Avar cemetery of Budakalkász, the 9th century remains in the princely centre of Zalavár Mosaburg and in its environment in Transdanubia, the find corpus of the Gepid, Avar and Conquest periods and the cadastre of the grave finds from the 10th - 11th centuries. The monograph to be edited about the Nagyszentmiklós treasure appeared in 2004, while and the genetic studies in respect of Hungarian ethnogenesis, carried out within the frames of the NKFP project, are significant accomplishments.

Medieval studies

For a long time, this period could be studied only within the frames of the topographic work for lack of other possibilities. Nevertheless, colleagues studying the medieval times have achieved significant results in the mapping of the earthen forts of the Árpádian Era, and in

the study of the medieval settlement system, the use of boundaries, the medieval towns of Székesfehérvár, Vác and the one at Decs, the bronze metallurgy in Transylvania and the find material from the time of the Turkish occupation of Hungary. A large-scale NKFP project won in 2001 provides a new impetus and a financial background to the monographic publication of the yet unanalysed find material of formerly unearthed castles and royal centres. This project, ending in 2005 with important publications, will provide tasks for the researchers of the Middle Ages in the Institute and the partner institutions, museums in Budapest and in the country for several years.

Natural scientific studies

Natural scientific research, which stagnated from the beginning of the 90's, have strengthened by the turn of the millennium. An anthropologist, a zoologist, a botanists and a geologist help the archaeologists with conclusions concerning the environment, the climatic and anthropogenetic characteristics of the various periods. Beside the fact that modern archaeological work cannot be imagined without information about the history of the environment, these natural scientific studies also appear as independent achievements in the international scientific life. The NKFP project which ends in 2005 yielded several new dataof major importance. The results have been and will be published in three monographs. The other NKFP project of the Institute see above.

Restoration

No research is possible without restorers' work. The metal and ceramic restorers undertake commissions from outside as well beside working on the finds unearthed by the Institute. Thus the Institute has become one of the centres for the restoration of archaeological finds from excavations preceding the construction of motorhighways in Hungary. The specialists also restore of some exquisite find units on special requests.

RESEARCH INSTITUTE FOR ART HISTORY

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Range of Activities

The Institute is a national research centre, its principal task being research into the history, monuments and documents of Hungarian art and art in Hungary from the earliest times to the present day, and also the publication of research materials in this field. In time and space the range of the Institute's activities partly overlap the scope of the collections of Hungarian museums and the objects under the protection of Hungarian building conservation, partly exceed it by focusing on the whole of historical Hungary and the activities of Hungarian artists. In the process of fulfilling its tasks concerning the explo-

ration of the national heritage, the Institute co-operates closely with the public collections. It participates in international research projects, and maintains and initiates professional relations with other countries' research institutes. As a member of the Research Institutes of the History of Art (RIHA), it takes part in research into international, European and central-European art with regard to Hungarian art. As an associated member of the Research Centre of Social Sciences of the Hungarian Academy of Sciences, it carries on interdisciplinary research.

Research into the art-historiography, and also methodological and theoretical investigations constitute an integral part of the Institute's activities. With its collections (archives, photographic collection, lexicon of Hungarian artists, collection of archival abstracts, collection of seal replicas, library), the Institute promotes Hungarian and international art historical research. In accordance with the statute of the Hungarian Academy of Sciences, it is responsible for the museological care and conservation of the Art Collection of the Hungarian Academy of Sciences and organises its exhibitions. The Institute and its members are often invited to act as experts and provide special advice.s on different scientific and cultural fields. They are active in university education and postgraduate training, and they support young scholars in their early careers. The Institute organises professional discussions within the framework of its workshop called Collegium Artium as well as other Hungarian and international professional symposia and exhibitions.

The Institute regularly brings out publications, produces syntheses and other scholarly works in the field of art history. It publishes its own periodical called *Ars Hungarica*, and is responsible for the editing of the non-Hungarian-language journal *Acta Historiae Artium* and the art historical series *Művészettörténeti Füzetek / Cahiers d'histoire de l'art*.

An important international forum for the publication of recent Hungarian research is the entries of new, professional encyclopaedias (*Saur Allgemeines Künstlerlexikon*, *Enciclopedia dell'Arte medievale*, etc.) Besides compiling the national bibliography of art history, the Institute processes Hungarian publications for the international annotated bibliography of the profession (BHA).

Objectives and Research Topics

Further research into Hungarian art history along with the elaboration of new topics, main lines of research and new points of view, as well as expanding our present knowledge and the synthesis of existing research constitute the Institute's main objective. Besides synthesising works (the most recent ones being the volumes on Hungarian art from the beginnings to 1800 and from 1800 until today respectively) eminent subjects are: the art and architecture of the

Árpád age, research into the insignia, iconographical research (Saint Ladislas, Saint Martin), codicological research and the art of the illuminated book, within the framework of international Cupertino the art of Sigismund's age and the Jagiellonian age, research into artistic representation.

18th and 19th-century topics include multiplied graphics and book illustrations (basic research and the history of their reception), garden design (Historical gardens in Hungary), the investigation of the dwelling interiors of the bourgeoisie and upper classes, the architecture of Historicism (Art and bourgeois civilisation), Hungarian self-portraits at the Uffizi Gallery in Florence.

A summary of research into 19th and 20th-century art in a synthesising volume (Hungarian art in the 19th and 20th centuries). Individual research topics with international Cupertino: László Mednyánszy, the Ender brothers, bioromanticism, Hungarian-French relations in art, the transformation of the institutional system, basic research into the activities of inter-war art organisations, comparative study of central-European Neo-classical and post-avant-garde phenomena, art-historiographical investigation from the 19th century on, Pulszky's legacy, Lajos Fülep, Ernő Kállai, Lajos Németh, basic research into Hungarian art criticism and Hungarian art historians' activities, questions of art theory and methodology, new media in the 20th century, topographic survey of the artworks in the province of the Franciscan order, research related to the reconstruction of the Esterházy palace at Fertőd, investigations concerning the whole phenomenon of contemporary art.

A view of the institute's library

INSTITUTE OF ECONOMICS

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The Institute of Economics of the Hungarian Academy of Sciences is committed to international standards of fundamental and applied research in economics. It has focused increasingly on the analysis of the modern market economy and the transformation of the Hungarian economy. Research results are made available for and are regularly used by policy making bodies and universities. The IE/HAS puts emphasis on promoting academic cooperation with other Hungarian and international research centres. It also considers as a priority to develop stronger links with university departments and to take part in the

education of the new generation of researchers.

The research programme of IE/HAS is organised around the following areas:

Macroeconomics and Growth

Macro- and microeconomic aspects of sustainable economic development, macroeconomic performance and its micro-foundations, tools and efficiency of monetary and fiscal policy, the role of institutions in economic growth.

Empirical Industrial Organisation

Market structure, firm strategies and firm performance, market regulation, regulation and sectoral policies, sectoral and firm-level empirical studies.

Labour Market

Labour market evolution in Hungary and in other post-socialist economies, employment policies and their economic and social impact, wage policies, micro-level mechanisms of macro-level processes shaping labour demand; education system and the labor market, ethnic groups on the labour market.

Economics of Pension and Households

Overlapping generations: demography, employment, education, pension systems; income and consumption of households.

Globalisation, EU-integration and Convergence

Impact of globalization, regional integration and economic growth in small open economies alternative paths of development and competitiveness in transition economies, FDI in developing and transition economies; national and international innovation systems and their impact on economic growth; EU-integration and economic transition.

Public Economics and Public Policies

Fiscal policy and the role of central and local governments in market economies, regulation and efficiency in public services, education policies and finance; tax assignment, tax competition , tax compliance; industrial relations, collective bargaining and social partnership.

Agricultural Economics and Rural Development

Transformation of agriculture in CEE countries, agricultural policy modelling, vertical co-ordination, international trade of agricultural products, price analysis (price transmission on the food market); rural development policy.

Other fields of research include: mathematical economics, history of economic thought, economic systems

Dissemination of Research Output

Regular Seminars: Economic Theory and Policy Seminar Series;

Regular Publications: Discussion Paper Series; Budapest Working Papers on the Labour Market (joint publication with the Human Resources Department of the Corvinus University of Budapest); Labour Research Volumes (one volume per year); Labour Market Yearbook (one volume per year); IE/HAS Books (launched in 2005). Publications can be downloaded from http://www.econ.core.hu.

INSTITUTE OF ETHNOLOGY

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About the Institute

The Institute of Ethnology was founded in 1967 at the Hungarian Academy of Sciences as a Research Group of Ethnography for the advancement of ethnographic, folklore and general ethnological studies in Hungary. It obtained the status of an institute in 1991 when its name also changed. The Institute has 30-32 research associates in its four departments (Historical Ethnography, Folklore, Social Anthropology, General Ethnology).

Scope of activities

1. Research in all fields of ethnology (cultural anthropology) of the

Hungarians. It involves studies in historical formation of popular culture (material culture, folklore and structure of society) of the Hungarians and in its contemporary change, moreover a comparative research of these processes with regard to other nations and societies in the Carpathian Basin, in East-Central Europe and in the wider Eurasian context.

2. Research in social anthropology of contemporary rural population and of religious and national minorities in Hungary with a comparative outlook to East-Central Europe.
3. Research in general ethnology (cultural anthropology), with focus on theories, methods and based upon personal fieldwork carried out in other continents.
4. Constructing data bases and archives of data resulted from researches mentioned above.
5. Coordination of research in major ethnological (cultural anthropological) projects in Hungary.
6. Publication of research results partly in publications of the Institute.
7. Contribution to university, graduate and postgraduate education.
8. Participation in international research projects and in joint research with partner institutions abroad.

Research aims and topics

- *Hungarian Ethnography, an eight-volume handbook.* This is a comprehensive work on Hungarian ethnography, folklore and folk society, planned for eight volumes, of which seven appeared (Magyar Néprajz II-VII. Budapest, Akadémiai Kiadó 1988-2001). The last volume includes a survey of the history of research and a historical analysis of the formation of Hungarian popular culture.

- *Encyclopaedia of Hungarian Folk Culture in English.* It is a concise volume on Hungarian ethnography, folklore and folk society. It is based on the major comprehensive series published by the Institute before or in addition to Magyar Néprajz (Magyar Néprajzi Lexikon. Bp., 1977-1982, Magyar Néprajzi Atlasz. Bp., 1987-1992.) and on subsequent research.

- *Social change in contemporary Hungarian village.* Economic transformation, restructuration of rural society, changing habits, customs and value orientation are all subjects of research based upon fieldworks, that have been carried out in various localities of the Hungarian language area (Major publications from these studies in the last years: Utak és útveszt_k a kisüzemi agrárgazdaságban, 1990-1999. Bp., 2002. Utóparaszti hagyományok és modernizációs törekvések a magyar vidéken. Bp., 2005.).

- *Historical ethnography.* Historically oriented research and investigations based upon the use of historical sources are concentrated in the

Department of Historical Ethnography, but are carried out in other departments of the Institute, too. The main research targets are: comparative analysis of the elite, popular and peasant cultures; different regions of Hungarian peasant culture on the basis of the Atlas of Hungarian Folk Culture; ethnographical lessons of "canonica visitations"; the status of vineyards in the law of winegrowing communities; publication of artisan price-lists from the 17th to the 19th centuries.

- *Research in general ethnology (cultural anthropology) and on non-European territories.* The ramifying research of the social and cultural anthropologists of the Institute focus on cultural reflections on globalization in various parts of the world and the relevance of these phenomena with regard to some central theories of socio-cultural anthropology. In addition the publication of the Encyclopaedia of Uralic Mythologies continues, as well as Hungarian ethnogenesis, shamanism, ethnic relations and conflicts in the Caucasus and in Siberia, society and mentality of a Roma group in Transylvania, economic anthropological study of the Kikuyu (Kenya), religion and social organization of the Bru (Vietnam) are topics of research.

- *Folklore Studies.* The role of folklore in literature and fine arts is under study, as well as medieval allegories in folk narrative. A complete catalogue of the motifs of Hungarian folk tales and that of folk legend is under preparation, and thezaurus of folk beliefs. An updated edition of authentic folklore text of all genres will be represented in some new series of books prepared by the folklorists of the institute. These new text collections will be published in a CD-Rom format, as well as the Institute's other publications.

Archives

Library: over 69 000 volumes of books and periodicals.
Collection of photographs: over 53 000 photos and over 11 000 slides, mainly from Hungary, but also from

Siberia, Vietnam, New-Guinea and East-Africa.

Collection of manuscripts: it includes collections and manuscripts of research associates of the Institute and gifts and bequests of other scholars, who were related to the Institute.

Audio archive: folklore recordings from Hungary, from South Slavic territories and from Ob-Ugrians mainly.

Research archives: Hungarian Ethnographic Atlas, Archive of Shamanism, Data base of the Catalogue of Hungarian Folk Tales, Archive of Ethnomedicine, Collection of Folk Beliefs.

RESEARCH INSTITUTE OF ETHNIC AND NATIONAL MINORITIES

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The Institute was originally set up in 1998 as the Minority Studies Programme of the Hungarian Academy of Sciences and became an independent research centre as of January 1, 2001.

The primary objective of the Institute is to carry out complex and interdisciplinary studies on the situation of the Hungarian and Roma minorities in the Central and Eastern European region, as well as the non-Hungarian minorities in Hungary, involving the fields of contemporary history, sociology, anthropology, sociolinguistics, law and political science. The Institute pursues basic research in the topics of bilingualisme, identities and indentity construction, models of minority self-government, minority

institutions, interethnic relations and conflicts, as well as migration processes. At the same time, the Institute carries out applied research in support of the educational, cultural, linguistic, regional and local programmes of development concerning minority community building.

Furthermore, one of the other prime objectives of the Institute are the initiation and organization of Hungarian and international programmes of minority studies, the deepening of an interdisciplinary approach to minority studies, the establishment of extensive international scientific relations and a multifarious, comparative approach to the dynamic ethnic and minority processes taking place in Central and Eastern as well as in Western Europe.

Another important goal of the Institute is to create integrated ethnic databases that can facilitate the basic and applied research on minorities. These databases are integrated in the Interethnic Knowledge Management database which can be reached through the homepage of the institute. Based on research findings, the Institute formulates conclusions and recommendations for the political decision-makers responsible for minority issues, regarding the minorities in Hungary, the Hungarian minorities of the neighbouring countries and the Roma communities. The orientation of the activities of the Institute is characterized by responsiveness to current ethnic problems, the study of fundamental ethnic processes and phenomena on the level of basic research, an interdisciplinary approach and an aspiration to international professional integration.

Mongolian Shaman

The research activities of the institute are carried out in six units: research group of Hungarian minorities living in the neighbouring countries, research group of minorities living in Hungary, research group of Roma minorities of Hungary and the Central and Eastern European region, research group for Migration and Refugee Studies, research group for Jewish Studies, documentation and data base group.

Research programs

The situation of the Roma population in Hungary at the beginning of the 21st century

Hungarian-Slovak-Roma co-existence models in Gomor region

Re-learning of the mother tongue in the minority education system

Assimilation processes in minority regions

Minority Autonomy Conceptions of the Hungarian Communities in the neighbouring countries

Transformation of the self-identity in German, Chroatian and Bulgarian families living in Hungary

Motivation background of the ethnic migration from Transylvania, Subcarpathia and Voivodina to Hungary

Hungarian as a minority language and language rights in the neighbouring countries

Political participation of Hungarian minorities in different forms of decision-making

INSTITUTE OF HISTORY

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The Scope of the Activities of the Institute

The Institute of History of the Hungarian Academy of Sciences is a research institute within the framework and under the supervision of the Hungarian Academy of Sciences. It is an independent legal entity the budget of which conforms to the statues of the Academy. It is the chief workshop of Hungarian historical research, the main Hungarian partner of international historical scholarship. The Institute was founded in 1949 and has been functioning ever since. Its predecessor was the historical section of the Teleki Pál Institute (founded in 1941).

Its main task is basic research on Hungarian history in a regional, European and global context. The Institute focuses on particularly work and time intensive projects that can most efficiently be realized within the framework of a research institute.

The Institute's Major Research Goals and Topics

The Institute focuses on themes in Hungarian history that develop historical thinking and at the same time

are relevant to international research, and embody national interest. Priority is given to the preparation and publication of reference books and source publications.

The Hungarian State in the Middle Ages

Projects in this field deal with Hungarian developments in context of the mediaeval states on the periphery of Western European Christian culture. It is a central concern of the Institute to present the medieval Hungarian state's role in world history, to reveal its regional social and economic integrative function. Among others it has produced the genealogical corpus of Hungary's leading families, as well as the collection of late medieval Hungarian place names. Work relating to Hungary's medieval lay archontology, royal itineraries, and the historical geography of the Árpád period is in progress. Work has started on a lexicon of late mediaeval Hungarian history.

The History of Turkish-Hungarian Cohabitation

The Institute carries on the old traditions of Hungarian Ottoman studies in its effort to reveal the various forms of Turkish-Hungarian political, interethnic and interconfessional cohabitation. Research is carried out inIstanbul on the sources of Hungary's Turkish occupation and hence the description of the economic and institutional framework of Turkish-Hungarian coexistence. In addition to a yearbook of Ottoman studies they regularly publish newly discovered sources (e. g. defters). A collection of castle place names and an extensive monograph on the Ottoman military in Hungary are the most recent results in this field.

Hungary in the Habsburg Monarchy

Hungary's place in the Habsburg Monarchy, its relationship to the various provinces of this empire have been in the limelight of Hungarian historical dispute for one and a half centuries. The Institute devotes substantial resources to the publication of documents relating to two major periods: the 17th century and the so called Age of Dualism (1867–1918). Most attention is paid to the history of state institutions and social history.

Reasearch on the History of Nationalities and Churches

One of the main features of the development of East-Central Europe is the high degree of ethnic and religious heterogenity. Research is devoted to the history of Hungarians who were forced into a minority status after 1918. The Institute took an active part in the founding of the Institute of Ethnic and National Minorities of the Hungarian Academy of Sciences, an interdisciplinary research center on national and ethnic identities. A number of projects in this field are implemented in cooperation with this institute. During the last decade

the institute has published a number of source collections relating to the spread of Protestantism and the role of Counter-Reformation in the Carpathian basin. Other projects deal with the social and political role of churches in 20th century Hungary.

Hungary in the Soviet Zone

Within the framework of a long term project the institute is preparing a series of handbooks on various aspects of Hungarian domestic policy and Hungary's international relations beween 1945 and 1990. Through an international network the Institute intends to become the main regional center of research into the comparative history of the Soviet zone.

The History of Modern Hungarian Society and Culture

Social history projects have been in the forefront of the institute's research work since the early1980s with the long term aim of producing a larger synthesis of Hungarian social history. Since 1989 the Institute has been publishing a series of monographs entitled Social and Cultural Studies (three-four volumes per year). The volumes of this ongoing series serve as the basis of the planned synthetic work. Subjects include urban high and lower culture just as much as rural cultural traditions and key issues of modern Hungarian intellectual history. Special attention is paid to the study of the relationship between politics and historical scholarship in modern Hungary and Eastern Europe

Handbooks

As an ongoing long-term project, the Institute publishes a multi-volume Hungarian analytical historical bibliography edited by Domokos Kosáry. Since 1991 several chronologies and other standard manuals have been published by the Institute (História Library) that are meant to assist teachers and researchers just as much as mass communication experts in an objective approach to the study of history. The two-volume chronology of modern Hungarian church history had an especially great, positive echo among experts. Among others a comprehensive historical chronology of the period between 1945–1990, and first of all a new, modern four-volume Hungarian historical chronology are in the making. One of the most ambitious projects of the institute is a Hungarian Historical Atlas to be published in several volumes together with an abridged English version.

Source Publications

Ever since it was founded, the Institute regarded it as its central task to publish the annotated sources of medieval to modern Hungarian history. They include documents relating to the activities of mediaeval kings and queens, the history of the Hungarian state, Hungary's international relations, early modern and

modern social, cultural and church history, life and work of key figures of modern Hungary. Many collections of sources will come out on CD-ROM, as the Institute has pioneered in exploring new techniques in this field

The Institute as An Organizer of Scholarly Activities

In 1986 the Institute launched a series entitled" Lectures from the Workshops of Historical Scholarship". In this framework annually 5-8 presentations on larger, important topics are discussed. These debates take place in the presence of the best Hungarian experts of the respective topics and the deliberations are subsequently published. The Institute is also a central national and international" conference organizing workshop". In cooperation with the Europa Institute Budapest and with the help of the international agreements of the Hungarian Academy of Sciences with foreign academic centres, it hosts or co-organizes 14-16 domestic and international conferences a year.

INSTITUTE FOR LEGAL STUDIES

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The predecessor of the Institute for Legal Studies was founded in 1941 by an Order of the Prime Minister; since 1955 it has belonged to the Hungarian Academy of Sciences. The Institute's research activity covers a wide range of legal topics i.e. administrative law, civil law, comparative law, constitutional law, European law, international public and private law, legal philosophy, criminal law, etc. The current research work of the Institute is based on a three-year research programme approved by the Hungarian Academy of Sciences.

The main concern of the Institute is to promote legal sciences in Hungary; in addition it assists in various form the legislation, legal practice and legal education.

Research objectives and areas

The main research topics are following
- European law and the Hungarian legal system
- Current issues of business law and private law
- Environmental law
- Rule of law and the Hungarian legal order
- The European system of protection of fundamental and human rights
- General questions of the theory of the legal system

1) European law and the Hungarian legal system. This research stream focuses on the relations between Hungarian law and European law which is relevant to the fulfillment of Hungary's obligations arising from its membership in the European Union. This research field affects different branches of law. Special attention is given to the European Constitution, to the law of competition, to the legal aspects of international cooperation in criminal matters and the struggle against organized crime as well as to the info-communication law.

2) Current issues of business law and private law. Research in this field covers in particular questions of company law, law of bankruptcy, banking law, law of civil responsibilities /torts/, law of insurance, and medical law. In private law research priority is given to studies dealing with the new Hungarian Civil Code, interrelation between private (business) law and public (constitutional) law, in general, public law of economy, administrative law, financial law and criminal law.

3) Environmental law. This research stream focuses on the link between environmental protection and criminal law, the administrative aspects of environmental protection, questions of international law connected with the preservation of the natural and man-made environment, the economic implications of environmental regulation and the related requirements of harmonization of laws, as well as the status and importance of environmental protection within the ambit of business law.

4) Rule of law and the Hungarian legal order. Research on this subject examines the following questions: theoretical and practical aspects of constitutionality and legality, study and analysis of the constitutional systems of the Member States of the European Union. European standards and the Hungarian public administration: protection of individual rights in administrative law.

5) The European system of protection of fundamental and human rights. This research subprogramme is devoted to the theoretical aspects of human rights on the one hand and, on the other, it addresses problems connected with the functioning and case law of the European Court of Human Rights and to the practice of the European Court of Justice in

Luxembourg. As part of the main topic, priority is given to problems concerning the implementation of human rights, motivated by the fact that while the norms of international and domestic law governing human rights have been elaborated in great depth, their implementation lays considerably behind the law making.

6) General questions of the theory of the legal system. In this domain the Institute is concerned with studying general problems in the operation of the legal system, such as the foundations of the legal system, gaps in law, contradictions of legal systems, legislation with retroactive effect, constitutional aspects of the legal system, and problems of constitutional review. One aspect of this research project is the study of the concept and foundation of legal culture in general and the characteristics of legal culture in Hungary.

Other activities

In addition to research and teaching, the fellows of the Institute are involved in a wide range of projects managed by other academic and governmental organizations, and they advise different governmental and non-governmental agencies as independent experts. Projects of collaboration are undertaken with Hungarian and foreign universities and research centres in various countries.

RESEARCH INSTITUTE FOR LINGUISTICS

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Scope of activities

Studies in the grammar of Hungarian, research into its history and related languages, investigation of the human language capacity, explorations in the theory of grammar, enquiry into the properties of linguistic communication, construction of comprehensive linguistic data banks, development of language technology, participation in the education of future generations of linguists, and running an information service for other research centres of linguistics in Hungary and for the general public.

Research objectives and topics

I. Grammar and Theory

Description of present-day Hungarian, investigations in the theory of grammar

Study of the structure of the lexicon as a component of a generative grammar of Hungarian, characterization of the phonological, morphological, syntactic and semantic properties of lexical items. Development of the phonological, syntactic and semantic components of a new model of grammar on the basis of large bodies of data from present-day Hungarian. Implementation of the lexical component of grammar using current procedures of computational linguistics.

Upgrading the curriculum of the Theoretical Linguistics Program of HAS/Eötvös University

On the basis of investigations in generative grammar and in theoretical linguistics, a permanent development of the curricula of the Theoretical Linguistics Program and Graduate School in Theoretical Linguistics of the Hungarian Academy of Sciences and Eötvös Loránd University, Budapest, contributing to the education of future generations of linguists.

II. Historical Linguistics

Compiling a historical grammar of Hungarian

Producing a synchronic description of the syntax of Middle Hungarian (from the mid-16th century to mid-18th century). Comparisons with the descriptions of Proto-Hungarian and Old Hungarian published in earlier phases of the same project in order to determine the lines of developments connecting them. The chapters are written on the basis of a corpus of 3,000,000 characters. A further ongoing project of the research team is the publication of annotated editions of Old Hungarian codices (including a facsimile, transliteration and a preface). A further ongoing project of the research team is the publication of annotated editions of Old Hungarian codices (including facsimile, transliteration and preface).

Uralic Studies

Computerized morphological analysis of Uralic languages: the morphologies of nine minor Uralic languages (the Ob- Ugric languages, Permic languages, Volgaic languages, two of the Samoyedic languages (Nenets and Nganasan), as well as Northern Lapp). Completion of a phonological and phonotactic description of Proto-Ugric and Proto-Ob- Ugric; a lexicological/semantic investigation of common lexicological innovations of the Ob-Ugric languages. Diachronic and dialectological analysis of Permic languages.. Processing the linguistic material collected from two dialects of Ostyak and its publication on an electronic data carrier. Maintenance of Ob-Ugric Archives "Éva Schmidt".

Computerized morphological analysis of Uralic languages: the morphologies of nine minor Uralic languages (the Ob-Ugric languages, Permic languages, Volgaic languages, two of the Samoyedic languages (Nenets and Nganasan), as well as Northern Lapp). Completion of a phonological and phonotactic description of Proto-Ugric and Proto-Ob-Ugric; a lexicologico- semantic investigation of common lexicological innovations in the Ob-Ugric languages. Diachronic and dialectological analysis of Permic languages.. Processing the linguistic material collected from two dialects of Ostyak and its publication on an electronic data carrier. Maintenance of Éva Schmidt's Ob-Ugric Archives.

III. Interdisciplinary

Neurolinguistics

Investigation of the structure of mental grammar localized in cerebral areas, especially via an analysis of speech disorders (types of aphasia) that are due to injuries of various cortical areas. Research on the organization of mental grammar and on the relationships between the grammar and mental programs of human speech processing and speech production, using Hungarian material based on testing both normal and aphasic subjects. Checking the neurological validity of current grammatical models.

Acoustic-phonetic and perceptual investigation of spontaneous speech

Systematic description of speech production (spontaneous speech, individual speech properties) and its comparison with types of communication not requiring linguistic planning (laboratory speech recording, reading aloud, etc.). The analyses specifically target coarticulation and the issue of segmentation, as well as intonation, stress, and temporal factors of speech (also as a function of ageing). Series of experiments are carried out both in the area of segmental and suprasegmental structure using up-to-date analytical software, in order to gain information concerning the human processing of spontaneous speech.

Investigations of spoken language

Transcription, encoding, and digitalization of tape-recorded interviews with a random stratified sample of 200 subjects representing the inhabitants of Budapest, and the analysis of partial corpora that have been completed so far. Sociolinguistic questionnaire studies involving a sample representing the adult population of Hungary. Sociolinguistic investigation of the linguistic situation of Hungarian minorities living in neighbouring countries: Slovakia, Ukraine, Romania, Yugoslavia (Serbia), Slovenia, and Austria. Survey of Ongoing (Socio)linguitic Change in Eight Linguistic Minorities in Hungary: Boyash, Croatian, Deaf, German, Romani, Romanian, Serbian and Slovak.

Studies in normative linguistics

Sociolinguistic investigation of the attitude of Hungarian native speakers in connection with the normative forms of grammar and codified rules of orthography used in the standard. The results are put into the public information service of the institute providing members of the general public with expert advice in matters of usage.

Oriental Studies and Turkology

Roots and ramifications of Islam, and, as an actual case study, the analysis of the social background of

Islamic fundamentalism. The study of Arabic and Persian literature. The phonology and morphology of Pali. The history of Buddhism in India, Tibet and Mongolia on the basis of sources written in Sanskrit, Pali, Tibetan and Mongolian. Research in Tibetan linguistics. Preparation of the Etymological Dictionary of Egyptian. Chadic and Cushitic historical phonology and etymology. Investigations in Old Anatolian. Exploring the social background of Islamic fundamentalism, research in the history of that religion. The study of Arabic and Persian literature. The phonology and morphology of Pali. Publication of a current bibliography of international Turkology.

IV. Applications

'Academic Dictionary of Hungarian' (Comprehensive Dictionary of Literary and Spoken Hungarian)

The 'Academic Dictionary of Hungarian' is going to be published in eight volumes. It will be a corpus-based explanatory dictionary, which will present the word-stock of more than two centuries with a larger set of headwords and richer structure of meaning specifications than ever before. The dictionary will also show the historical development of lexemes. The 'Academic Dictionary of Hungarian' also uses about 5 million slips, which were collected from the beginning of the 20th century. Meanings will be illustrated by specimen sentences, indicating their exact sources.

The computerised Hungarian Historical Corpus (www.nytud.hu/hhc) contains 23 millions of running words. This corpus contains works of fiction, science, quality journalism and also textbooks written between 1772 and 2000. Further tasks include the permanent enlargement of the Hungarian Historical Corpus and the development of analytical processes for old texts.

The Dictionary of Hungarian (The Comprehensive Dictionary of Literary and Spoken Hungarian)

The new Dictionary of Hungarian is to be published in eight volumes. It will be a corpus-based explanatory dictionary presenting the word-stock of more than two centuries with a larger number of entries and richer structures of meaning specifications than ever before. The dictionary will also show the historical development of lexemes. The Dictionary of Hungarian' also makes use of ca. 6 million index-cards, hand-written and collected from the end of the 19th century. Meanings will be illustrated by specimen sentences, indicating their exact sources. The computerised Hungarian Historical Corpus (www.nytud.hu/hhc) contains 23 millions of running words. This corpus contains works of fiction, science, quality journalism and also textbooks written between 1772 and 2000. Further tasks include the permanent enlargement of the Hungarian Historical Corpus and the development of analytical processes for old texts.

Hungarian National Corpus

150 m word reference corpus richly annotated in standard XML form. After its linguistic analysis, the next task is the implementation of an increasingly more accurate method of accessing (corpus.nytud.hu/hnc). The existing morphological analysis of the corpus is now being complemented by a syntactic analysis.

Computerized lexical data base of the Hungarian core vocabulary

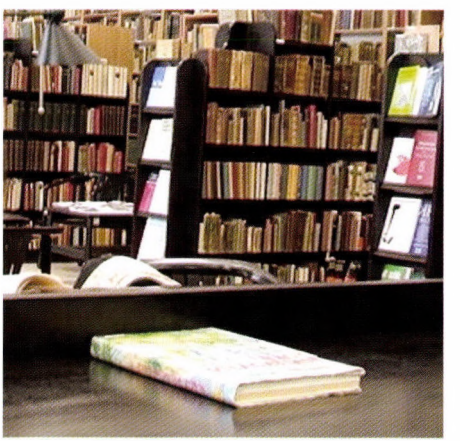
Constructing a lexical data base that contains a syntactic and semantic analysis of unprecedented accuracy of a core vocabulary selected on the basis of the frequency data of the Hungarian National Corpus of Texts. The dictionary will be a central component of a syntactic parsing system to be developed.

Development of an automatic translation system

In the framework of a research cooperation with Systran, both directions of an English-Hungarian and a French-Hungarian machine translation system is being developed. Application of the general system to the special terminology of business.

Information retrieval from short business news

Constructing a lexical data base and a surface syntactic parser for the projected system, in cooperation with Internet content providers.



INSTITUTE OF LITERARY STUDIES

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Scope of activities

Research on
- the history of Hungarian Literature from its beginnings to the present
- literary theory
- the history of literary criticism
- Central and East European literature

Critical editions and source studies in Hungarian and Neo-Latin literature.

Editing of reference books and bibliographies.

Publishing of the reviews: Irodalomtörténeti Közlemények, Helikon, Literatura, Magyar Könyvszemle, Neohelicon, Camoenae Hungaricae.

Joint research projects with diverse institutions and universities both in Hungary and abroad, incl. the Czech Republic, Croatia, Estonia, France, Germany, Italy, Russia and Slovakia, as well as Hungarian departments of universities in neighbouring countries.

The building of the Eötvös College

- Textology: critical editions of classical oeuvres of Hungarian Literature, e.g. J. Arany, F. Kölcsey, S. Petőfi, M. Vörösmarty, M. Babits, etc.

- The history of Hungarian literary criticism: monographs of cultural eras and important personalities.
- Critical studies on contemporary Hungarian literature.
- Studies on literary currents, periods and institutions.
- Comparative study of Central and East European literatures: the relations of Hungarian literature to Central and East European literatures, typological studies.
- 18th century literature: comparative studies in cultural history.
- Literary theory: poetics, theory of interpretation, dialogicity, interpreting communities.
- The history of literary cults.
- Renaissance studies: joint research programmes and critical editions.

INSTITUTE FOR MUSICOLOGY

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E-mail: director@zti.hu

The courtyard of the institute

Scope of activities

- to maintain and enrich the primary collections hosted by the institute: the Hungarian Folk Music and Folk Dance Archives, the Bartók Archives, the Ernő Dohnányi Archives, and the Museum of Music History, all of which are unique to Hungary, and internationally also of outstanding importance in their field.
- to conduct comprehensive research into the music history of Hungary, and in various fields of general music history,
- to carry out research in the domains of ethnomusicology and ethnochoreology, especially in Hungarian and European folk music and folk dance,
- to participate in graduate and postgraduate education in musicology in cooperation with the Ferenc

Liszt Academy of Music, Budapest.

Research aims and topics

Researches in Music History

- Study of liturgical music of medieval Hungary and Central Europe (plainchant, early polyphony, notation).
- Publication of Musicalia Danubiana, a series of critical editions of musical sources, originating in Hungary before cca 1820.
- Preparation and publication of Volume III (18th century) of the comprehensive series Music History of Hungary.
- Critical edition and publication of Ferenc Erkel's operas.
- Documentation of, and research into Béla Bartók's life and work, preparation of the Béla Bartók Complete Critical Edition, of the Thematic Catalogue of Béla Bartók's compositions, and of Bartók's Collection of Hungarian Folk Songs, Complete Edition.
- Documentation of, and research into Ernő Dohnányi's life and work, preparation of the Thematic Catalogue of Ernő Dohnányi's compositions.
- Organological research and planning of the new permanent exhibition of the Museum of Music History.

Researches in Ethnomusicology and Ethnochoreology

- Preparation and publication of volumes XI and XII ('Old Style' melodies) of the series Collection of Hungarian Folk Music (Corpus Musicae Hungaricae Popularis).
- Preparation and publication of the catalogue of the 'New Style' layer of Hungarian folk songs.
- Development of a computer-aid catalogue system for the complete folk music material recorded and/or transcribed in the period since cca 1900.
- Collection and recording of Hungarian folk music and folk dances, and the audiovisual publication of recorded material.
- Preparation and edition of folk dance monographs.

INSTITUTE FOR PHILOSOPHICAL RESEARCH

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Fields of activities

Central research project: philosophical questions of the information society. This project is based on broad philosophical foundations and applies traditional philosophical analyses, exploiting the classical philosophical background which has been accumulated at the institute.

Research groups

Research Group for the Philosophy of Science

Activity: Studies on the knowledge based society from the point of view of the philosophy of science. Investigations on the theoretical significance of the new communication technology, with special respect to electronic networks and interactive multimedia; studies on the history of science.

Research group for Social Philosophy

Activity: Studies on the new perspectives provided by the information society for social philosophy, including the new form of social organizations, political and ethical consequences.

Research Group for the History of Philosophy

Activity: Studies on the history of philosophy from the perspective of communication technologies. Investigations on the relationship between the cultural environment and philosophy. Historical analysis of the relationship between the international intellectual trends and Hungarian creativity.

Research Group for the Philosophy of Religion

Activity: Studies concerning the problems of religion as language and a form of communication; verbal and non-verbal religious language and its relation to communication; changes in social values.

Projects

Reception and Creativity: Open Hungarian Culture

Activity: Studies on the problem of how a specific Hungarian creativity occurred in the period between the late 18th century and the end of the 20th century. The project scrutinizes

the mechanism how the Hungarian high culture received and assimilated the European cultural movements. This process gave rise to new original works in several intellectual fields. The multidisciplinary research comprises many fields, including philosophy, literature, science and technology, law and language.

Communication in the 21st century

Activity: Studies on the impact of mobile devices on communication. In the first phase an interdisciplinary approach has been provided to the mobile information society by a group of experts consisting of philosophers, psychologists, sociologists, economists, linguists, political scientists and historians of science. While in all areas of life we witness a radical increase in the demand for mobile internet access, questions as regards further directions of development are at many points open, and need to be addressed by the social sciences. Contrary to earlier expectations, the emergence of computer-based, networked, interactive communication enhances, rather than diminishes, the physical mobility of users. In the second phase, the research will be increasingly directed at the issue of "m-learning." M-learning is learning as it arises in the course of person-to-person mobile communication.

The Institute serves as a scientific background for UNIWORLD

UNIWORLD is a virtual university based on the achievements of the institute's studies on the information society. It tries to apply the experiences of networking in higher education thus attempting to conform to international trends.
UNIWORLD tries to achieve a double aim

- It conducts scientific research concerning the application of the Net in education, in the communication of new knowledge.
- It offers courses on philosophy, ethics and other subjects from the perspective of the theory of communications, and is trying to develop its activities.

INSTITUTE OF POLITICAL SCIENCE

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Objectives and goals of the Institute

The Institute of Political Science of the HAS conducts theoretical, empirical and comparative research primarily in the field of political science, and to a considerable extent in the field of related social sciences as well. Its activity is characterised by a marked inter- and multidisciplinary approach. It is its task to continuously study Hungarian political life, to describe and interpret the decisive trends and to enrich the academic means requisite for that work.

The research activities of the Institute cover a broad area of topics. The assessment of the various aspects and consequences of systemic change was in the forefront of analy-

sis in the 1990's. Though it has not lost its importance, it has been enriched since then by major international comparative studies. The emphasis has gradually shifted to the study of the process of European integration. In the research teams of the Institute several research projects are in progress that address concerns related to the membership of Hungary in the European Union. Our analyses of the above process are done not only from the specific angle of political science, but also from that of philosophy, social theory, sociology and anthropology.

The Institute has built up a broad national research network and it serves as a centre and background institution for political science research conducted in several places in Hungary.

Our colleagues are involved in higher education both at graduate and postgraduate levels. They helped to introduce political science into the curricula of universities and colleges all over the country. Some of them hold the office of chair professors and lead Ph. D. courses.

Naturally, academic co-operation with other Hungarian research organisations has also gained significance. The Institute participates in a number of international projects jointly with other national institutions. The number of presentations given at various academic conferences is impressive. Most of them fall under academic co-operation arrangements and our researchers give account of their achievements and carry on activities for the dissemination of knowledge at various ad hoc events, too.

The broad activities of the Institute take advantage of the resources available under research grants. Since its establishment the Institute has participated competitive international academic applications with considerable success. The progress of Hungary towards the European Union has already made several foreign resources supporting research available, and the research fellows have been successful in trying to have access to them. Naturally, a significant part of joint international research projects deals with the European integration process and with its Hungarian aspects and therefore they have been carried out jointly with European partners. At the same time the scope of co-operation with colleagues from outside Europe is not negligible either.

In addition to the large number of foreign publications, numerous presentations are given abroad and teaching activities outside Hungary also contribute to the success of applications for research grants. Our colleagues give presentations in several parts of the world, mostly in EU member states and in the United States, as well as in Turkey and in Norway, at IPSA and other Congresses.

The research staff actively participates in the operation of the Hun-

garian Association for Political Science, in the professional jury of the National Base Programmes for Academic Research, and in other academic organisations. Relying on its extensive national and international contacts, the Institute organises conferences, publishes monographs, collections of papers, conference proceedings and working papers, too.

The Political Science Review, the only Hungarian professional periodical of the discipline, is also edited and published by the Institute. In addition, the Central European Political Science Review, the English-language political science periodical of the region is also edited and published here.

The research institute has built up an advanced computer network system which provides adequate infrastructure for the research. The favourable composition of the research staff by age and its high standard of qualification offer encouraging perspectives for the continuity of the research work in the long run.

Research tasks and topics of the Institute

Theoretical and methodological questions

Basic research in political science, theory and methodology traditionally belong to the profile of our Institute. Topics such as the principles and foundations of political science and the theoretical perspectives of politics in general all come under the above definition. Summaries of studies on Hungarian political life and reviews on the state of art and various tendencies within the discipline are also included in this category.

Research related to the system of political institutions

Research related to elections, to the various state institutions and the parties can be listed under this heading. The researchers investigate not only the institutional changes caused by the system change, but also the effects of the European integration on the Hungarian political system.

Research into political sociology

The empirical and theoretical study of the reshuffled social and economic structure after the system change is an important task of the Institute because of its relevance to national and local politics.

Research related to European integration

While practically all of our research projects pay special attention to some aspects of the European integration of Hungary, special analyses are being done on the topic of the European Union. The research group for international and European politics studies the changing rules of

integration and accession policy of the EU and their implications for the Hungarian adaptation policy, and analyses the new challenges for the political, economic and legal culture of the country.

Researches in the area of the sociology of values

The project studies the changes that occurred in the social consciousness, in the set of values and behavioural culture of Hungarian society in the context of accelerating globalisation and European integration. The study of the emergence of a European civil society is also in progress, similarly to the work on the influence of the eastern enlargement of the European Union on the institutions, culture and identity/identities. The study of the border regions in the European Union as laboratories for transnational co-operation and the investigation of similar transborder activities between Hungary and its neighbours is a promising new research topic of the group.

INSTITUTE FOR PSYCHOLOGY

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Scope of activity

- Basic research in psychology that contributes to scientific progress and may be applied directly or indirectly.
- Complex, interdisciplinary psychological studies
- Applying and developing research methods
- Contribution to institutional – gradual and postgradual forms – of professional and scientific training
- Scientific cooperation with Hungarian and international research sites
- Promotion of psychological research
- Comprehensive participation in scientific public life and in the activities of the psychological community.

Research topics and objectives

Elementary information processing: Cognitive development and neurological mechanisms underlying cognitive processes

Visual attentional processes
- principles of complex organization in automatic and attentional processes
- changes of attentional processing with advancing age
- Attentional processes in extreme environmental conditions (e. g. hypoxia)

Task-independent representation of the auditory environment
- Processes of acoustic pattern formation

Automatic and attentional change-detection

Components correlating with cognitive psychophysiological phenomena

Chaos theory based and psychopharmacological investigation of spontaneous electric activity of the brain (EEG) in animal and human experiments

Scalp distribution of ERPs in circumscribed cerebral lesions in cerebrovascular patients
- Dimensional map analysis of spontaneous EEG activity in this patient group

Neuronal mechanisms in the formation of ERPs in animal models
- Investigation of regional features of transient and steady state responses by multichannel intracortical multielectrode analysis of primary-tonotopic and secondary areas of the acoustic cortex in behavioral task situations

Developmental aspects of cognitive functionsPotential correlates of cognitive operations (acoustic and phonological conditions of speech understanding, processing features of linguistic functions, lexical, morphological and semantic processing, developmental psychophysiology of arithmetics probability perception)

Psychophysiological investigations on cognitve aspects of brain pathology and the effects of every-day stimulants

Mechanisms of early cognitive development

- Development of attribution of intentions, goals, beliefs and other intentional mental states
- Mechanisms and functions of imitative learning
- The relation between self-detection and deduction

The role of contingent parental affect-mirroring interactions in the development of emotional consciousness and self-control

- Mechanisms of contingency detection and early sensitivity to response-contingent stimulation in infancy

- Different developmental functions of parental mirroring interactions in infancy

Research of socialization with focus on critical developmental stages and parent-child relations

Longitudinal in the framework of attachment theory (Budapest Infant-Parent Study BIPS)

- Genetic and environmental factors infuencing the development of early attachment relationships are studied in collaboration with the Molecular Genetics Group of the Department of Medical Chemistry, Molecular Biology and Pathobiochemistry of the Semmelweis University. The research is focused on interactions of the genetic variability of the dopamine neurotransmission, temperament and parental behaviour in the formation of infant attachment.
- The BIPS will be extended to investigating the long-term continuity of attachment, and to studying effects of attachment on later information processing, especially on the attention system.

Social psychological study of deviant careers

Use of risk drugs and analysis of drug-using at-risk groups with social psychological and qualitative methods

Concepts of competition in cross-cultural comparison and in the mirror of social-political changes in Hungary

- Age-related and generational changes in attitudes to competition
- Relation between competition and personality

Longitudinal study on the identification of high ability and outstanding skills

- Follow-up of careers of chosen children
- New methods for the determination and early detection of high ability

Processes of information gathering and utilization, decision making and judgement

- Research of personal and person perception determinants of questioning strategies
- Effect of emotional states on information gathering
- Changes in cognitive processes in eldelryold ages
- International comparison of the perception of societal risk profiles

Esthetic judgement in the visual arts

Theoretical and empirical assessment of theories of esthetic experiences.

Social information processing, social representations, text understanding, communicaton

- Comparative psychological study of literary, Freudian and historical text understanding by mapping mental representational networks
- Prototypical concepts of literature and history
- Distinction between literary and historical texts
- Relations of reading motives and textual characteristics in both types of texts
- Understanding of literary texts
- Perception and evaluation processing in fine arts

Relations between texts (with focus on narrative texts) and psychological processes (with focus on personal and social identity)

Methodological developments in computerized and computer-aided psychological content analysis

The use of such developments in the research of
- Personality development (with focus on deviant forms of behavior)
- Identity (with focus on national identity and identity traumas)
- Social and cultural memory (with focus on social representation of history)
- Dynamics of social representation

Social psychological research of the organization of personal and social identity

Narrative construction, autobiographical structure and social representation of identity
- Computer-aided content analysis of interview texts (with focus on coping with autobiographical traumas and crises)

Relation of political attitudes, human rights awareness and prejudice (with focus on attitudes toward Romas, strangers, and on anti-Semitism)

Longitudinal study of ideological contents and social psychological structures of prejudices, and their effects on institutional and legal practice

Problems of body picture and self-picture
- Analysis of body-related popular and scientific discourses
- The role of body representations in the formation of personal and social identity.

CENTRE FOR REGIONAL STUDIES

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Mission

The Centre for Regional Studies, which is an institute of complex social science researches, was founded in 1983 and operates in the form of a network. It is a base of the Hungarian regional development researches, played and still plays a dominant role in the creation, carrying out and training of regional sciences, in co-operation with the European system of science.

The strategic objectives of the Centre

Research of the long term Hungarian and international processes of regional and urban development, the globalising (European, Euro-regional, Central-Eastern European, Hungarian) spatial structures, their division of labour, their system of institutions and tools; Establishment of decisions concerning regional development in Hungary and the country's accession to the European integration; Training and further training of the experts of regional and urban development.

The Centre for Regional Studies, by research organisation based on programmes, acts as a framework institute in theoretical researches and in the implementation of strategic programmes. The CRS initiated the setting up and operation of the Committee for Regional Sciences of the Hungarian Academy of Sciences. The research fellows of the institute direct the special committees of regional and urban development in the regional committees of the Academy, also, they lead graduate and postgraduate and PhD courses on regional economics in Hungarian higher education institutions.

Scientific profile

Great Plain Research Institute

- Study of the economic, societal and environmental renewal of the Great Hungarian Plain
- Methodology of micro regional researches
- Rural development strategies
- Development concept and strategy for the
- Great Hungarian Plain
- Survey of the Carpathians Euroregion and the Tisza–Maros–Danube cooperation

Transdanubian Research Institute

- Survey of Hungarian and international regionalism
- Regional development and policy in Europe
- The institutional system of public administration and regional development
- Methodology of regional development programming
- Regional requirements of sustainable development
- Complex survey of the infrastructure systems and networks
- Regional development strategy for South Transdanubia
- Analysis of the development of the Alpine–Adriatic region

Central and North Hungarian Research Institute

- Study onf the regional structure of urban network and of society
- Analysis of the spatial structure of urban functions and urban network
- Survey of Budapest and its agglomeration based on international comparisons
- Development strategy for North Hungary

West Hungarian Research Institute

- Survey of the spatial spreading of innovation
- Analysis of regional financial and income processes
- Study of the Vienna–Bratislava–Győr cooperative region
- Comparative analysis of success regions, cities
- Regional development concept and strategy for North Transdanubia

Research programmes

Regional development and policies in Europe

- Driving forces of regional development in a Western Europe
- The systems of regional policy tools and institutions in the advanced market economies

- Structural and cohesion policy of the European Union

Regional transformation in East-Central Europe

- Regional development processes in East-Central Europe
- Transformation of the urban network
- Cross-border co-operations
- Euro-regions
- Directions of development in the Danube regions (VISION-PLANET programme)

The regional development strategy of Hungary

- The impact of the European processes on
- The Hungarian spatial structure
- The development of the regional economic structure in Hungary
- Spatial types in Hungary
- Transformation of the settlement structure
- Success settlements and regions
- Regional policy and the EU -accession
- Environment protection and regional development

The institutional system of territorial administration and regional policy

- The institutional system of regional development
- New functions of the territorial administration
- The role of local governments in regional development

- Regions as an institute and their functions
- Co-operation of the actors in regional development

Regional development concepts and strategies

- National Development Concept of Hungary
- Regional development concepts
- County development concepts
- Urban development concepts
- Regional establishment of sectoral and business development strategies

Training of regional science

- Joint PhD programme on regional policy and economics with the Faculty of Economics of the University of Pécs
- Post-graduate courses on regional and urban development
- Institute of Sociology and Social Policy, Faculty of Arts of Eötvös Loránd University, Budapest
- Faculty of Economics of the University of Pécs (graduate training)
- Faculty of Economics of the University of Pécs (two-year specialisation on regional economics)
- Széchenyi István University, two-year training of urban economics, Győr
- Training of the subjects of regional science and participation in the PhD training in the following higher education institutes: Faculty of Arts and Faculty of SciencScience of University of Pécs; Faculty of Economics, Miskolc; Faculty of Natural Sciences of József Attila University, Szeged;.

INSTITUTE OF SOCIOLOGY

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Profile of the Institute

The Hungarian Academy of Sciences Institute of Sociology was founded in 1963 and became an important center of the Hungarian social scientific researches. Besides domestic researches the Institute is involved in several EU-, OECD- and NATO-projects and it maintains strong scientific co-operation with more than 30 research institutes.

Main fields of activity

Modernisation of the economic and technological systems;
Empirical research on social transformation;
Social development trends;

Role of human resources;
Elderly and ageing society;
Sociology of values;
Innovation processes;
Institutional changes;
East and Central European comparative research;
Communication and Media;
Environmental issues;
Social and cultural anthropology, social history;
Cultural research;
Systems of management;
Social policy.

Research aims

The basic aim of the Institute is twofold. First, to conduct 'classical' sociological researches, that is, basic researches on sociological theoretical and methodological issues; and secondly, to examine the dynamics of changes in Hungarian society and to work out methods for solving current social problems and conflicts. Consequently, it carries out empirical and interdisciplinary social researches on the one hand, while it also pursues policy-oriented researches on the other. It applies both analytical and normative research methods. Involvement of international co-operation is a priority of the researches.

Dynamics in Transformation of Hungarian Society

- Emergence of a new bourgeois society in Hungary;
- The new service class;
- Old and new poverty in Hungary;
- Modernisation processes;
- The Roma/Gypsy population in Hungary;
- Changing rural societies;
- Changing family structures;
- Changing role of women, transformation of gender roles;
- Changing world of work;
- Political trends in Hungary;
- Changes in the conception of justice;
- Mortality;
- Civil society.
- Social (environmental, women's and trade union) movements.

Globalisation Impacts on Hungarian Society

- Transformation of institutional system;
- Regional conflicts;
- Adaptation processes related to joining the European Union;
- Communication systems of economic organisations;
- New production methods;
- Institutionalisation process of technology and innovation;
- Systems of knowledge creation and distribution;
- Transformation of health-care system;
- Local government policies;
- Co-operation between public and private institutions in social policy.

Risk Society

- Distribution and re-distribution of risks;
- Management of risks at macrolevel;

- New deprivation related to knowledge distribution.

Social Consciousness, Values, Culture and Identity

- Minority/majority policies;
- Activity structure of Hungarian society;
- Value changes in Hungarian society;
- Attitudes and values of the economic elite;
- Cultural aspirations of the new elite;
- The state of culture and its changes in Hungary.

European Studies:

- East and Central European comparative studies (models of development, situation of minorities, comparison of elites);
- Nationalism and democratisation in an all-European context
- Centre-periphery relations in Europe;
- Winners and losers of European integration;
- Regional co-operation in Europe.

Theoretical, Methodological and Historical Aspects of Social Sciences

RESEARCH CENTRE FOR SOCIAL STUDIES

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The purpose of Research Centre for Social Studies working since January 1st 2001. is to organize and coordinate the accentuated scientific tasks, to vivify and aid multi- and interdisciplinary projects and to provide them with the conditions necessary for execution. Another important goal of the center is to organize conferences and joint scientific projects of nine academic institutes of social sciences working in the Buda Castle area, to cope with all the control and managing tasks and to run the Academy building in the Buda Castle quarter. What's

more, some projects even include researchers and institutes from other scientific areas like natural science.

The organizational base of the Research Centre for Social Studies is the group of the social science institutes of the Academy, above all the nine institutes in the Buda Castle quarter (Sociology, History, Archeology, Minority Studies, Art History, World Economics, Ethnology, Legal Studies, Political Sciences). Within the Centre for Social Studies there are four research teams, namely:

Demographic Research Team

The Hungarian Academy of sciences established a demographic research team within the Research Centre for Social Studies to study demographic issues and demographic policies. Its main recent task is to take part in the production of the demographic atlas showing Hungary's population at the beginning of the 20th century.

Science bank

Activities of the Science bank working within the frames of the Research Centre for Social Sciences are: to establish and replenish databases of academic and scientific history, bibliographies, chronologies and a network of connections with every research institutions where researches of scientific history are in progress.

Program Bureau of Strategic Studies

Based on Government Resolutions 2184/1996 and 2269/1996 several strategic research projects have been launched in 1997 at the Hungarian Academy of Sciences. Their base institution, Program Bureau of Strategic Studies was established in 2001. The Bureau coordinates an average of 20 research programs per year.

European History Workshop

This team has been working since 2002 May, with the coordination of Hungarian research projects on European history as its main task. The workshop also establishes and develops international cooperations and publishes studies on European history.

INSTITUTE FOR WORLD ECONOMICS

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A view of the institute

History

The Institute for World Economics of the Hungarian Academy of Sciences (IWE) has operated in its present form since 1973. Its predecessor was the Afro-Asian Research Centre, founded in 1965.

The institute pursues policy-oriented research activity independent of political influences. Its purpose is to draw conclusions and make recommendations for Hungarian policy-makers, based on its research findings. These concern economic policy

and the main lines of economic development, especially in relation to occurrences in Europe - in the European Union (EU) and the Central and Eastern European (CEE) region - and to the challenges of the global economic system.

The pillars of the institute's scientific philosophy, so to speak, are a strategic character, an interdisciplinary approach, and a forcefully international framework in its main activity.

The importance and influence of scientific institutions engaged in international economic research have been increasing all over the world. This is due to the accelerating processes of globalization, and nearer home, to the transformation of Central and Eastern Europe and the return of the region to the international mainstream. The IWE has possessed since its foundation a dynamic, internationally active staff of researchers who are open to the world. They have reacted successfully to the professional challenges posed by the decisive political and economic processes of the last few years.

Fields of research

- The main fields of research at the IWE are these:
- Comprehensive assessment of the processes occurring in the world economy.
- Forecasting the changes and trends in the world economy to be expected in the medium and long term.
- Examining the enlarging and deepening processes in the EU, especially in relation to Hungary's accession.
- Comparative study of the economic transformation in the Central and Eastern European countries since the change of system.
- Monitoring the trends, industries, countries and groups of countries decisive to the Hungarian economy.
- Analysis of the trends and the global and regional determinants and factors in international competitiveness.
- Examining the international competitiveness of the Hungarian economy, exploring ways of increasing it through global, regional and bilateral cooperation, and devising economic-policy measures to enhance it.

The institute bases its activity on a global network of cooperation. It has comprehensive, institutionalized relations with similar institutes in Hungary, Europe and the rest of the world (especially in Japan, Southeast Asia, Latin America and the United States).

Structure and operation

The institute's research work is conducted in decentralized research centres organized on regional and/or functional bases. *Ad hoc* groups from more than one research centre may assemble within the institute to per-

form specific research tasks and projects. These sometimes include outside researchers as well. The institute also accepts research commissions from outside. Some of its income derives from funding obtained by competitive applications.

The research centres and main research fields

Development Research Centre

The centre prepares development studies and researches into the developing world. Topics: world agriculture and the World Trade Organization (WTO); agricultural transformation in the CEE countries; Hungarian agriculture and food economy; CEFTA cooperation; EU agriculture and Hungary's agricultural accession; the potential labour-market effects of accession; the labour market and employment policy in the EU countries; globalization and the labour market in the world economy, with special attention to Eastern Europe; the labour-market for young people in Eastern Europe; world economic trends and their influence on Hungary; globalization, the financial bubble crisis.

East-Central European Research Centre

The centre researches into Russia and the CIS, Poland and the Baltic states, the Czech Republic and Slovakia, and Southeast Europe. The field includes Hungary's relations with the CEE countries, and regional cooperation and European integration. The centre attaches great importance to comparative analysis of CEE region in relation to the transformation as a whole and to various aspects of it.

European Integration Research Centre

The centre deals with economic integration within the EU, the economic situation and integration interests of its members-states, and aspects of Eastern enlargement, such as financial considerations. It also covers Hungary's preparations for EU accession, and the role and effects of foreign direct investment (FDI) on Hungary.

Japan and Southeast Asia Research Centre

The centre deals with the position of the Asian-Pacific region in the world, and socio-political and economic questions. Subjects include 'Asian values', modernization, concepts of democracy, and management methods, the transformation process in the Japanese economy and society, and the People's Republic of China and the so-called Greater Chinese Community, as well as cooperation formations (APEC, ASEAN, *etc.*), Asia-Europe dialogue (ASEM), and the macroeconomic and corporate relations between the Far East region and Hungary.

Modernization and Services Research Centre

Within the field of the infrastructure and services, emphasis is placed on the following fields: Hungarian strategy in negotiations with the EU and the conditions for Hungarian entry into the EU; international comparison of economic-development levels; modernization models in various centuries and countries; corporate reorganization and competitiveness in Hungary; FDI projects and modernization of Hungarian manufacturing industry; aspects of environmental protection; environmentally sensitive transport policy; territorial (regional) dimensions of these.

Library

One of the main aids to the researches in the institute is the Scientific Information Service. Since January 2000, this has been part of the Combined Social Sciences Library, along with the libraries of research institutes for law, political studies and sociology.

The scope of the library is decided by the research directions being pursued at the institute at any time. Many of the accessions come through the institute's extensive network of international cooperation and exchanges. This means that a decisive proportion of the stock consists of items not commercially available or found elsewhere. The good relations with international institutions mean that the library has sizeable collections of publications, statistics and handbooks from the EU, the World Bank, the IMF, the OECD, specialist UN agencies, and other bodies.

A comprehensive library information service is available for readers by telephone, on +36 1 224 6759. The computerized catalogue can be accessed via www.etk.mtapti.hu.

Publications

The institute's research findings appear in its own and outside publications. Prominent institute publications include the internationally well-known *Working Papers* series, appearing for more than ten years now. The series in Hungarian are entitled *Kihívások* (Challenges) and *Műhelytanulmányok* (Working Studies). Occasional volumes of studies in English or Hungarian also appear. The institute's publications form the basis for the extensive international programme of exchanges mentioned in the previous section.

OFFICE FOR ACADEMY RESEARCH GROUPS ATTACHED TO UNIVERSITIES AND OTHER INSTITUTIONS

Address: Budapest, Nádor u. 7.
Postal adress: H-1051 Budapest, Nádor u. 7.
Telephone: (36-1) 413-3220
Telefax: (36-1) 413-7890
Director: Huba PAÁL
E-mail: igazgato@tki.office.mta.hu,
titkarsag@tki.office.mta.hu

Council of the Research Group's Representatives
President: Béla HALÁSZ, O. M.
Vice president: Kálmán MEDZIHRADSZKY, O. M.
Edit MADAS, D. Sc. (Literatura)

Research Groups According to Universities and Institutions:

Berzsenyi Dániel Teacher's College

Research Group for Regional Development and Microintegration
Head: Ádám TÖRÖK, C.M.
Research topic: The development of the region of western Hungary in the context of globalisation and european integration, microintegration cross-border coperation

Budapest University of Economics Sciences and Public Administration

Research Group for "Together for Europe"
Head: Attila ÁGH, D.Sc. (Political Sciences)
Research topic: The Europeanization of the Hungarian policy

Research Group for Complex Futures Studies
Head: Erzsébet NOVÁKY, D.Sc. (Economics)
Research topic: Evolutionary development and forecasting of complex economic systems, future judgement of entrepreneurs

Research Group for European Integration
Head: Tibor PALÁNKAI, O.M.
Research topic: European integration

Budapest University of Technology and Economics

Research Group for Physical Geodesy and Geodynamics
Head: József ÁDÁM, O.M.
Research topic: Physical geodesy and geodynamics, and some further subjects within geodetic science

Research Group for Stochastics
Head: Imre CSISZÁR, O.M.
Research topic: Randomness, information, dynamical system

Research Group for Geoinformation
Head: Ákos DETREKŐI, O.M.
Research topic: Geoinformation, remote sensing and image processing research

Research Group for Reinforced Concrete
Head: István HEGEDŰS, D.Sc. (Engineering)
Research topic: Theoretical and experimantal research in the statics and dynamics of reinforced concrete structures

Research Group for Geotechnics
Head: József FARKAS, D.Sc. (Engineering)
Research topic: Interaction between the soil and structure

Research Group for History and Philosophy of Science
Head: Márta FEHÉR, D.Sc. (Philosophy)
Research topic: History and philosophy of the sciences

Research Group for Technical Chemistry
Head: Zsolt FONYÓ, O.M.
Research topic: Enviromental oriented academic research for tehnical chemistry with theoretical and experimental tools

Research Group for Numerical Structural Mechanics
Head: Zsolt GÁSPÁR, O.M.
Research topic: Numerical structural mechanics

Research Group for Materials Science
Head: János GINSZTLER, C. M.
Research topic: Materials science and technology

Research Group for Informatics and Electronics
Head: László GYÖRFI, O.M.
Research topic: Statistic, information theory, telecommunication

Research Group for Solid in Magnetic Fields
Head: András JÁNOSSY, O.M.
Research topic: Study in high magnetic fields, of solids with unusual electric and magnetic properties

Research Group for Control Engineering
Head: László KEVICZKY, O.M.
Research topic: Modeling and control of linear, nonlinear systems, robots and mechatronic systems

Research Group for Alkaloid Chemistry
Head: Lajos NOVÁK, D.Sc. (Chemistry)
Research topic: Preparation and biological evaluation of natural product

Research Group for Embedded Information Technology
Head: Gábor PÉCELI, D.Sc. (Engineering)
Research topic: Theory of distributed heterogeneous systems, embedded information systems

Research Group for Neuropsychology and psycholinguistics
Head: Csaba PLÉH, O.M.
Research topic: Neuropsychological disorders in childhood, Williams syndrome and SLI, child language, mechanisms of sentence processing

Research Group for Dynamics in Machines and Vehicles
Head: Gábor STÉPÁN, C.M.
Research topic: Dynamics of machines and vehickes

Research Group for Technical Analytical Chemistry
Head: Klára TÓTH, O.M.
Research topic: Research and development of chemical sensors and instrumental methods of analysis

Research Group for Organic Chemical Technology
Head: Ferenc FAIGL, D.Sc.(Chemistry)
Research topic: Selective reactions in organic chemistry

Research Group for Theory of Condensed Material Physics
Head: Alfréd ZAWADOWSKI, O.M.

Research topic: Theory of strongly correlated electron systems, many-body physics, computational physics

Research Group for Soft Matters
Head: Miklós ZRÍNYI, D.Sc. (Chemistry)
Research topic: Soft materials (complex fluids, composite elastomers polymer gels)

Research Group for Molecular Network Dynamics
Head: Béla NOVÁK, D.Sc.
Research topic: Matematical modelling at cellular, regulatory networks with the tools of reaction-kinetics

University of Debrecen

Research Group for Land use and Regional Development
Head: János NAGY, D.Sc. (Agriculture)
Research topic: Scientific foundation of the agriculture and soil protection and the agroecological, biological and cultivation technological effects with computer programs

Research Group for Ethnography
Head: Elek BARTHA, D.Sc.
Research topic: The meeting and connections of culture in the regions of the North-Eastern part of the carpathian basin

Research Group for Textological Studies on the Age of Enlightenment
Head: István BITSKEY, C.M.
Research topic: Textoligical studies on the age of enlightenment

Research Group for Cell-Biophysics
Head: Sándor DAMJANOVICH, O.M.
Research topic: Structural and functional role of cell surface receptor pattens

Research Group for Cell Signaling and Apoptosis
Head: László FÉSŰS, O.M.
Research topic: Molecular mechanism and cell signaling pathways contributing to determine cell fate

Research Group for Tumorvirus
Head: Lajos GERGELY, D.Sc. (Medicine)
Research topic: Ethiological role of human papilloma- and retroviruses

Research Group for Number Theory
Head: Kálmán GYŐRY, O.M.
Research topic: Effective, quantitative and computational investigation in Diophantine number theory

Research Group for Homogeneous Catalysis
Head: Ferenc JOÓ, C.M.
Research topic: Aqueous organometallic chemistry catalytic modofication of biological membranes

Research Group for Theoretical Linguistics
Head: András KERTÉSZ, C.M.
Research topic: Empirical foundation of cognitive semantic theories

Research Group for Cell Physiology
Head: László KOVÁCS, O.M.
Research topic: Molecular mechanism of intracellular signal transduction under physiological and pathological conditions

Research Group for Carbohydrates
Head: András LIPTÁK, O.M.
Research topic: Synthesis of biologically active carbohydrate derivaties

Research Group for Tissue and Neuroscience
Head: László MÓDIS, D.Sc. (Medicine)
Research topic: Cell-cell and cell-matrix interactions in the organization of connective and nervous tissues

Research Group for Thrombosis and Haemostasis
Head: László MUSZBEK, O.M.
Research topic: Factor XIII of blood coagulation: structural and functional aspects, involvement in various diseases

Research Group for Microbial Development Genetics
Head: Mátyás SIPICZKI, D.Sc. (Biology)
Research topic: Genetic regulation of the differentitation and multiplication of microscopic fungi and streptomyces:genetic and genomic analysis

Research Group for Autoimmune Diseases
Head: Gyula SZEGEDI, O.M.
Research topic: Polysystemic autoimmune and cardiovascular diseases

Research Group for Antibiotics
Head: Pál HERCZEGH, D.Sc. (Chemistry)
Research topic: Isolation, structure elucidation, semi-synthetic transformation, and synthesis of new antibiotics

Research Group for PET Study
Head: Lajos TRÓN, D.Sc. (Biology)
Research topic: Functional investigations by positron emission tomograph

Research Group for Vulgo
Head: Mihály VAJDA, C.M.
Research topic: Encyclopedia of ethics

Research Group for Evolution Genetics and Conservation Biology
Head: Zoltán Sándor VARGA, D.Sc. (Biology)
Research topic: evolution genetics, conservation biology

Eszterházy Károly Teacher's College

Research Group for Bryology
Head: Sándor ORBÁN, D.Sc. (Biology)
Research topic: Complex research of the taxonomy, phytogeography and ecology of bryophytes

Eötvös Loránd University, Budapest

Research Group for Comparative Ethology
Head: Vilmos CSÁNYI, O.M.
Research topic: Studies on behaviour evolution by comparative ethological methods

Research Group for Immune Regulation
Head: Anna ERDEI, C.M.
Research topic: The role of immune complex bindig receptors in the induction and regulation of immune reactions, study of the function of B lympocytes, dendritic cells and mastocytes

Research Group for Geoinformatics and Space Sciences
Head: Csaba FERENCZ, D.Sc. (Engineering)
Research topic: Investigation of the Earth surface and upper atomsphere by electromagnetic wave-analytical methods using satellite data

Research Group for Combinatorial Optimization
Head: András FRANK, D.Sc. (Matematics)
Research topic: Combinatorial optimization: structures and algorithms

Research Group for Biotechnology
Head: László GRÁF, O.M.
Research topic: Proteomics of serine proteases of the human brain

Research Group for Atelier (Hungarian–French Scientific Workshop)
Head: György GRANASZTÓI, D.Sc. (History)
Research topic: Researches on social sciences, preparation of the young researchers for international scientific works

Research Group for Geology
Head: János HAAS, D.Sc (earth sciences)
Research topic: Geological study of Hungary and the surrounding region

Research Group for Structural Chemistry
Head: István HARGITTAI, O.M.
Research topic: Determination and modeling of intramolecular and intermolecular information in molecular structure

Research Group for Nuclear Techniques in Structural Chemistry
Head: Zoltán HOMONNAY, D.Sc. (Chemistry)
Research topic: Chemical applications of the Mössbauer spectroscopy and the positron annihilation techniques

Research Group for Theoretical Physics
Head: Zalán HORVÁTH, C.M.
Research topic: Particle physics and high energy nuclear physics, quantum field theory, Statistical physics, chaotic behaviour, nonequilibrium dynamical system, pattern formation, enviromental fluid flows

Research Group for Peptide Chemistry
Head: Ferenc HUDECZ, D.Sc (Chemistry)
Research topic: Synthesis and structure-function studies of bioactive peptides and peptide conjugates

Research Group for Communication Studies
Head: György HUNYADY, C.M
Research topic: communication research

Research Group for Legeal History
Head: Lajos IZSÁK, D.Sc. (History)
Research topic: The ways of development of the Hungarian legal history in the XIX–XX. Century

Research Group for Neurobiology
Head: Gábor JUHÁSZ, D.Sc. (Biology)
Research topic: Neurobiology of neurodegenerativ disorders and state dependent changes in brain protean

Research Group for Altaic Studies
Head: György KARA, C.M.
Research topic: Altaic studies

Research Group for Academic Dictionary of Hungarian Language
Head: Miklósné KAÁN, D.Sc.
Research topic: Compilation of the Academic Dictionary of Hungarian Language

Research Group for Applied Number Theory
Head: Imre KÁTAI, O.M.
Research topic: Applied and algorithmic number theory

Research Group for Philosophy of Language
Head: János KELEMEN, C.M.
Research topic: Philosophy of language

Research Group for Nyugat
Head: Zoltán KENYERES, D.Sc. (Literature)
Research topic: Sudies of the periodical Nyugat: Endre Ady, Mihály Babits, Dezső Kosztolányi

Research Group for Historical Linguistics
Head: Jenő KISS, C.M.
Research topic: Researching Hungarian linguistics records

Research Group for the Investigation of the Collection of Prints of the ELTE University Library
Head: Éva KNAPP, D.Sc.
Research topic: Investigation and Systematisation of the collection of prints of the ELTE University library (Historical and allegoric representation in 18th century)

Research Group for Literary Theory
Head: Ernő KULCSÁR SZABÓ, O.M.
Research topic: Higlightings of the Medial character of language in Hungarian literature and art theory in the first half of the 20th century

Research Group for Systematic Zoology
Head: Sándor MAHUNKA, O.M.
Research topic: Taxonomical researches to explore th biodiversity of soils

Research Group for Classical Studies
Head: Miklós MARÓTH, O.M.
Research topic: Hungarian medieval latin dictionary classical esthetics

Research Group for Geophysics and Environmental Physics
Head: Attila MESKÓ, O.M.
Research topic: Global and regional studies in geophysics, appiled and enviromental geophysics, enviromental and sustainability science studies

Research Group for Protein Modelling
Head: Gábor NÁRAY-SZABÓ, O.M.
Research topic: Investigation of protein structure-activity relationships with X-ray crystallography, nuclear magnetic resonance and computer modelling

Research Group for Regional Science
Head: József NEMES NAGY, D.Sc.
Research topic: Regional studies, regional modelling, special inequalities, theory of social space

Research Group for European Art History
Head: Krisztina PASSUTH, D.Sc.
Research topic: European art history

Research Group for High Culture
Head: Sándor RADNÓTI, D.Sc. (Philosophy)
Research topic: The genesis and functioning of modern high culture

Research Group for Structural Chemistry and Spectroscopy
Head: Pál SOHÁR, C.M
Research topic: Synthesys and comlex spectroscopic study of metallorganic and heterociclic compounds

Research Group for Interdisciplinary Archaeology
Head: Miklós SZABÓ, O.M.
Research topic: Interdisciplinary research in archaeology

Research Group for Ecology and Theoretical Biology and Ecology
Head: Eörs SZATHMÁRY, D.Sc. (Biology)
Research topic: Theoretical biology

Research Group for Ideologies
Head: Mihály SZEGEDI-MASZÁK, O.M.
Research topic: Ideologies: image, music and text as forms creating culture in Romanticism and Modernism

Research Group for Historical Russistic
Head: Gyula SZVÁK, D.Sc.
Research topic: Historical Russistic and basic research on Sovietology

Research Group for Statistical Physics
Head: András PATKÓS, C.M.
Research topic: Statistical physics of mesoscopic systems

Research Group for NATO Information
Head: László VALKI, D.Sc. (Law)
Research topic: NATO's Role in recent international relations war on terrorism

Research Group for Biological Physics
Head: Tamás VICSEK, O.M.
Research topic: Collective behaviour in biology

Research Group for Evolutionary and Molecular Genetics
Head: László OROSZ, C.M.
Research topic: Evolution of Filicidae taxa, genetic regulation, developmental genetics, mesoderm development

Research Group for Folklore Text Analysis
Head: Vilmos VOIGT, D.Sc.
Research topic: Collecting, systematizing of hungarian folklore texts, with forming adat-base archive, preparing scholary editions

Research Group for Enviromental Chemistry
Head: Gyula ZÁRAY, D.Sc. (Chemistry)
Research topic: Accumulation of heavy metals in plant and humanbiological materials: investigation of biofilms and urban aerosols

University of Kaposvár

Research Group for Animal Science and Hygieny
Head: Péter HORN, O.M.
Research topic: Food safety and human health concerns of toxic substances in the food chain

Károli Gáspár Calvinist University

Research Group for Legal and Administrative Question of Sciences and Researches
Head: Lajos LŐRINCZ, O.M.
Research topic: Legal and administrative question of sciences and researches

Lutheran Teological University, Budapest

Research Group for Social Ethics and Ecumenics
Head: András REUSS, D.Sc. (Teology)
Research topic: Public statements of churches on social ethical issues-evalution, Confrontation, Considerations

Research Institute of Demography of the Central Statiscital Office

Research Group for Demographic Methods
Head: Tamás FARAGÓ, D.Sc. (Sociology)
Research topic: Long time population development in Hungary

Liszt Ferenc University of Music

Research Group for History and Teory of Church Music
Head: László DOBSZAY, D.Sc.
Research topic: History and teory of church music

University of Miskolc

Research Group for Lőrinc Szabó
Head: Lóránt KABDEBÓ, D.Sc. (Literature)
Research topic: Szabó Lőrinc data base, text- and document edition, processing the memorial library, Hungarian and international topography

Research Group for Geotechnology
Head: Ferenc KOVÁCS, O.M.
Research topic: Complex evaluation of effects of geotechnical activity

Research Group for Numerical Mechanics
Head: István PÁCZELT, O.M.
Research topic: Numerical investigation of non-linear mechanical problems

Research Group for Materials Sience
Head: András ROÓSZ, C.M.
Research topic: Examination and simulation of transformation in metals and alloys

Research Group for Mechanical Technologies
Head: Miklós TISZA, D.Sc. (Engineering)
Research topic: Application of the methods of computer aided engineering in materials science and materials processing technologies

Research Group for Production Information Engineering
Head: Tibor TÓTH, D.Sc. (Engineering)
Research topic: Application of new Infromation Technology (IT) tools for Supporting Computer Intergrated Production

National Rabbi Teaching and Jewish University, Budapest

Research Group for Jewish Religious Studies
Head: Tamás STALLER, D.Sc. (Philosophy)
Research topic: A religious studying of Hungarian and East-European Jewish Community

National Archives of Hungary, Budapest

Research Group for Archives of Sigismund's Age
Head: László SOLYMOSI, D.Sc. (History)
Research topic: Research and publication of the archives of Sigismund's Age

Hungarian Natural History Museum, Budapest

Research Group for Animal Ecology
Head: László PAPP, O.M.
Research topic: Structure and diversity of animal communities, population interactions

Research Group for Paleontology
Head: Attila VÖRÖS, C.M.
Research topic: Critical events and evolution of the biosphere in the past 250 million years

University of West-Hungary, Sopron

Research Group for Process Engineering of Agricultural Products
Head: Miklós NEMÉNYI, D.Sc. (Agriculture)
Research topic: Modelling of the conversing, storing and process engineering methods of the agricultural products

Research Group for Production Biology
Head: Csaba MÁTYÁS, C.M.
Research topic: Biological and environmental conditions determining production and stability of forest ecosystems

National Széchenyi Library, Budapest

Research Group for Mediaeval Manuscripts and Early Hungarian Printed Books
Head: Edit MADAS, D.Sc
Research topic: Identification, description and cataloging of codices preserved in Hungarian Libraries and of codex-fragments from the binding of early printed books

Research Group for History of the Hungarian Revolution of 1956
Head: Gábor GYÁNI, D.Sc.
Research topic: History of Hungary between 1944–1989. especially the Sixties, and the history of the Hungarian Revolution of 1956

Péter Pázmány Chatolic University, Budapest

Research Group for Liturgy
Head: Péter ERDŐ, D.Sc.
Research topic: The possibilities of forming the public divine service based on liturgical and Cannonical Discipline

University of Pécs

Research Group for Neurohumoral Regulations
Head: Valér CSERNUS, D.Sc.
Research topic: Investigation of neuronal systems elaborating hypophysiotropic neurohormones and study of hypophysitropic hormone analogs

Research Group for Clinical Neuroscience
Head: Tamás DÓCZI, D.Sc. (Medicine)
Research topic: Investigation of basic problems in clinical neuroscience by means of molecular methodology

Research Group for Hungary and Europe
Head: Ferenc FISCHER, PhD.
Research topic: History of Hungary and Europe in the 19th–20th Century

Research Group for Clinical Genetics
Head: György KOSZTOLÁNYI, C.M.
Research topic: Genotypical and phenotypical analysis of genetic instability

Research Group for Neurophysiology
Head: László LÉNÁRD, C.M.
Research topic: Mechanisms of motivation learning and reinforcement

Research Group for Chemical Sensors
Head: Géza NAGY, D.Sc (Chemistry)
Research topic: Development of selective chemical sensors, investigation of molecules and interaction mechanisms providing sensor function. Working out measuring methods employing sensors

Research Group for Fluorescence Spectroscopy
Head: Béla SOMOGYI, D.Sc. (Biology)
Research topic: Studies on functional dynamics of cytoskeletal and motor-proteins by the use of fluorescence spectroscopy: from individual moleculer to cellular systems

Research Group for Reproductive- and tumor Immunology
Head: Júlia SZEKERES, D.Sc. (Medicine)
Research topic: The immunomodulatory molecule- PIBF affects tumor growth and the development of autoimmunity

Research Group for Neuropharmacology
Head: János SZOLCSÁNYI, O.M.
Research topic: Pharmacology of primary afferent neurons

Research Group for Adaptational Biology
Head: Róbert GABRIEL, D.Sc.(Biology)
Research topic: short and long-term adaptational processes in living organisms and ecosystems

Research Group for Mitochondrial Function and Mitochondrial Diseases
Head: Balázs SÜMEGI, D.Sc. (Biology)
Research topic: studying the role of mitochondrial damage, oxidative damage and PARP activation in different deseases and understanding their regulation

Research Group for Nonliner and Quantum Optics
Head: József JANSZKY, C.M.
Research topic: nonlinear optics, optics is photonic materials, quantum optics, quantum informatics

Semmelweis Medical University, Budapest

Research Group for Neurobiochemistry
Head: Veronika ÁDÁM, D.Sc. (Medicine)
Research topic: Oxidative stress in the central nervous system. Transports in the blood-brain barrier

Research Group for Molecular Genetics
Head: Rudolf de CHATEL, D.Sc. (Medicine)
Research topic: Molecular genetics of cardiovascular and metabolic diseases

Research Group for Molecular Immunology
Head: András FALUS, C.M.
Research topic: Allergy and leukemia, immunology and genomics

Research Group for Neuropsychopharmacology
Head: Zsuzsanna FÜRST, D.Sc. (Medicine)
Research topic: Brain reward and stimulatory mechanisms: neurobiological and pharmacotherapeutic aspects

Research Group for Neuroendocrinology
Head: Ida GERENDAI, D.Sc. (Medicine)
Research topic: Neurochemical and functional analysis of the hypothalamic glutamatergic innervation and of the control of gonadal function and prolactin secretion

Research Group for Peptide Biochemistry
Head: György KÉRI, D.Sc. (Biology)
Research topic: Synthesis and characterisation of anti-tumour peptides and other signal-transduction inhibiting molecules

Research Group for Neurobiology
Head: Elemér LÁBOS, D.Sc. (Biology)
Research topic: Functional morphology of neural plasticity

Research Group for Neurochemical
Head: Tamás TÖRÖK, D.Sc. (Medicine)
Research topic: Studies of neorodegenerative and neuroprotective mechanisms

Research Group for Endoplasmic Reticulum
Head: József MANDL, C.M.
Research topic: Transport processes and transporters in endoplasmic reticulum

Research Group for Brain Physiology
Head: Csaba NYAKAS, D.Sc. (Medicine)
Research topic: Action of exercise and dieting on normal and pathological brain ageing

Research Group for Neuromorphology
Head: Miklós RÉTHELYI, D.Sc. (Medicine)
Research topic: Neuroanatomical and neurochemical identification of the pathways of central nervous system

Research Group for Cardiovascular Disease
Head: István PRÉDA, D.Sc. (Meicine)
Research topic: Interrelationships of endothelial functions and intravascular thrombotic procesesses in patients with cardiac and vascular disease

Research Group for Metabolism and Atherosclerosis
Head: László ROMICS, O.M.
Research topic: Complex study on the pathomechanism of atherosclerosis by genetical, immunological and cellbiological approaches

Research Group for Biophyisics
Head: Judit FIDY, D.Sc. (Biology)
Research topic: Application and extension the DNA-based molecular and global UV dosimetry to the VUV, UVA, VIS radiation bacterial and mammalian cells, proteins

Research Group for Nephrology
Head: László ROSIVALL, D.Sc. (Medicine)
Research topic: Pathomechanism of progressive renal fibrosis

Research Group for Membrane Biology and Immunopathology
Head: Balázs SARKADI, C.M.
Research topic: Structure and function of biological membranes

Research Group for Genes and Environment
Head: Péter SÓTONYI, C.M.
Research topic: „Affected family"investigation of pathologycal cell division with cyto- and moleculargenetical methods

Research Group for Cellular and Molecular Physiology
Head: András SPÄT, O.M.
Research topic: Biological signal transduction

Research Group for Molecular Pathology
Head: Béla SZENDE, D.Sc. (Medicine)
Research topic: Regulation of growth and propagation of tumors

Research Group for Pediatrics and Nephrology
Head: Tivadar TULASSAY, C.M.
Research topic: Prevention of adulthood chronic diseases in childhood. Indentification and investigation of risk factors

Research Group for Gastroenterology and Endocrinology
Head: Zsolt TULASSAY, C.M.
Research topic: Molecular biologic aspects of gastroenterological and endocrinological disorders

Research Group for Molecular Oral Biology
Head: Gábor VARGA, D.Sc.
Research topic: Research in the field of oral biology, physiology and pathophysiology particularly on regulation of epithelial transport process and cell proliferation

University of Agricultural Sciences, Gödöllő

Research Group for Applied Animal Genetics and Biotechnology
Head: András DINNYÉS, D.Sc.
Research topic: Research on genetics and biotechnology in animal breeding

Research Group for Process Control
Head: István FARKAS, D.Sc. (Engineering)
Research topic: Computer aided process controll in agriculture

Research Group for Molecular Plant Breeding
Head: László HESZKY, C.M.
Research topic: Development and application of molecular breeding methods in agricultural and horticultural crop plants

Research Group for Agricultural Mycology
Head: László HORNOK, C.M.
Research topic: Development and use of nuclein acid based diagnostic technique for identification of plant pathogen fungi

Research Group for Modeling of Processed Plant Structures
Head: Péter SZENDRŐ, D.Sc. (Agriculture)
Research topic: Non food use agricultural by-products and wastes

Research Group for Plant Ecology
Head: Zoltán TUBA, D.Sc. (Biology)
Research topic: Plant ecological processes in temperate and tropical areas under changing climate

University of Szeged

Research Group for History of Ideas in Early Modern Period
Head: Mihály BALÁZS, D.Sc.
Research topic: History of ideas, church history

Research Group for Organic Catalysis
Head: Ferenc NOTHEISZ, D.Sc. (Chemistry)
Research topic: Enantioselective catalytical syntheses

Research Group for Laser Physiscs
Head: Zsolt BOR, O.M.
Research topic: Femtosecond lasers, application of lasers in materials science, biology and medicine

Research Group for Ability Development
Head: Benő CSAPÓ, D.Sc.
Research topic: System organization and development of knowledge and skills

Research Group for Artifical Intelligence
Head: János CSIRIK, D.Sc. (Matematics)
Research topic: Machine learning, speech recogniton, natural language processing

Research Group for Nanostructured Materials
Head: Imre DÉKÁNY, C.M
Research topic: Preparation and characterization of nanoparticles, nanocomposites and ultrathin layers

Research Group for Dermatology
Head: Attila DOBOZY, O.M.
Research topic: Functional genomic studies and new therapeutic possibilites of inflammatory and hyperproliferative skin diseases

Research Group for River Tisza
Head: László GALLÉ, D.Sc. (Biology)
Research topic: Ecology of terrestrial communities along River Tisza and its tributanes with special emphasis on econet function and stability

Research Group for Medieval Hungarian History
Head: Ferenc MAKK, D.Sc. (History)
Research topic: Chartesrs of the Angevin era, Medieval Hungarian History

Research Group for Microbiology
Head: Erzsébet NAGY, D.Sc.
Research topic: Production and molecular genetic characterization of transgenetic fungi

Research Group for Cardiovascular Pharmacology
Head: Gyula PAPP, O.M.
Research topic: New potential drugs to treat heart failure and cardiac arrhythmias: analysis of efficacy and mechanisms of action

Research Group for Protein Chemistry
Head: Botond PENKE, C.M.
Research topic: Characterization and investigation of proteins playing key role in the pathomechanism of neurodegenerative diseases

Research Group for Natural Effect and Embryology
Head: János SZABAD, D.Sc. (Biology)
Research topic: What factors are required for the commencement of embryogenesis?

Research Group for Neurohumoral Studies
Head: Gyula TELEGDY, O.M.
Research topic: Neural and humoral regulation of adatptive processes

Research Group for Analysis
Head: Vilmos TOTIK, O.M.
Research topic: Approximation theory and dynamical systems

Research Group for Neurology
Head: László VÉCSEI, C.M.
Research topic: Pathomechanism of neurological disorders: therapeutic perspectives

Research Group for Heterocyclic Chemistry
Head: Ferenc FÜLÖP, D.Sc. (Chemistry)
Research topic: Synthesis and stereochemical study of fused-skeleton saturated heterocycles and 1,2-disubstituted alicyclic compounds

Research Group for Turkology
Head: Árpád BERTA , D.Sc. (Linguestic)
Research topic: History of turkic languages

Research Group for Reaction Kinetics
Head: János KISS, D.Sc. (Chemistry)
Research topic: Surface science and heterogeneous catalysis

Research Group for Bioinorganic Chemistry
Head: Tamás KISS, D.Sc. (Chemistry)
Research topic: Biospeciation of essential and toxic metalions and complexes, structural and functional modelling of metalloproteins

University of Veszprém

Research Group for Plant Virology
Head: Gábor HORVÁTH, O.M.
Research topic: Biology and ecology of plant viruses and virus resistance

Research Group for Air Chemistry
Head: András GELENCSÉR, D.Sc.
Research topic: Study on the physical and chemical properties of atmospheric aerosol and its enviromental effects

Research Group for Analytical Chemstry
Head: János MINK, D. Sc (Chemistry)
Research topic: Applying of FTIR, Raman- and atomic spectroscopy in material environmental sciences

Research Group for Petrochemistry
Head: Ferenc UNGVÁRY, D. Sc (Chemistry)
Research topic: Synthetic application of metal compounds in organic chemistry