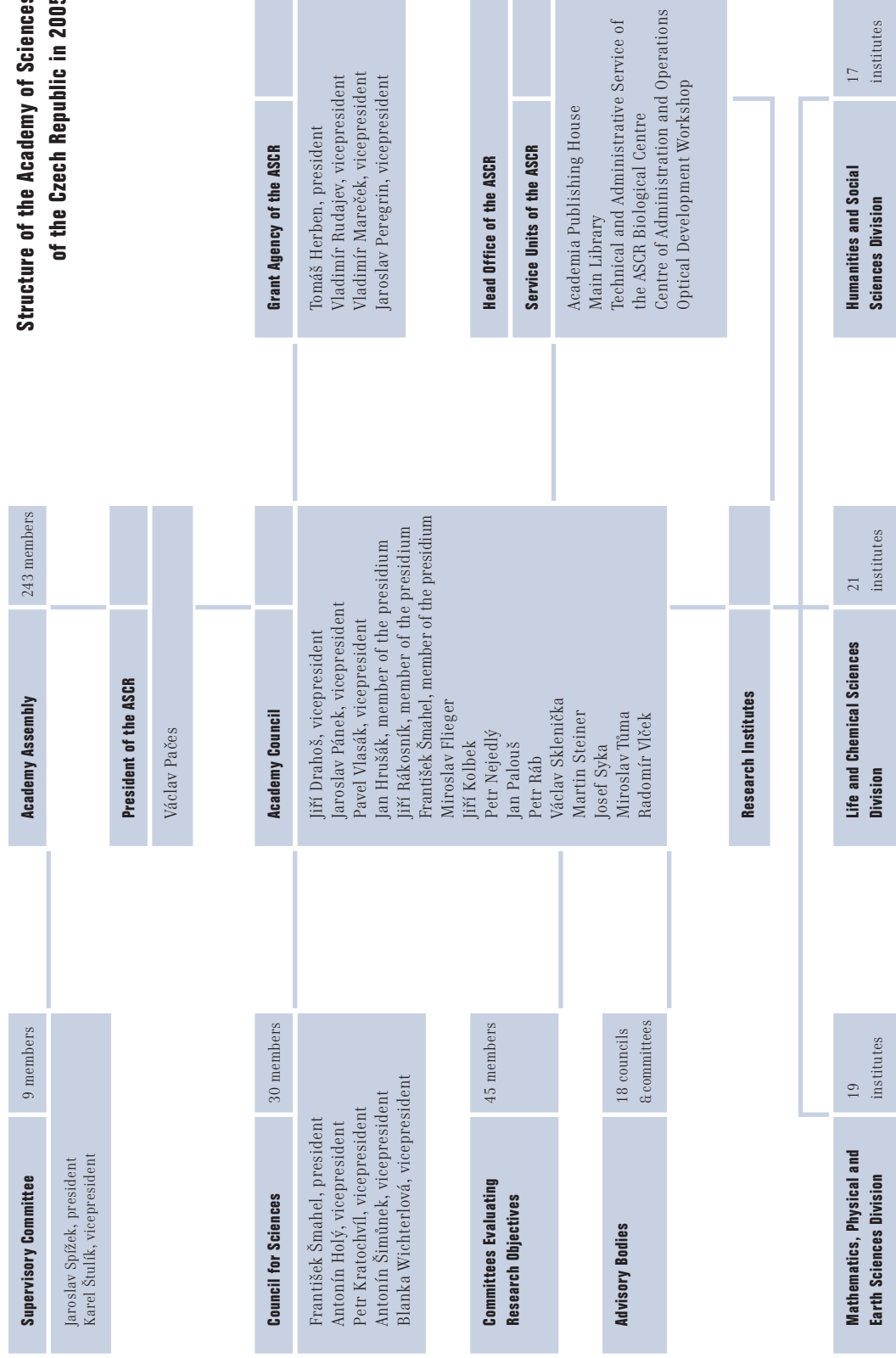


2005



ACADEMY OF SCIENCES OF THE CZECH REPUBLIC — ANNUAL REPORT

Structure of the Academy of Sciences of the Czech Republic in 2005







THE ACADEMY
OF SCIENCES
OF THE CZECH
REPUBLIC



Foreword by the President

Dear Readers,

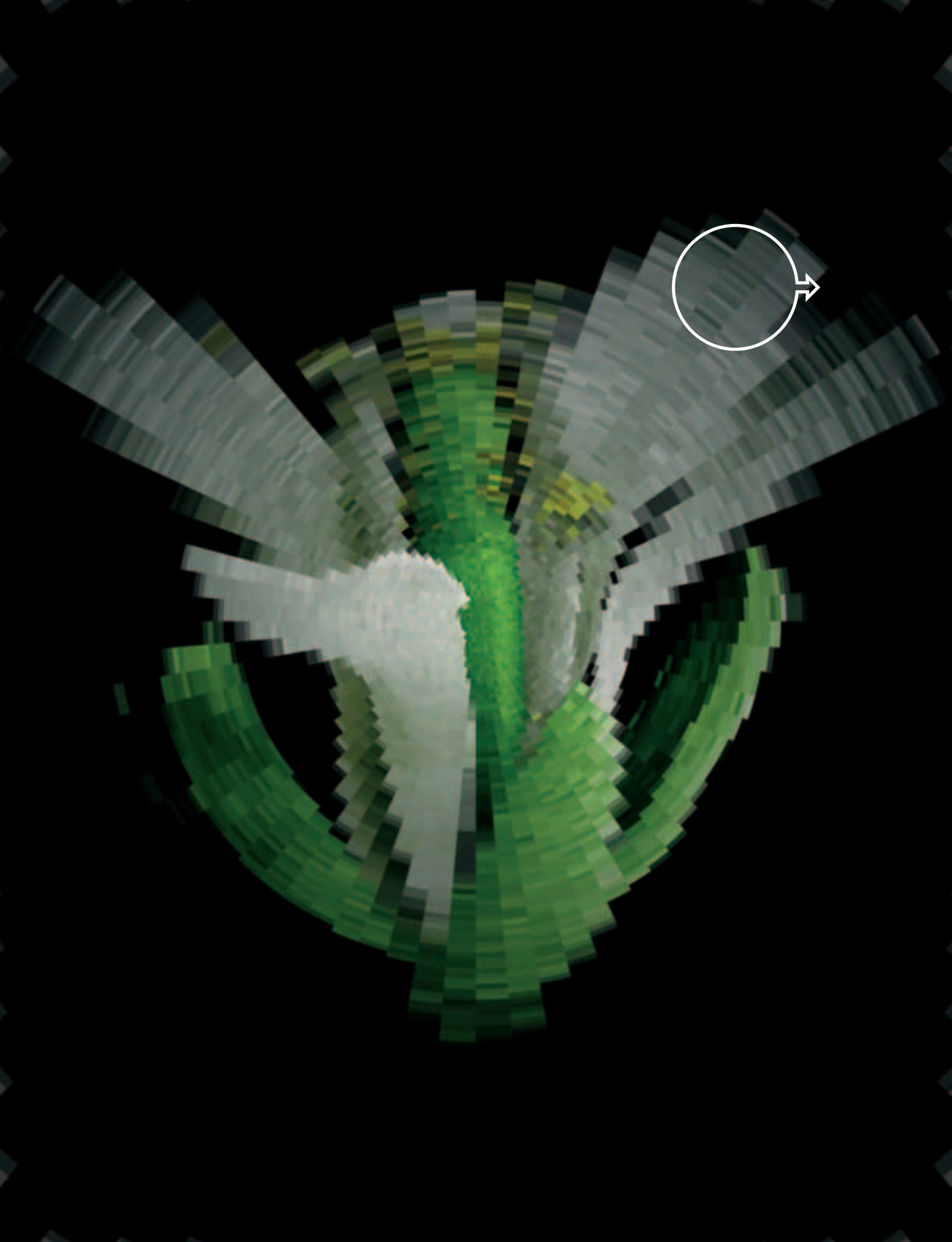
The year 2005, the first full year of work by the newly elected Academy Council, Council for Sciences, and myself, was a year full of widespread research work in the Academy's scientific community as well as other activities. This was particularly true with our integration into the European Research Area, training of young scientists and scholars, Academy cooperation with universities and the business sphere, in science communication and other areas.

It was also a year that brought profound changes in the legal and economic arrangement of our scientific efforts. An Act on public research institutions became effective on 13 September 2005 together with an amendment of the Act on the Academy of Sciences. Although the new legal arrangement will be fully implemented only after 1 January 2007, we took initial steps for the change by the end of 2005. After considering all aspects involved we modified the organisation of the Academy's research institutes and a draft of new Statutes of the Academy was accepted. Detailed preparations for implementing the new Acts will continue in 2006.

Therefore, I believe that this Annual Report of the Academy of Sciences of the Czech Republic for 2005 is not only a gratifying account of what was accomplished, but it also substantiates our optimistic outlook for the future.

Václav Pačes





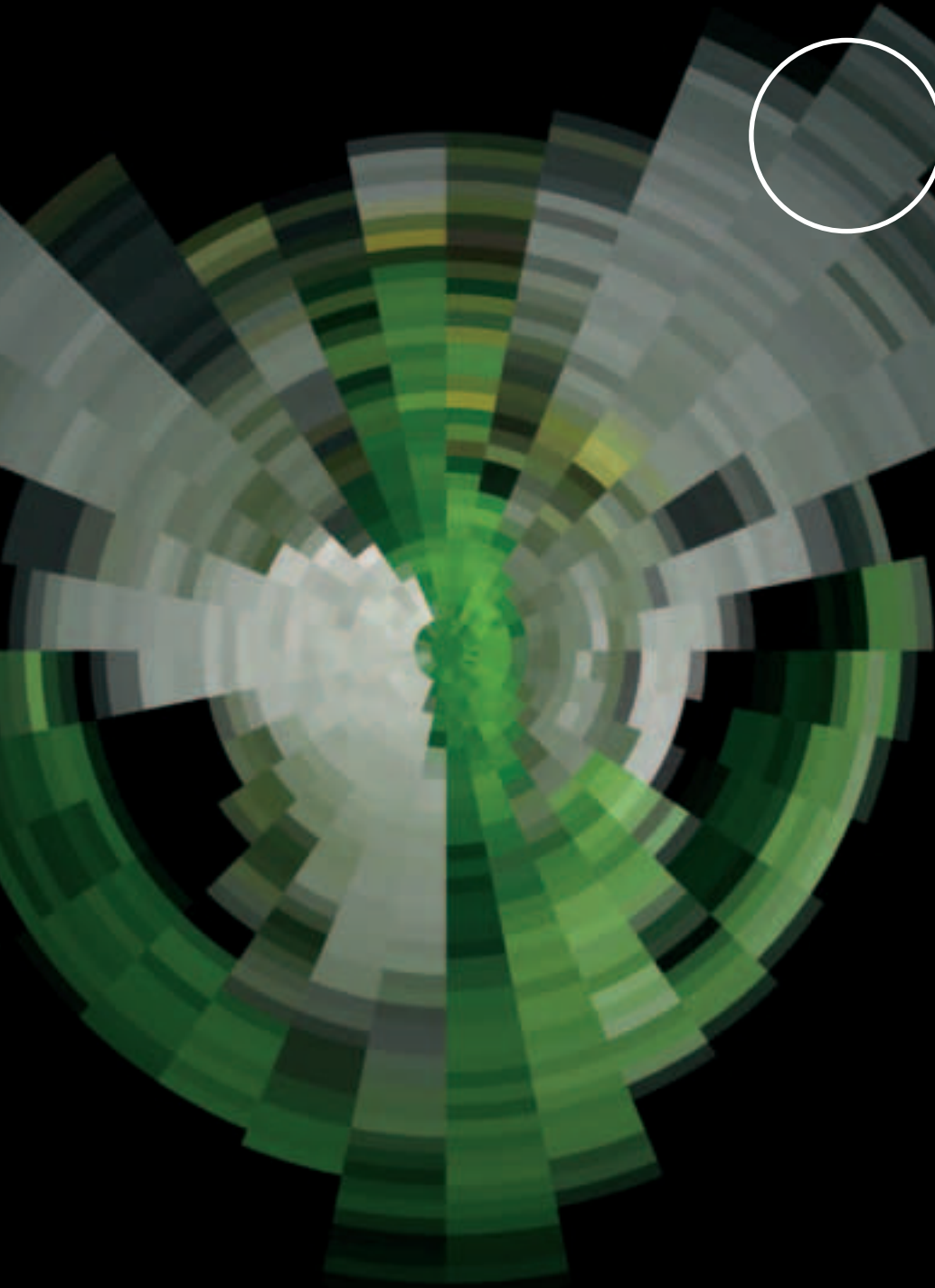


Foreword by the President **3**
Introduction **7**
Scientific Activities and the Results of Basic and Targeted Research **17**
Cooperation with Universities and the State of Educating Scientists **53**
Cooperation with the Business Sphere and Other Institutions **57**
International Cooperation **63**
Public Tenders in Research and Development **76**
Science Communication **81**
Summary of the Use of Financial Resources **86**

List of Appendices

List of Advisory and Auxiliary Bodies of the ASCR **91**
Publication Results at the ASCR **92**

1



The Academy of Sciences of the Czech Republic (hereinafter referred to as the ASCR) adapted its activities in 2005 to the **Concept of Research and Development at the ASCR** that had been updated in the previous year for 2005–2008. This principal programme was carried out in connection with tasks ensuing from the national policies (“The National Research and Development Policy of the Czech Republic for 2004–2008”, “The National Innovation Research and Development Policy of the Czech Republic for 2005–2010”) and government documents concerning research and development in this country and those involving Czech membership of the European Union. The former include “Long-term Basic Directions of Research Adopted by the Government of the Czech Republic in June 2005”. This document has outlined new tasks for the ASCR and will regulate its activities for several years. The latter document, “Priority Measure in the Attitude of the Czech Republic”, relates to the document “Investing in Research: an Action Plan for Europe”, as well as the objectives of the “Lisbon Strategy”, revised in Luxembourg in June 2005.

Important events at the ASCR included elections of its **new president**, Prof. Václav Pačes, DSc., new members of the Academy Council and Council for Sciences for the 2005–2009 term at the XXVth session of the Academy Assembly on 24 March 2005. The Academy Council then elected new vice-presidents of the ASCR – Ing. Pavel Vlasák, DSc., Prof. RNDr Jiří Drahoš, DSc. and Prof. PhDr Jaroslav Pánek, DSc. – and appointed its advisory bodies for the 2005–2009 term. The ASCR Committee for Work with Laboratory Animals was dissolved and a Departmental Expert Committee of the ASCR to Authorize Projects Involving Experiments on Animals was set up in agreement with the legal rules of protection of animals against abuse.

In response to present needs, the Academy Council appointed two new advisory bodies, a Council for Support of ASCR Participation in European Integration of Research and Development, and a Council for Cooperation of the ASCR with the Business and Application Sphere. (All advisory and auxiliary bodies are listed in Appendix 1.)

New laws have also begun to influence the life of the ASCR. The most important are **Act 341/2005 on public research establishments and Act 342/2005 on changes in some laws in connection with adoption of the Act on public research establishments**, which has amended, among others, the Act on the Academy of Sciences of the CR. Both Acts became valid on 13 September 2005. The full text of the **Act on the Academy of Sciences** appeared in the Collection of Acts on 18 October 2005 under No. 420/2005 Coll. (Part 144).

Ratification of these Acts by the Parliament completed the extended endeavour of the Academy to change the legal status of its institutes to one better suited to their



Václav Klaus,
 president of the Czech
 Republic
 and Václav Pačes,
 president of the ASCR
 at the XXVIIth session
 of the Academy
 Assembly on
 15 December 2005

research work and their need of cooperation with Czech universities as well as with research establishments in other countries. Measures for gradual implementation of the new laws have been taken. The Academy Assembly endorsed, at its XXVIIth session in December 2005, **a draft of new Statutes of the ASCR** which was then submitted to the Czech government for approval.

In 2005, the ASCR comprised 57 research institutes listed on the inside of back cover. In connection with the intended transformation of these institutes into public research establishments, debates were held seeking to **propose their optimal restructuring**. As a result, the Academy Assembly at its XXVIIth session approved the merging of the Institute of Electrical Engineering with the Institute of Thermomechanics, the merging of the Institute of Entomology, Institute of Hydrobiology, Institute of Parasitology, Institute of Plant Molecular Biology, Institute of Soil Biology and the Technical and Administrative Service of the ASCR Biological Centre into one establishment, the Biological Centre at České Budějovice, the merging of Masaryk Institute with the Archives, and the merging of the Academia Publishing House with the Centre of Administration and Operations. The mergers are effective from 1 January 2006.

In the course of 2005, the Institute of Landscape Ecology underwent a transformation ensuing from its research plan for 2005–2010, and its name was changed to Institute of Systems Biology and Ecology. With the consent of the Academy Council, a group of researchers left the Institute of Experimental Medicine for the Institute of Physiology, and the staff of the Geomechanics Department of the Institute of Rock Structure and Mechanics became associated with the Institute of Geology. As a result, off the national economic strategy and the need for applicable results, the Academy Council began to discuss the possibility of establishing an Institute of Biotechnology. The Czech government approved the Academy's intention to take over the unique COMPASS D tokamak which the United Kingdom Atomic Energy Authority offered gratis to the Institute of Plasma Physics.

The ASCR urged the **participation of its institutes in European programmes** by impacting European science policy in debates and consultations on the proposed 7th Framework Programme of the EU for 2007–2013, also through the Czech Contact Office for Research and Development (CZELO) in Brussels. The ASCR also assisted its institutes in participating in European programmes by proposing legislative changes in taxation and by financial audits completed by employees of the Head Office. (For details, see Chapter 5.)

With reference to **cooperation with the applied research and business sphere**, ASCR institutes participated in projects of applied research and development, and some entered into contracts with business firms. The Technology Centre played an important role in this cooperation, particularly by providing information for research and development, technology transfers and strategic studies. Cooperation within the framework of National Research Programme I was good, the Academy's institutes took part in 141 projects in 10 parts of the Programme. (For details, see Chapter 6.)

Cooperation with regions and state administration produced some good results. For example, cooperation between the ASCR and Orlicko, an association of towns and villages in the region, and topics on which some ASCR institutes worked within the Orlice River project, proved valuable for research as well as for the participating municipalities where the results were put to practical use.

After assessing the output of the Centre for Documenting Transfers of Cultural Property Belonging to Victims of World War II, the ASCR recommended the Czech government extend its activities till 2011. The Academy also participated in the debate preceding formulation of the proposal of a law regulating research on human embryonic stem cells. (Details can be found in Chapter 4.)

ASCR's **cooperation with universities** was extensive, especially with its staff members teaching numerous university courses, in obtaining and extending accreditation for graduate study programmes, in joint projects including publication of joint results, particularly in the Ministry of Education, Youth and Sports' programme of research centres. Three new joint departments with universities were established in 2005, bringing the total to 50. Evaluation of the activities of the joint departments carried out in 2005 confirmed the usefulness of this form of collaboration. There were problems in the financing of the joint departments, but they were due to the present legislation and to difficulties in raising funds for renewal of equipment and for acquiring modern instruments and technologies. Close cooperation of the ASCR with the Council of Universities contributed to good relations with the universities. (Chapter 3 has more information.)

The ASCR institutes take part in the **National Research Programme** (NRP). Projects under the "Programme of Targeted Research and Development" were completed by 31 December 2005. The ASCR together with the Council for Research and Development prepared a report on the launching and course of those parts of NRP where it acted as a provider. They were the programme **Information Society** with 4 subprogrammes, and the subprogramme **Support of Targeted Research Projects** of interdisciplinary programme 2 "Integrated Research". In accordance with the document "Long-term Basic Lines of Research" the ASCR proposed a new NRP programme, **Nanotechnology for Society** for 2006–2010. The Czech government agreed and a public competition was announced. (For more information, see Chapter 6.)

Work on **research objectives** is the principal activity of each ASCR institute. The results of 63 research objectives of 1999–2004 were evaluated in the first half of 2005. The committees for the most part concluded that the results were outstanding at the international level. New research objectives were also assessed, along with the earlier results of the institutes, in an interdepartmental evaluation organised by the Ministry of Education, Youth and Sports. The interdepartmental committee recommended that all the research objectives proposed by the ASCR institutes be funded. The Academy Council decided, in accordance with legal regulations, to fund each research objective in accordance with the outcome of a strict internal evaluation. Work on **63 new research objectives** for 2005–2010 began in 2005. (More information can be found in Chapter 2.)

Awards of
the ASCR

In 2005, the Academy Council of the Academy of Sciences of the Czech Republic, upon the recommendation of the Commission on Awards of the ASCR, presented the following awards:



DE SCIENTIA
ET HUMANITATE
OPTIME MERITIS
medal for
outstanding
scientific work and
for the
advancement of
humanitarian ideas

designed by
Josef Hvozdenký

The ASCR Award for Outstanding Scientific Results of Major Significance

To

Dr. Tomáš JUNGWIRTH (Institute of Physics, ASCR) for: **Ferromagnetism and New Spintronic Phenomena in Semiconductors** – accompanied by a supplement of 50,000 CZK

A research team of the Institute of Molecular Genetics, ASCR, composed of: Prof. RNDr. Václav HOŘEJŠÍ, CSc. (head of the team), RNDr. Ladislav ANDĚRA, CSc., RNDr. Pavla ANGELISOVÁ, CSc., Mgr. Tomáš BRDIČKA, Mgr. Naděžda BRDIČKOVÁ, Mgr. Jan ČERNÝ, PhD, Mgr. Karel DRBAL, PhD, PhMr. RNDr. Ivan HILGERT, DrSc., MUDr. Ondřej HORVÁTH, RNDr. Vladimír KOŘÍNEK, CSc., Mgr. Ing. Jiří ŠPIČKA, for: **The Significance of Membrane Microdomains and their Novel Protein Components in Immunoreceptor Signalling** (a collection of ten papers) – accompanied by a supplement of 100,000 CZK

A research team composed of : PhDr. Klára BENEŠOVSKÁ, CSc. (Institute of Art History, ASCR), PhDr. Jan FROLÍK, CSc. (Institute of Archaeology, ASCR, Prague), Mgr. Jana MAŘÍKOVÁ-KUBKOVÁ (Institute of Archaeology, ASCR, Prague), PhDr. Ivan MUCHKA (Institute of Art History, ASCR) for

the permanent exposition **The Story of Prague Castle** – accompanied by a supplement of 100,000 CZK

The ASCR Award to Young Researchers for Outstanding Achievements

To

Mgr. Michal DOVČIAK, Ph.D., born 1973 (Astronomical Institute, ASCR) for: **Radiation of Accretion Discs in Strong Gravity** – accompanied by a supplement of 25,000 CZK

Ing. Petr HALADA, Ph.D., born 1972 (Institute of Microbiology, ASCR) for: **The Development of Proteomic Methods for the Identification and Structural Characterisation of Biologically and Biotechnologically Relevant Proteins** (a collection of papers) – accompanied by a supplement of 25,000 CZK

Mgr. Bronislav OSTŘANSKÝ, Ph.D., born 1972 (Oriental Institute, ASCR) for his research on **The Perfect Man and his World in the Mirror of Islamic Mysticism. The Divine Dispensations for the Remedy of the Human Kingdom** – accompanied by a supplement of 25,000 CZK

The ASCR Award for an Exceptionally Successful Programme or Grant Project

To

A research team of the Institute of Scientific Instruments, ASCR, composed of: Ing. Josef HALÁMEK, CSc., Ing. Pavel JURÁK, CSc. for: **New Methods of Non-invasive Diagnostics of Nervous and Cardiovascular Diseases** – accompanied by a supplement of 70,000 CZK

A research team of the Institute of Microbiology, ASCR, composed of: Ing. Peter ŠEBO, CSc. (head of the team), Ing. Radim OSIČKA, Dr., Mgr. Jiří MAŠÍN, Ing. Marek BASLER, Mgr. Jana VODOLÁNOVÁ for: **Investigation of the Mechanism of Membrane Translocation of the Adenylate Cyclase Toxin** – accompanied by a supplement of 70,000 CZK

A research team of the Institute of Biophysics, ASCR, composed of: RNDr. Michal ŠTROS, CSc. (Head of the team), Ing. Alena BAČÍKOVÁ, Mgr. Eva MUSELÍKOVÁ-POLANSKÁ, Božena KRÖNEROVÁ for: **Understanding DNA Binding of the RNA Polymerase I Transcription Factor UBF** – accompanied by a supplement of 50,000 CZK

Significant contributions

made by individual Czech and foreign scientists in the fields of science, promotion of humanitarian ideas, and international scientific cooperation were awarded **Honorary Medals** of the **ASCR**.

The highest distinction – the **DE SCIENTIA ET HUMANITATE OPTIME MERITIS Honorary Medal** – was awarded to the following:

Prof. Ing. Ivo BABUŠKA, DSc., Dr.h.c. – University of Texas, Austin, USA
Prof. RNDr. Petr HÁJEK, DSc. – Institute of Computer Science
Prof. Ing. Jaroslav JANÁK, DSc., Dr.h.c. – Institute of Analytical Chemistry
Prof. Norbert KRÓO – Hungarian Academy of Sciences, Budapest, Hungary
Zdeněk MACAL – Czech Philharmonic Orchestra, Prague
Prof. Ing. Ivan WILHELM, CSc. – Charles University, Prague



Honorary
Medals

Honorary Medals for merit in individual fields of science were awarded to the following:

The B. Bolzano Honorary Medal for Merit in the Mathematical Sciences

Prof. RNDr. Radko MESIAR, CSc. – Faculty of Civil Engineering, STU, Bratislava, SR
 Prof. RNDr. Jaroslav PEREGRIN, CSc. – Institute of Philosophy

The E. Mach Honorary Medal for Merit in the Physical Sciences

Prof. Dr. Alexandr JABLONSKÝ – Polish Academy of Sciences, Warsaw, Poland
 RNDr. František KROUPA, DSc. – Institute of Plasma Physics
 Prof. Andrew Richard LANG, PhD., FRS – University of Bristol, United Kingdom
 Prof. Guido Van OOST, PhD – University of Ghent, Belgium

The F. Pošepný Honorary Medal for Merit in the Geological Sciences

Doc. PhDr. Pavel POVONDRA, DSc. – Institute of Geology, ASCR

The G. J. Mendel Honorary Medal for Merit in the Biological Sciences

Prof. Dr. Georg KLEIN – Microbiology and Tumour Biology Centre, Karolinska Institutet, Sweden
 Prof. RNDr. Ivan RAŠKA, DSc. – Institute of Experimental Medicine
 Prof. MUDr. Jaroslav ŠTERZL, DSc. – Institute of Microbiology

The J. E. Purkyně Honorary Medal for Merit in the Biological Sciences

Dr. Mikuláš POPOVIČ – Institute of Human Virology, Baltimore, Maryland, USA

The J. Dobrovský Honorary Medal for Merit in the Social Sciences

PhDr. Marta BEČKOVÁ, CSc. – Institute of Philosophy
 Dr. Aleksandar ILIĆ – The Embassy of Serbia and Montenegro in the Czech Republic

The Jan Patočka Memorial Medal

PhDr. František HOFFMANN, CSc. – Archives of the ASCR
 RNDr. Vladimír PETRUS, CSc. – Head Office of the ASCR
 RNDr. Jana ŠLOTOVÁ, CSc. – Institute of Biophysics

The V. Náprstek Honorary Medal for Merit in Science Communication

Dipl. Pol. Dr. Werner KORTHAASE – Deutsche Comenius-Gesellschaft e.V., Berlin, BRD
 MUDr. František KOUKOLÍK, DSc. – Thomayer Hospital, Prague
 Prof. RNDr. Ivo KRAUS, DSc. – Czech Technical University, Prague

The following members of ASCR institutes received **national and other awards**:

The national second degree **Medal for Merit in Science** was awarded to

Prof. RNDr. Helena ILLNEROVÁ, DSc. of the Institute of Physiology

Česká hlava (Czech Intellect) was awarded to Prof. Ing. Armin DELONG, DSc. of the Institute of Scientific Instruments by the Czech government

Česká hlava Invention Prize to Prof. RNDr. Blanka ŘÍHOVÁ, DSc. of the Institute of Microbiology and Prof. Karel ULBRICH, DSc. of the Institute of Macromolecular Chemistry

Medal of the Senate of Parliament of the Czech Republic was awarded to Prof. RNDr. Blanka ŘÍHOVÁ, DSc. of the Institute of Microbiology

Praemium Bohemiae 2005 to Prof. PhDr. František ŠMAHEL, DSc. of the Institute of Philosophy

Award of the Minister of Education, Youth and Sports for Research and Development, to Doc. JUDr. Josef BLAHOŽ, DSc. of the Institute of State and Law, Prof. RNDr. Alois KUFNER, DSc. of the Mathematical Institute and Prof. MUDr. Josef SYKA, DSc. of the Institute of Experimental Medicine

Award of the Minister of the Environment to RNDr. Vojen LOŽEK, DSc. of the Institute of Geology

Award of the Ministry of Health to a team of the Institute of Molecular Genetics, led by Prof. MUDr Jan BUBENÍK, DSc.

The Jan Masaryk Silver Medal was awarded by the Minister of Foreign Affairs to Prof. Jan ŠVEJNAR, PhD. of the Economics Institute for his contribution to good Czech-American relations

Award of the Czech Science Foundation to Prof. RNDr. Viktor BRABEC, DSc. of the Institute of Biophysics

Award of the Learned Society of the Czech Republic to RNDr. Václav PETŘÍČEK, CSc. of the Institute of Physics and Ing. Ivan HLAVÁČEK, DSc. of the Mathematical Institute

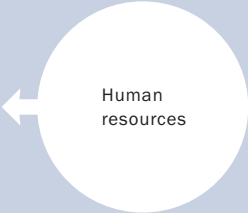
The **Knights' Cross** of Poland was awarded to Prof. PhDr. Radomír PLEINER, DSc. of the Institute of Archaeology for his contribution to cooperation between Poles and Czechs

The French order **Chevalier des Palmes Académiques** to Ing. Peter ŠEBO, CSc. of the Institute of Microbiology

Yanzhao Friendship Award to Prof. RNDr. Jan ŽDÁREK, DSc. of the Institute of Organic Chemistry and Biochemistry from the government of Hebei Province (China) for many years of collaboration in science

Fourteen graduate students as well as young scientists who had completed doctoral study programmes in 2005 and worked at ASCR institutes were successful in competitions or obtained awards in acknowledgment of their work.

Seeking to improve the age range of the staff of its institutes, the ASCR gave special attention to young researchers. In 2005, **The Otto Wichterle Award** for young scientists and scholars working at the Academy was awarded to twenty-one researchers: nine working in the Mathematics, Physical and Earth Sciences Division, eight in the Life and Chemical Sciences Division and four in the Division of Humanities and Social Sciences. Based on the evaluation of the work of those who had received this premium and the role of awards in the life of the ASCR, the Academy Council decided to increase the amount and lower the upper age limit of candidates. Another stimulus, assigning “starting flats” to young research workers, continued.



Human
resources



ASCR's president
Václav Pačes
presenting The Otto
Wichterle Award,
June 2005

Special attention was given to key posts in the ASCR's staff structure, i.e., **directors of the institutes and other units**. The Academy's management carefully selected the members of selection committees and required strict observance of the rules of selection procedure. Eight new directors were appointed for their first term in office, and nine directors were reappointed for their second terms.

Attestations are regularly organized at all ASCR institutes, and their employees are **categorized by their qualifications** in accordance with the career rules of the ASCR. In 2005, the all-Academy Coordinating Committee discussed 38 proposals to place employees in the highest category, 33 of which were approved. Nine outstanding research workers were awarded the **Doctor of Science (DSc.)** degree. A total of 29 persons have obtained this degree since 2003, while another 11 applications are under consideration.

The **J. E. Purkyně Fellowship** seeks to place at ASCR institutes excellent scientists, Czechs as well as foreigners, under 40. In 2005, this Fellowship was awarded to MUDr. David SEDMERA, PhD. (Institute of Animal Physiology and Genetics), RNDr. Bohuslav REZEK, PhD. (Institute of Physics) and Mgr. Tomáš KRUML, CSc. (Institute of Physics of Materials).

The results of an efficiency evaluation of the institutes and individuals affected not only the funding of research but all areas of the life of ASCR. Scientometric data (indicators) of the last 5 and 10 years were analysed for assessing the Academy's efficiency and contribution to Czech research and development. The analysis showed an improvement in measurable efficiency (i.e., in indicators used) within the ASCR. In 2005, the number of papers in periodicals monitored in the Web of Science (WOS) grew by 17 percent in comparison with 2004. Scientific productivity at the ASCR is shown by the numbers of original papers published in impact journals (according to the WOS database):

	2001	2002	2003	2004	2005
Czech Republic (total)	5276	5290	6186	6173	7588
Of this, ASCR	2029	2021	2262	2189	2567



The project **Open Science**, which seeks to challenge teachers but especially to stimulate the interest of grammar school students in science, is a major initiative in **science communication**. The two-year project was initiated in the autumn of 2005 by the ASCR together with the Faculty of Science of Charles University, Faculty of Electrical Engineering of Czech Technical University, the Czech Society for Biochemistry and Molecular Biology, and Krátký Film Praha, Ltd.

For more information on the communication of research and development, see Chapter 7.

The efficacy was audited of the internal control system as well as the use of funds from the national budget and management of state property to ensure principles of good management are followed and property is protected. The special means accounts and compliance with the law on public orders was the object of close scrutiny. No serious mistakes were found. Fifteen ASCR establishments, i.e., about 22 percent, were audited. Ten scientific societies were audited for compliance with the principles of allocation of funds from the national budget, and adhering to the contracts they had signed. No serious faults were found. The conclusions of the individual audits were discussed by the Academy Council. Subsequent inspection has shown that the measures taken reduce repetition of mistakes to a minimum.

The transformation of the ASCR institutes to public research establishments presents some intricate legal problems concerning property. Therefore, a Committee for dealing with immovable and movable assets as well as obligations connected with the transformation was set up to propose possible ways of settling all disputable cases. In the autumn of 2005, the Academy Council approved a “Procedure on Transferring Immovable ASCR Assets to Public Research Establishments”.

2



2

Scientific Activities and the Results of Basic and Targeted Research

The results of the Academy's institutes are presented by the fields of research. The principal lines of research are given for each section. Abstracts of some of the studies, such as team studies, individual discoveries and important publications, are given for illustration (co-authors from establishments beyond the Academy are mentioned). The abstracts of studies whose titles are listed at the end of each section can be found at the ASCR's website. They are just samples of the work done at the Academy's institutes in 2005.

1 • Mathematics, Physics and Informatics

The section includes six institutes, three in physics and three in mathematics and informatics. Their research objectives are as follows:

Astronomy and astrophysics • Astronomical Institute

Computer science for the information society: Models, algorithms, application
• Institute of Computer Science

Advanced mathematical methods in retrieval, processing and applications of information and knowledge in complex and non-determinist systems
• Institute of Information Theory and Automation

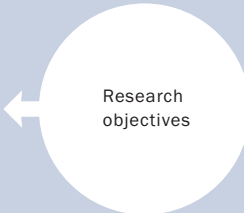
Phenomena of elementary particle physics beyond the standard model
• Institute of Physics

Specific effects in condensed systems with reduced dimensions and broken symmetries
• Institute of Physics

Physics and technology of nanostructures, surfaces and thin films
• Institute of Physics

Wave and corpuscular light propagation, optical materials and technology
• Institute of Physics

Intense radiation sources and radiation – matter interaction • Institute of Physics



Research objectives

Illustrative
abstract

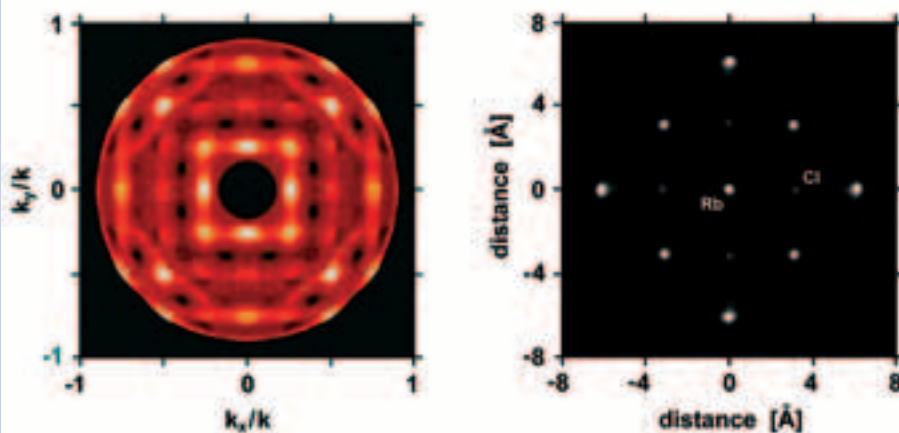
The development and amplification of general mathematical knowledge and its application in other fields of science as well as practice • Mathematical Institute

Nuclear physics and related fields in the basic, applied and interdisciplinary research
• Nuclear Physics Institute

X-ray holography with atomic resolution • Institute of Physics

At present, the structure of crystalline samples is usually solved by x-ray, electron or neutron diffraction. However, the problem of how to determine the atomic structure of samples without translation periodicity (such as, small clusters of atoms, organic molecules, viruses, etc.) remains to be solved.

The method of x-ray diffuse scattering holography which has been proposed at the Institute of Physics appears to be very promising from this point of view, because, in principle, it makes it possible to obtain the hologram of a cluster of atoms (and a three-dimensional real-space image of atoms can be reconstructed numerically from the hologram) by measuring anomalous x-ray diffuse scattering. This holographic method was not only proposed theoretically [1], but its feasibility was also proved experimentally by using a rubidium chloride sample [2]. Currently we are working on the improvement of data collection accuracy [3] as well as on the development of better reconstruction algorithm so as to determine more complicated, and thus more interesting, unknown structures.



The hologram obtained as a difference of diffuse scattering patterns recorded at energies of 15.060 keV and 15.120 keV (left). Holographic reconstruction of Rb and O atoms in the (001) crystallographic plane (right).

- (1) M. Kopecký: X-ray diffuse scattering holography, *J. Appl. Crystallogr.* 37:711–715 (2004).
- (2) M. Kopecký, J. Fábry, J. Kub, E. Busetto, and A. Lausi: X-ray diffuse scattering holography of a centrosymmetric sample, *Appl. Phys. Lett.* (in press)
- (3) J. Fábry, M. Kopecký, J. Kub: A simple method of shielding area detectors from unwanted Bragg diffractions, *J. Appl. Crystallogr.* (in press)

Illustrative
abstract

On the low Mach number limit for the full Navier-Stokes-Fourier system • Mathematical Institute

In this paper, the authors examine the full system describing the flow of compressible fluids including the effects of temperature. Rigorous results for this system were until recently very rare and included

only physically unrealistic cases. E. Feireisl created a more complete theory of resolution of these equations including real phenomena in flowing fluids. In this paper, we prove that if the so-called Mach number tends to zero, then the solutions of the full system tend to solutions of equations for incompressible flow, i.e., equations in which the influence of compressibility is neglected (as, e.g., with water). The Mach number is a fraction between the typical speed for a given flow (e.g., average speed of a river stream) and the sound speed in the fluid. It distinguishes, for example, whether the flow is subsonic or supersonic.

If the fluid becomes less compressible, the sound speed increases, the Mach number decreases, and in the limiting case tends to zero. This then corresponds to the flow of the ideally incompressible fluid. This fact is rigorously verified in this paper by methods of modern analysis and sophisticated limited procedures. At the same time, we can differentiate the type of flow for which we can accept the simpler “incompressible” flow from the complicated full system. Any result proved for real fluids influenced by temperature is appreciated worldwide and appears in strict competition on pages of the best mathematical journals. (The complete text of this paper has already been accepted for publication in the Archive for Rational Mechanics and Analysis.)

E. Feireisl, A. Novotný: On the low Mach number limit for the full Navier-Stokes-Fourier system. Accepted in Archive for Rational Mechanics and Analysis

Shifts of seasons at the European mid-latitudes: Natural fluctuations correlated with the North Atlantic Oscillation • Institute of Computer Science

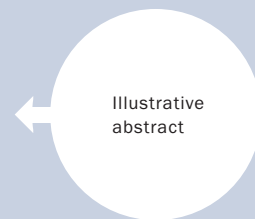
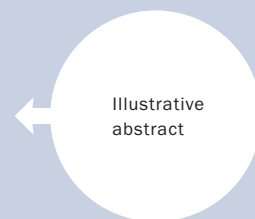
In agriculture, forestry and biology in the 1990s, it has been observed that the spring seasons started earlier than in the previous decades. In order to find an objective measure of timing of seasons, a precise estimation of the instantaneous phase of the annual cycle has been developed and applied to historical air temperature records from several European locations. The earlier onset of spring in 1990s has been confirmed and this proved to be consistent with historical temperature records. Rather than a result of the recent climate changes, these season shifts are part of a natural fluctuation process which is related to the global atmospheric circulation processes. It is important to understand the source and the dynamics of this dynamic process, since precise predictions of the timing of seasons can have an important influence on agriculture, forestry, water and energy management (heating seasons), transportation and tourism.

Paluš, M., Novotná, D., Tichavský, P.: Shifts of seasons at the European mid-latitudes: Natural fluctuations correlated with the North Atlantic Oscillation. *Geophysical Research Letters* 32 (12): Art. No. L12805 (2005)

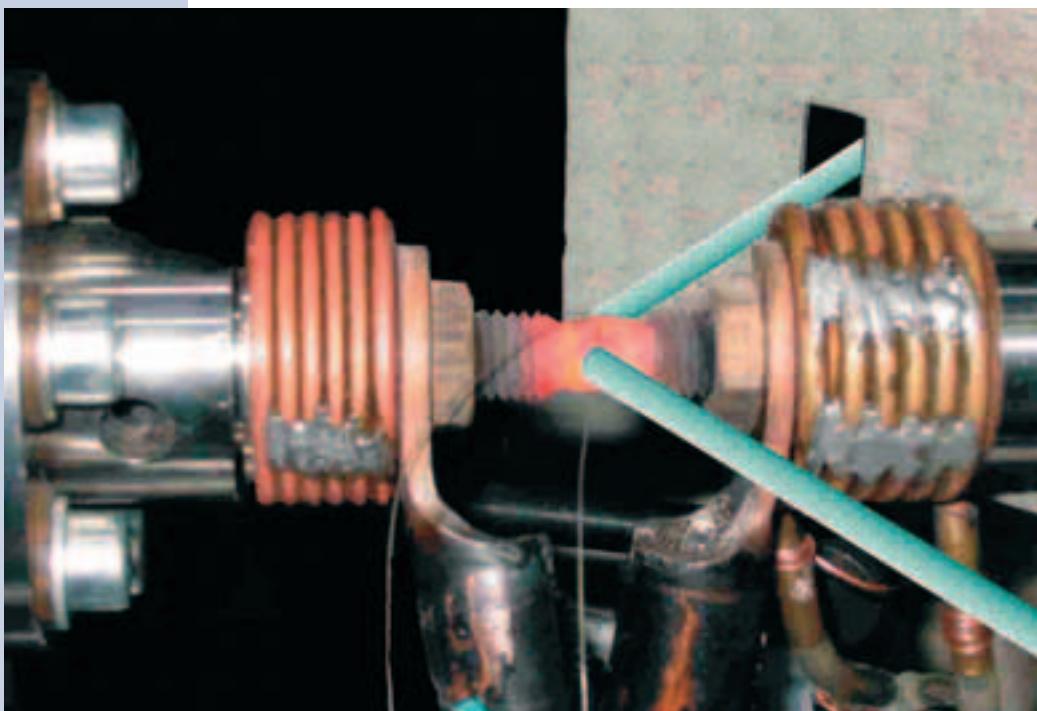
In-situ neutron diffraction studies of transformation characteristics of modern types of steels • Nuclear Physics Institute

P. Lukáš, O. Muránsky, P. Jenčuš, P. Šittner¹, Y. Tomota², P. G. Xu²

Basic tasks of the modern types of steels are excellent mechanical properties – strength and easy formability, good corrosion resistance, and, of course, low production expenses. Material scientists try to solve these conflicting demands by a proposed concept of low-alloyed multiphase steels where exceptional material parameters could be reached by sophisticated thermomechanical treatments. In researching these kinds of materials, we applied a new experimental method combining high temperature mechanical testing and the neutron diffraction. In collaboration between NPI Rež, IoP Prague and Ibaraki University, Hitachi Japan, we performed unique *in situ* neutron diffraction experiments with low-alloyed austenitic-ferritic steels on their thermomechanical loading. The experimental results yielded valuable information on transformation behavior of steels in dependence



on the production technological parameters, such as the rate and degree of the mechanical deformation, intercritical annealing temperature, cooling rate and influence of the alloying elements.



Photograph of the specimen of the tested steel upon high-temperature mechanical loading at the neutron diffractometer; the incident and diffracted neutron beam is plotted in the photograph as well.

Jenčůš, P., Lukáš, P., Zrník, J., Nový, Z.: Neutron diffraction studies of Si-Mn TRIP steel in situ upon thermomechanical processing. *J. Neutr. Res.* 12: 243–248 (2004).

Xu, P. G., Tomota, Y., Lukáš P., Adachi, Y.: In Situ Neutron Diffraction of Austenite-to-Ferrite Transformation in Nb-free and Nb-added Low Alloy Steels during Thermo-mechanically Controlled Process. *Iron and Steel* 40 Suppl.: 234–238 (2005).

Muránský, O., Lukáš, P., Zrník, J., Šittner, P.: Neutron Diffraction Analysis of Retained Austenite Stability in Mn-Si Trip Steel during Plastic Deformation. *Physica B*: (in press) (2006).

Xu, P. G., Tomota, Y., Lukáš, P., Muránský O., Adachi, Y.: Austenite-to-Ferrite Transformation and Phase Strain Evolution in Low Alloy Steels during Thermomechanically Controlled Process Studied by In Situ Neutron Diffraction. *Acta Materialia* (submitted).

¹Institute of Physics, Na Slovance 2, Praha 8, 182 21

²Department of Materials Science, Ibaraki University, 4-12-1 Nakanarusawa-cho, Hitachi, Ibaraki, Japan

List of studies

1. Radio “crystallography” of solar corona (Astronomical Institute)
2. Discovery of three populations of meteoroids without sodium (Astronomical Institute)
3. Radiative transfer in moving media (Astronomical Institute)
4. Elastic scattering of protons at very high energies (Institute of Physics)
5. Infrared light reveals ferroelectric order at nanometric scale (Institute of Physics)
6. Magneto-caloric phenomena in intermetallic compounds under high pressure (Institute of Physics)
7. Low temperature deposition of oxide thin films by plasma systems (Institute of Physics)
8. X-ray holography with atomic resolution (Institute of Physics)
9. On the low Mach number limit for the full Navier-Stokes-Fourier system (Mathematical Institute)
10. Function properties of rearrangement invariant spaces defined in term of oscillations (Mathematical Institute)
11. Complete ccc-Boolean algebras, the order sequential topology and a problem of von Neumann (Mathematical Institute)
12. Distribution of sequences: A sampler (Institute of Computer Science)

13. Rounding error analysis of the Gram-Schmidt orthogonalization process (Institute of Computer Science)
14. Shifts of seasons at the European mid-latitudes: Natural fluctuations correlated with the North Atlantic Oscillation (Institute of Computer Science)
15. Bose-Einstein condensation in geometrically deformed tubes (Nuclear Physics Institute)
16. Low-level determination of silicon in biological materials using radiochemical neutron activation analysis (Nuclear Physics Institute)
17. In-situ neutron diffraction studies of transformation characteristics of modern types of steels (Nuclear Physics Institute)
18. Nonlinear model of closed economy (Institute of Information Theory and Automation)
19. Accelerator for the cross ambiguity function computation (Institute of Information Theory and Automation)
20. Feature/word selection in text classification (Institute of Information Theory and Automation)

2 • Applied Physics

In 2005, the section was formed by eight institutes with the following research objectives:

Interaction of electromagnetic fields and the dynamics of controlled energy conversion in electrical engineering • Institute of Electrical Engineering

The dynamics of fluid systems and transformation processes in the hydrosphere
• Institute of Hydrodynamics

Physical properties of advanced materials in relation to their microstructure and processing • Institute of Physics of Materials

Physical and chemical processes in plasmas and their applications • Institute of Plasma Physics

Materials, structures, systems and signals for electronics, optoelectronics and photonics
• Institute of Radio Engineering and Electronics

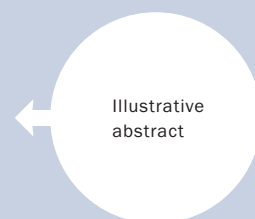
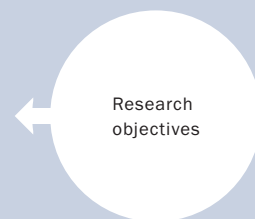
Development of experimental methods for studying physical properties of matter, and their application in advanced technologies • Institute of Scientific Instruments

Time-dependent responses of materials, systems and environments to the impact of natural factors and human actions • Institute of Theoretical and Applied Mechanics

Complex dynamical systems in thermodynamics, fluid and solid mechanics
• Institute of Thermomechanics

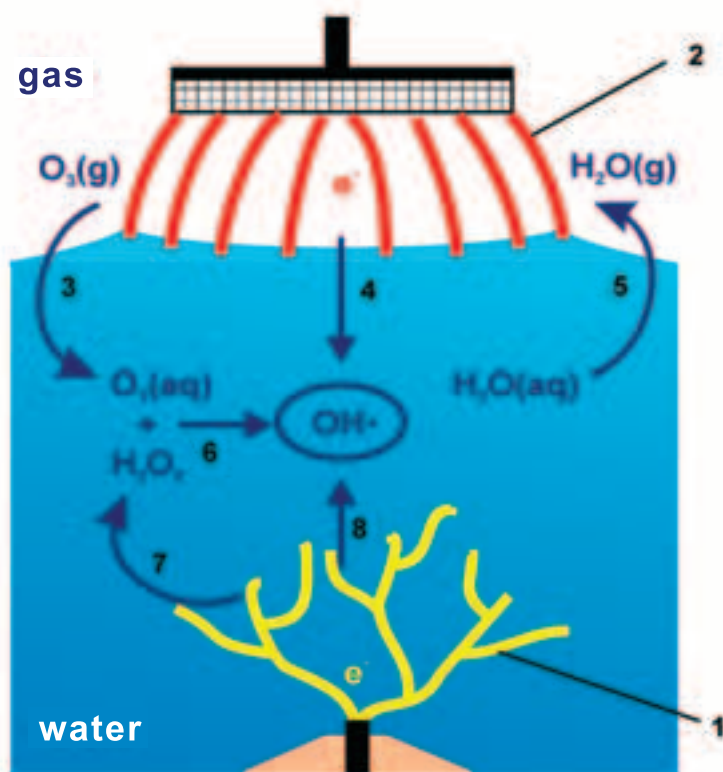
Plasmachemical oxidation processes in hybrid gas-liquid electrical discharge reactor
• **Institute of Plasma Physics**

Czech physicists from the Institute of Plasma Physics developed, in cooperation with their American colleagues from Florida State University, a hybrid gas-liquid electrical discharge reactor that generates gas phase discharge above the water surface simultaneously with the electrical discharge directly in the liquid. These discharges initiate a variety of physical and chemical effects in water, which might be effective for degrading a number of organic pollutants and in the destruction and inactivation of



microorganisms in water. In order to examine plasmachemical processes induced in the hybrid reactor, the mechanism of degradation of substituted phenols, as model organic compounds, was studied in detail. The main chemical processes induced in these reactors include the formation of ozone in the gas phase above the water and formation of $\text{OH}\cdot$ radicals and H_2O_2 in the liquid.

In addition, the processes initiated at the gas-liquid interface by the gaseous plasma channels in direct contact with water surface, yield the formation of additional $\text{OH}\cdot$ radicals in water vapor and subsequent dissolution of these radicals and ozone into water. Physicists observed a significantly enhanced degradation of phenols in the hybrid reactor compared to their removal by the single-liquid phase discharge reactor owing to the combined action of chemically active species produced by the discharges in both gas and liquid phases. In addition, physical effects such as UV radiation, shock waves and strong electric field occurred simultaneously in the reactor. The results obtained contribute significantly to our understanding of the processes induced by electric discharges in water and will allow further development of the hybrid reactors for water treatment applications.



Scheme of plasmachemical oxidation processes induced in hybrid series reactor under oxygen atmosphere.

- 1, Liquid phase discharge;
- 2, gas phase discharge;
- 3, formation of ozone and its dissolution in water;
- 4, transfer of $\text{OH}\cdot$ radicals from the gas into the water;
- 5, vaporization of water surface;
- 6, peroxone process decomposition of hydrogen peroxide by ozone;
- 7 and 8, generation of H_2O_2 and $\text{OH}\cdot$ radicals by liquid phase discharge.

Lukeš P., Locke B. R. (2005) Plasmachemical Oxidation Processes in Hybrid Gas-Liquid Electrical Discharge Reactor. *J. Phys. D: Appl. Phys.* 38 (22):4074–4081

Lukeš, P., Člupek, M., Babický, V., Janda, V., Šunka P. (2005) Generation of ozone by pulsed corona discharge over water surface in hybrid gas-liquid electrical discharge reactor. *J. Phys. D: Appl. Phys.* 38 (3):409–416

Illustrative
abstract

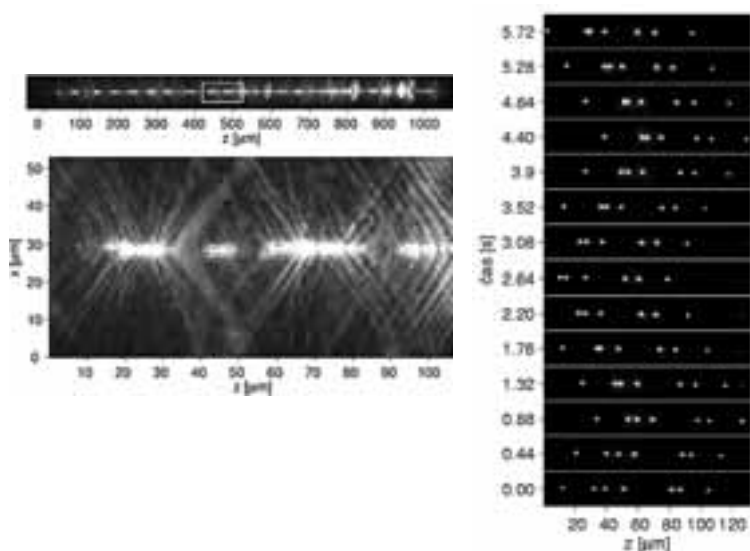
Optical conveyor belt • Institute of Scientific Instruments

Optical conveyor belt is a device that employs the movable interference structure of light to confine and

transport micron and submicron scale objects placed in liquid in a controllable manner. Concerning the momentum transport from light to the objects, this system retains the principles of classical optical tweezers. However, it does not use a single focused laser beam but a so-called non-diffracting Bessel beam.

Its radial profile of optical intensity has a central micron-size maximum that almost does not change its width over one millimetre axial distance. If an obstacle (micron-size object) is placed into such a beam, the beam is disturbed only over a short distance behind which it self-reconstructs into the original shape. The optical conveyor belt employs two identical but counter-propagating non-diffracting beams. As a result of their interference, they form a standing wave (a system of intensity maxima and minima).

Up to hundreds of micro-objects can be confined in these maxima and minima. Moreover, the phase change in one of the beams causes movement of the standing wave structure together with the confined objects so they can be transported precisely axially. This system was developed in cooperation of teams from the Institute of Scientific Instruments in Brno and the University of St. Andrews in Scotland. They succeeded in spatial organization of polystyrene beads of radii from 100 nm into a one-dimensional array and performed its movement over a distance as long as one millimetre.



← ← The trapped objects with 175 nm in radius placed in the system of optical traps. The upper part is an image composed of 10 frames from CCD record and shows the whole 1 mm long chain of confined particles. The area of the white rectangle corresponds to the lower unscaled part of this record.

← This image shows 7 polystyrene particles of 100 nm in diameter confined in non-diffracting standing wave. Altering phase of one of the interfering counter-propagating beams the whole structure of nodes and antinodes can be shifted together with the confined object. This movement over 50 μm in both directions is presented here. However, our setup enabled the particle delivery over 20× longer distance.

Čižmár, T., Garcés-Chávez, V., Dholakia, K., Zemánek, P.: Optical conveyor belt for delivery of submicron objects. — *Appl. Phys. Lett.* 86: 174101:1–3 (2005).

Čižmár, T., Garcés-Chávez, V., Dholakia, K., Zemánek, P.: Optical trapping in counter-propagating Bessel beams. *SPIE Proc.* 5514: 643–651 (2004).

Čižmár, T., Garcés-Chávez, V., Dholakia, K., Zemánek, P.: Optical conveyor belt based on Bessel beams. *Proc. SPIE Int. Soc. Opt. Eng.* 5930, 59300X (2005).

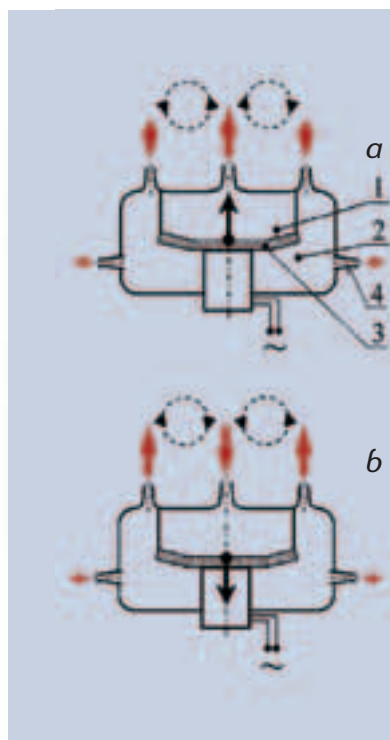
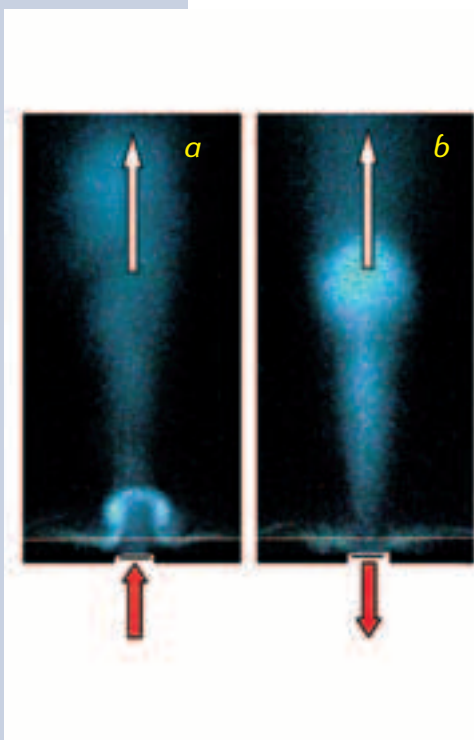
Čižmár, T., Šiler, M., Zemánek, P.: An optical nanotrap array movable over millimetre range. Submitted to *Applied Physics B*.

Illustrative
abstract

Hybrid synthetic jets • Institute of Thermomechanics

Synthetic jets are generated by pushing and pulling fluid periodically through a nozzle orifice. In spite of zero time-mean flux in the orifice, a non-zero time-mean jet flow is generated (synthesized) from the individual “puffs” (Fig.1). These flows have many potential applications in active control of flow-fields and thermal fields (e.g., in external and internal aerodynamics, cooling electronic components and turbine blades, mixing in chemical reactors, etc.). Many advantageous applications are proposed at microscale, in micro-electromechanical systems (MEMS). The basic advantage is simplicity – no blower and no fluid supply piping is required. As a result, the synthetic jets have recently been the subject of intensive investigations.

The newly proposed hybrid synthetic jets combine the synthetic jet actuator with a fluidic pump, usually of the double-acting reciprocating type with valve-less rectification. In contrast to standard synthetic jets, the hybrid synthetic version is intrinsically a non-zero net mass flux device. This enhances the produced effects. Theoretical, experimental, and numerical computation studies were performed in international collaboration of the Institute of Thermomechanics ASCR, National Taiwan University, and the University of Sheffield, UK [1, 2, 3]. The main results are the subjects of two patent applications [4].



← ← Smoke visualization of the synthetic jet
a – displacement stroke,
b – suction stroke

← Schematic representation of the double-acting actuator of the hybrid synthetic jet:
1 – front chamber,
2 – rear chamber,
3 – oscillating diaphragm,
4 – entrainment
(a) Displacement stroke of the front chamber (1), when chamber (2) sucks fluid;
(b) suction stroke of the front chamber (1)

[1] Trávníček Z., Fedorchenko A. I., Wang A-B.: An enhancement of synthetic jets by means of an integrated valve-less pump. In: 10th Asian Congress of Fluid Mechanics, 2004, Sri Lanka, 535–540

[2] Trávníček Z., Fedorchenko A. I., Wang A-B.: Enhancement of synthetic jets by means of an integrated valve-less pump, Part I: Design of the actuator, Sensors and Actuators A – Physical, 120 (2005), 232–240

[3] Trávníček Z., Tesář V., Wang A-B.: Enhancement of synthetic jets by means of an integrated valve-less pump, Part II: Numerical and experimental studies, Sensors and Actuators A – Physical, 125 (2005), 50–58

[4] Wang A-B., Trávníček Z., Wang Y-H., Hsu M-C.: Double-acting device for generating synthetic jets. Patent Application 0093118160, 2004, Taiwan (in Chinese); US Appl. 10/894,613, 2004 (examining status)

1. Role of short cracks in fatigue life prediction of materials (Institute of Physics of Materials)
2. Energy distribution measurements of the locally generated fast particle beam on Tore Supra, and consequences of the beam generation (Institute of Plasma Physics)
3. Plasmachemical oxidation processes in hybrid gas-liquid electrical discharge reactor (Institute of Plasma Physics)
4. Detection and statistical evaluation of turbulent structures in a thermal plasma jet (Institute of Electrical Engineering)
5. The influence of natural organic matter and morphological properties of separable aggregates on water treatment process (Institute of Hydrodynamics)
6. Simulation of hydrological processes in basins focusing on runoff changes evaluation (Institute of Hydrodynamics)
7. Optical conveyor belt (Institute of Scientific Instruments)
8. The injected charge contrast in very low energy electron microscopy (Institute of Scientific Instruments)
9. Analysis and optimization of broadband, high dynamic range acquisition systems (Institute of Scientific Instruments)
10. Optical biosensor for rapid detection and identification of chemical and biological substances in the field (Institute of Radio Engineering and Electronics)
11. Raman fibre amplifier with time-division-multiplexed pumping (Institute of Radio Engineering and Electronics)
12. Pyroelectric detector of infrared radiation for ecology (Institute of Radio Engineering and Electronics)
13. Squeeze-film lubrication of the human ankle joint subjected to the cyclic loading encountered in walking (Institute of Theoretical and Applied Mechanics)
14. An analysis of mechanical properties of timber (Institute of Theoretical and Applied Mechanics)
15. Development of a hypoplastic constitutive model for fine-grained soils (Institute of Theoretical and Applied Mechanics)
16. Hybrid synthetic jets (Institute of Thermomechanics)
17. Constitutive models of materials with shape memory (Institute of Thermomechanics)
18. Biomechanics of the human voice (Institute of Thermomechanics)



List of studies

3 • Earth Sciences

The section consists of five institutes with the following research objectives:

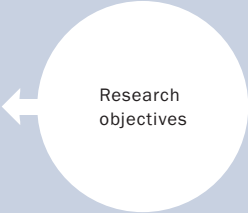
Study of the internal structure and dynamics of the Earth • Geophysical Institute

Investigation of the Earth's atmosphere and its interaction with surface and cosmic forcing
• Institute of Atmospheric Physics

Earth system at the intersection of geological processes, evolution of life, and the climatic and anthropogenic impacts • Institute of Geology

Physical and environmental processes in the lithosphere induced by human activities
• Institute of Geonics

Research on the properties of geo-materials, development of methods for their environmentally safe use, and interpretation of geodynamic processes • Institute of Rock Structure and Mechanics



Research objectives

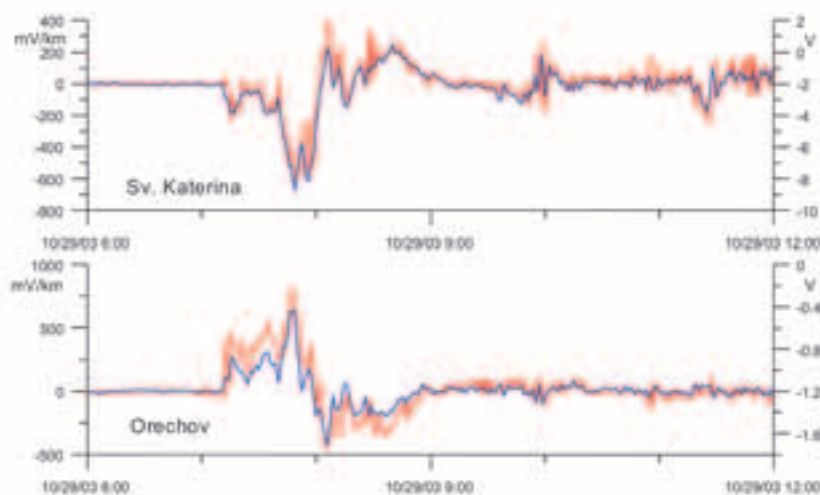
Illustrative
abstract

Pipe-to-soil voltages induced in Czech oil pipelines during strong geomagnetic storms of October–November 2003 • Geophysical Institute

Anticorrosive protection of oil and gas pipelines is a combined compound system of passive and active members. The most widely-used component of passive protection is tar or PE insulation. The most important active component is a cathodic protection system that provides stable negative pipe-to-soil potential (1 to 2 volts). Corrosion is an electrochemical process and the maximum damage occurs at points where electric current flows from the metal into the surrounding ground. The potential is continuously monitored and evaluated at the station of cathodic protection. It was violation of cathodic protection during the magnetic storms in October–November 2003 that caused the pipeline operator get in touch with the geomagnetic department of the Geophysical Institute.

Data from Ořechov (Brno) and Havlíčkův Brod stations on the Družba pipeline and Sv. Kateřina on the pipeline Ingolstadt – Kralupy nad Vlt. were analyzed within the framework of pilot project. The plane wave model of the geoelectric field was computed on the basis of geomagnetic data registered at the Geomagnetic Observatory at Budkov near Prachatice and compared with the measured pipe-to-soil voltage. While a high correlation between these two processes was found at Ořechov and Sv. Kateřina, the geoelectric signal at Havlíčkův Brod was near the level of noise. The analysis thus allowed distinguishing between geomagnetically induced voltages and disturbances of an anthropogenic origin (stray currents due to dc railways).

The study is an interesting illustration of the fact that a geomagnetic field – weak from a local point of view (the daily variation is less than 1 000 nT even during the strongest geomagnetic storms) – can induce appreciable voltages and currents in sufficiently long conductors.



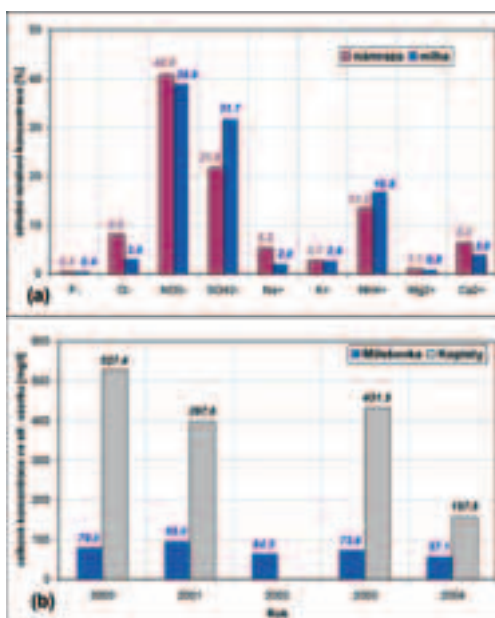
Fit between the measured pipe-to-soil voltage (red) and the computed geoelectric field (blue) for the most disturbed period of 29 October 2003.

Hejda P., Bochníček J.: Geomagnetically induced pipe-to-soil voltages in the Czech oil pipelines during October–November 2003. *Annal. Geoph.* 23:3089–3093 9 (2005)

Pollutant concentration in deposited precipitation • Institute of Atmospheric Physics

Samples of solid (rime) and liquid (fog) deposited precipitation are systematically collected in meteorological observatories at Milešovka, Kopisty (IAP, ASCR) and Churáňov (the sampling site of the Institute of Hydrodynamics, ASCR) as well as at other localities during campaign measurements. Fog measurements showed that a pollutant concentration affects the relationship between liquid water content in fog and visibility. Sample analyses also proved different pollutant concentrations in fog and rime water. Rime samples showed a nearly twofold relative concentration of Ca^{2+} , Na^+ , and Cl^- ions compared with fog water in contrast to SO_4^{2-} ion concentration, which was lower by 10% (Fig. a).

The samples from northern Bohemia confirm that NO_3^- is becoming the main acidifier of deposited precipitation and replaces SO_4^{2-} in that position. In southern Bohemia, SO_4^{2-} ions remain as the main acidifier, however, the NO_3^- proportion increases. Pollutant concentration in deposited precipitation proved to be of the same order as in the precipitation samples under a tree canopy. Generally, throughfall water shows the highest pollutant concentration as it includes pollutants coming from precipitation, fallout of solid particles and plant metabolism. Mean annual fog samples collected at the Kopisty observatory, located in one of the most polluted regions in northern Bohemia, demonstrated a development of pollutant concentration (Fig. b).



(a) The percentage of basic pollutants in fog water and rime water at the Milešovka observatory. The data set covers the time period 1999–2004.

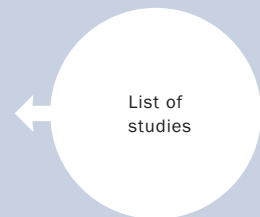
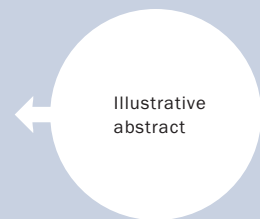
(b) Total pollutant concentration [mg/l] in a mean annual fog water sample at the Kopisty by Most observatory (the years 2000, 2001, 2003, 2004) and at the Milešovka observatory (the years 2000–2004).

Fišák J., Řezáčová D. and Mattanen J.: Calculated and Measured Values of Liquid Water Content in Clean and Polluted Environments. *Studia Geoph. et Geodaetica* (in press).

Fišák J., Chaloupecký P., Fottová D., and Řezáčová D.: Pollutant concentrations in the fog water at the Kopisty Observatory. *Studia Geoph. et Geodaetica* (after first review).

Fišák J. and Tesař M.: Solid and liquid occult precipitation in the headwater regions of the Czech Republic. - International conference on Headwater Control VI: Hydrology, Ecology and Water Resources in Headwaters, Bergen, Norway, 20–23 June 2005, CD Proceedings.

1. Pipe-to-soil voltages induced in Czech oil pipelines during strong geomagnetic storms of October–November 2003 (Geophysical Institute)
2. Temporal changes of temperature in karstic rocks of the Chicxulub impact structure (Geophysical Institute)



3. The devastating Sumatra earthquake of December 26, 2004: the role of the Seismological Service of the Geophysical Institute in informing media and the public (Geophysical Institute)
4. Evolution of anurans in the Cretaceous and Tertiary (Institute of Geology)
5. Investigation of magnetic parameters in dependence on the size of magnetic grain (Institute of Geology)
6. „Radiobarites“: products of thermal springs in the Ohře Graben (Institute of Geology)
7. Pollutant concentration in deposited precipitation (Institute of Atmospheric Physics)
8. Increased persistence of atmospheric circulation over Europe (Institute of Atmospheric Physics)
9. Reversal in long-term trends in the ozone layer (Institute of Atmospheric Physics)
10. Acoustic generator of pressure pulsations (Institute of Geonics)
11. Modelling of cable stayed and suspension bridges (Institute of Geonics)
12. A set of measures for protection of mine workings in rockburst prone areas (Institute of Geonics)
13. Bone replacements and filling elements based on composite materials to be used in orthopaedy and their preparation (Institute of Rock Structure and Mechanics)
14. Effect of exposure to hot air on the structure and properties of heat-resistant fiber reinforced composites (Institute of Rock Structure and Mechanics)
15. Experimental verification of the possibility of gasification of wastes with brown coal (Institute of Rock Structure and Mechanics)

4 • Chemical Sciences

This section includes six institutes whose research objectives are as follows:

Advanced analytical techniques for bioanalysis, environmental analysis and nanotechnology
• Institute of Analytical Chemistry

Research on multiphase reacting systems for designing processes important in synthesis and preparation of novel materials, in energy production and protection of the environment
• Institute of Chemical Process Fundamentals

Design, synthesis and characterization of clusters, composites, complexes and other compounds based on inorganic substances; the mechanisms and kinetics of their interactions
• Institute of Inorganic Chemistry

The structure, reactivity and dynamics of molecular and bio-molecular systems: theory, experiment, application • J. Heyrovský Institute of Physical Chemistry

Advanced polymer materials and supramolecular systems: Synthesis and research on their properties, phenomena and implementation in special applications and innovative technologies
• Institute of Macromolecular Chemistry

Regulation of life processes: Chemical modulators of selected biological systems relevant to medicine and agriculture • Institute of Organic Chemistry and Biochemistry

Novel type of HIV protease inhibitors based on carboranes • Institute of Organic Chemistry and Biochemistry

In collaboration with the Institute of Inorganic Chemistry and Institute of Molecular Genetics of the ASCR, Department of Analytical Chemistry of the Institute of Chemical Technology in Prague and Department of Virology of the University of Heidelberg, we designed, synthesized and tested a novel

Research
objectives

Illustrative
abstract

type of HIV protease inhibitor based on a carborane framework. Carboranes are polyhedral boron compounds, discovered in the 1960s and studied extensively since then by chemists and physicists alike. We have shown for the first time that they could also be very potent enzyme inhibitors. We prepared more than 100 modified carboranes. The most effective ones of the series (metallacarboranes) are very potent inhibitors of HIV protease, they block viral replication in tissue culture, are not toxic for the mammalian cells and are also active against resistant forms of the enzyme.

Using X-ray crystallography, we obtained 3D-structures of these novel inhibitors in a complex with viral protease. They bind to the protease active site using a novel binding mode, which can explain the fact that they retain their activity against viral proteases derived from the most resistant viral strains.

Cígler, P., Kožíšek, M., Řezáčová, P., Brynda, J., Otwinowski, Z., Pokorná, J., Plešek, J., Grüner, B., Dolečková-Marešová, L., Máša, M., Sedláček, J., Bodem, J., Kraeusslich, H.-G., Král, V. and Konvalinka, J. From non-peptide towards non-carbon protease inhibitors: metallacarboranes as specific and potent inhibitors of HIV protease. *Proc. Natl. Acad. Sci. USA* 102, 15394–15399 (2005).

Novel HIV Protease Inhibitors, Patent number:WO2005073240, Publication date:2005-08-11

Magnetic nano- and microspheres for medicine and biology • Institute of Macromolecular Chemistry

Recently, the application of magnetic particles in various fields of natural and technical sciences has been continuously increasing. It is important, especially in biochemical, biological and medical applications, that they can be easily handled by a magnetic field, monitored in magnetic resonance imaging and can carry biologically active compounds, such as a drug, nucleic acid, or antibody.

Working with cooperating research organizations we developed new procedures for preparation of magnetic iron oxides (magnetite, maghemite and Co, Cu, Mn ferrites) in a wide range of particle sizes, starting from nanoparticles (millionths of millimeter) up to microspheres (thousandths of millimeter). We also developed techniques of modification of the surface of the particles for a range of practical applications.

The modifications increase the stability of colloidal nanoparticles and make it possible to introduce functional groups. For example, we prepared a magnetic polymer carrier with carboxyl groups utilized for isolation of nucleic acids in molecular diagnostics of microorganisms, for immobilization of enzymes in enzyme reactors and microchips used in diagnostics and in the determination of protein structure from very small samples. Magnetic polymer microspheres with immobilized antibody turned out to be an attractive carrier for the determination of pathogenic bacteria *Campylobacter jejuni* in food.

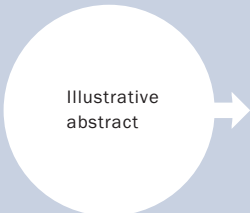
Moreover, ferrite particles are effective heterogeneous catalysts in the degradation of dyes and polyaromatic hydrocarbons using hydrogen peroxide, which are otherwise difficult to remove. This may be used in environment protection. Our magnetic iron oxide nanoparticles modified with saccharides or peptides are able to penetrate stem cells (e.g., bone marrow stromal cells) better than currently available commercial products. Identification of the cells labeled by means of magnetic resonance is thus possible after injection of small amounts of magnetic nanoparticles. This is of advantage, for example, in monitoring cells in *in vivo* applications, such as transplantations into the organism, and in long-term monitoring of their post-transplantation behavior and for the determination of pathological changes associated with the cell dysfunction.

Horák D., Rittich B., Španová A., Beneš M.J.: Magnetic microparticulate carriers with immobilized selective ligands in DNA diagnostics. *Polymer* 46: 1245–1255 (2005).

Křížová J., Španová A., Rittich B., Horák D.: Magnetic hydrophilic methacrylate-based polymer microspheres for genomic DNA isolation. *J. Chromatogr. A* 1064: 247–253 (2005).

Španová A., Rittich B., Beneš M. J., Horák D.: Ferrite supports for isolation of DNA from complex samples and polymerase chain reaction amplification. *J. Chromatogr. A* 1080: 93–98 (2005).

← Illustrative abstract


 Illustrative abstract

Korecká L., Ježová J., Bílková Z., Beneš M., Horák D., Hradcová O., Slovákova M., Viovy J. L.: Magnetic enzyme reactors for isolation and study of heterogeneous glycoproteins. *J. Magn. Magn. Mater.* 293: 349–357 (2005).

Bílková Z., Slovákova M., Minc N., Fütterer C., Cecal R., Horák D., Beneš M. J., le Potier I., Křenková J., Przybylski M., Viovy J. L.: Functionalized magnetic micro and nanoparticles: optimization and application to μ -chip tryptic digestion. *Electrophoresis*, (in press).

Horák D., Hochel I.: Magnetic poly(glycidyl methacrylate) microspheres for ELISA *Campylobacter jejuni* detection in food. *e-Polymers*, <http://www.e-polymers.org/061> (2005)

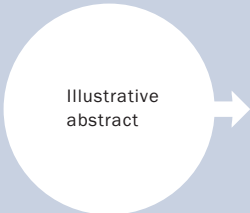
Novel original compounds with antiviral activity • Institute of Organic Chemistry and Biochemistry

In connection with our continued search for biologically active compounds among acyclic nucleoside phosphonates we have discovered a structural group of very potent antivirals based on the structure of 2-amino-4-hydroxy(4-amino)pyrimidine substituted at the 6-position by the 2-phosphonoalkoxy group; the activity is directed against retroviruses and DNA viruses. Our recent discovery has shown that this activity is considerably enhanced by substitution with methyl group or halogen (Cl, Br) at the 5-position.

Structurally related is the (R)-enantiomer of 2,4-diamino-6-[3-hydroxy-2 (phosphonomethoxy)propyloxy]pyrimidine which, in addition to the above, strongly interferes with the life cycle of hepatitis B virus.

Our third discovery concerns the sym-triazine analogue of the notorious antiviral *cidofovir* wherein the mentioned heterocycle (5-azacytosine) replaces cytosine. It is an important drug candidate, being as, if not more active as the parent compound, with a markedly lower *in vitro* toxicity. It remains to be seen whether this molecule, as with the preceding two types meets the strict requirements of the preclinical phase of drug development.

De Clercq, E., Holý A.: Acyclic nucleoside phosphonates: a key class of antiviral drugs. *Nat. Rev. Drug Discovery* 4, 928–940 (2005).
Ying C., Holý A., Hocková D., Havlas Z., De Clercq E., Neyts J.: Novel acyclic nucleoside phosphonate analogues with potent anti-hepatitis B virus activities. *Antimicrob. Agents Chemother.* 49, 1177–1180 (2005).


 Illustrative abstract

Collection of papers elucidating the nature of surface processes during decomposition of N₂O over Fe-zeolite • J. Heyrovský Institute of Physical Chemistry

The aim of the studies is development of a catalyst for N₂O abatement, the highly dangerous greenhouse gas, from industrial exhausts by its decomposition into molecular components under the presence of NO/NO₂ oxides. Development of a selective and highly active catalyst was initiated by the anticipated limits of EU for N₂O starting in 2007.

Papers^{1,2} presented as a continuation of the systematic study of N₂O decomposition^{3,4}, analyze the structure and reorganization of the active centers during N₂O decomposition over Fe-zeolites and thus elucidate the mechanism of the action of the Fe-site in the ligand field of the skeletal oxygens of the zeolitic framework. By following the isotopic composition of the oxygen molecules in the gas phase during decomposition of ¹⁵N₂¹⁸O we have shown that the framework oxygen of the zeolite lattice directly participates in N₂O decomposition. This surprising result contradicts the generally anticipated simple recombination of the O-atoms formed by N₂O decomposition and adsorbed on the Fe active sites. In this connection it is important to realize a further result shows that dehydroxylation of the zeolite, inducing formation of electron-acceptor Al-Lewis sites in the vicinity of the redox Fe-sites, substantially increases decomposition of N₂O. Highly important for the implementation of this process is the addition of a low concentration of NO molecules increasing the number of framework oxygen atoms participating in the formation of molecular oxygen and substantially increasing decomposition of N₂O. This finding has shown that surface NO_x species provide the active intermediates of the N₂O decomposition.

In summary, our results elucidate the dynamics and inter-connections between surface reaction intermediates and oxygen atoms forming the host network of the apparently “inert” aluminosilicate network and coordinating the active Fe-centre. By understanding the structural conditioning of the formation of the oxygen molecule during decomposition of N_2O over Fe-zeolite materials we have created a significant background for the development of a catalytic process for abatement of the exhaust gases (N_2O , NO, NO_2) from nitric acid production plants.

Nováková, J., Schwarze, M., Sobalík, Z.: Role of zeolitic oxygens during the decomposition of $^{15}N_2^{18}O$ over Fe-ferrierite. *Catal. Lett.* 104: 157–162 (2005).

Nováková, J., Sobalík, Z.: N_2O decomposition and formation of NO_x species on Fe-ferrierite. The effect of NO and CO addition on the decomposition and the role of surface species. *Catal. Lett.* 105: 169–173 (2005)

Molecular-based simulations of complex chemical systems • Institute of Chemical Process Fundamentals

The accurate prediction of reaction and phase equilibria for complex chemical systems is an important problem in chemical engineering. These phenomena occur simultaneously during the industrially critical process of reactive distillation. Phase and reaction equilibrium calculations for complex chemical systems are traditionally carried out by means of empirically based thermodynamic equation of state and/or liquid-state activity-coefficient models.

To implement these approaches, particular experimental data concerning the behavior of each constituent pure fluid is required. These data are then combined with the mixture model; in addition, a mixture parameter appearing in the theory is often evaluated by means of an experimental measurement of the mixture. The accuracy of these approaches in predicting the experimental data varies; as with nearly all empirically based methods, the path to further progress is not always clear.

The alternate approach to the calculation of phase and reaction equilibria involves modelling the intermolecular interactions between the constituent molecules of the system followed by phase and reaction equilibrium calculations using various computer simulation techniques. Molecular-based simulation approaches have a considerable advantage over the empirically-based approaches in that predictions may be made in the absence of experimental data of any kind, provided one construct an intermolecular potential model for the system either by ab initio calculations or semiempirically.

In 1994, Smith and Tříska [1] proposed the first direct method for the simulation of reaction equilibria, the Reaction Ensemble Monte Carlo method. After specifying the system stoichiometry and the thermodynamic constraints, the method only requires knowledge of the species intermolecular potentials and their ideal-gas properties. The method's simplicity allows it to be readily used for situations involving any number of simultaneous reactions as well as reactions occurring within or between phases. The authors, in collaboration with Prof. W. R. Smith, used the method to predict reaction and phase equilibria for various bulk reacting mixtures [2–5]. During the last two years, the use of the method has been further extended to nanoconfined systems [6, 7].

Lísal, M., Bendová, M., Smith, W. R.: Monte Carlo adiabatic simulation of equilibrium reacting systems. The ammonia synthesis reaction. *Fl. Ph. EqL* 235: 50–57 (2005)

Lísal, M., Brennan, J. K., Smith, W. R.: Chemical Reaction Equilibrium in Nanoporous Materials: NO Dimerization Reaction in Carbon Slit Nanopores. *J. Chem. Phys.* (submitted) (2005)

1. Discovery of a new type of moving zone boundary (Institute of Analytical Chemistry)
2. Supercritical fluid chromatography with ionic liquids for “green” chemistry and technology (Institute of Analytical Chemistry)

← Illustrative abstract

← List of other studies

3. Preconcentration of antimony and bismuth for ultratrace determination (Institute of Analytical Chemistry)
4. Synthesis of carborane based inhibitors of HIV protease (Institute of Inorganic Chemistry)
5. Nanodispersive oxide powders for chemical warfare agents destruction (C) (Institute of Inorganic Chemistry)
6. Environmental application of the diode laser photoacoustic detection (J. Heyrovský Institute of Physical Chemistry)
7. Isolation of yttrium and europium compounds from scrap luminophoric dust obtained during the re-processing of used TV screens (Institute of Chemical Process Fundamentals)
8. Organic-inorganic coatings and films (Institute of Macromolecular Chemistry)
9. De novo design of α -amylase inhibitor: A small linear mimetic of macromolecular proteinaceous ligands (Institute of Organic Chemistry and Biochemistry)

5 • Biological and Medical Sciences

The section is formed by nine institutes conducting research in the following:

The genetic, functional and developmental potential of animal cells, tissues and organisms: their use in medicine, ecology and agriculture • Institute of Animal Physiology and Genetics

Biophysics of dynamic structures and functions of biological systems • Institute of Biophysics

Study of regulating the development of the insect organism, insect population dynamics, and the roles of insects in ecosystems • Institute of Entomology

Mechanisms of regulating the growth and development of plants at the levels of cells, organs and whole organisms: physiological, genetic and molecular bases • Institute of Experimental Botany

Molecular, cellular and systemic mechanisms of major diseases of the human organism, their diagnosis, therapy and pharmacotherapy • Institute of Experimental Medicine

Microorganisms in research and biotechnology • Institute of Microbiology

Molecular genetics and cellular bases of key biological processes: gene expression, oncogenesis, virus replication, immunity and development of the organism • Institute of Molecular Genetics

Investigation of the molecular and cellular basis of physiological and pathophysiological processes in order to clarify the pathogenesis of important human diseases • Institute of Physiology

Research on the molecular organisation of plants and their pathogens, induction and analysis of targeted changes in the genome and plastome, and the study of photosynthesis and heritability in interaction with the environment and pathogens • Institute of Plant Molecular Biology

Segmental trisomy of Chromosome 17: A mouse model of human aneuploidy syndromes • Institute of Molecular Genetics

The presence of an extra copy (trisomy) of human Chromosome 21, known as the Down Syndrome, is the most frequent cause of mental retardation and is associated with a variable set of other developmental disturbances. Several mouse models of Down Syndrome were designed in an attempt to analyze the

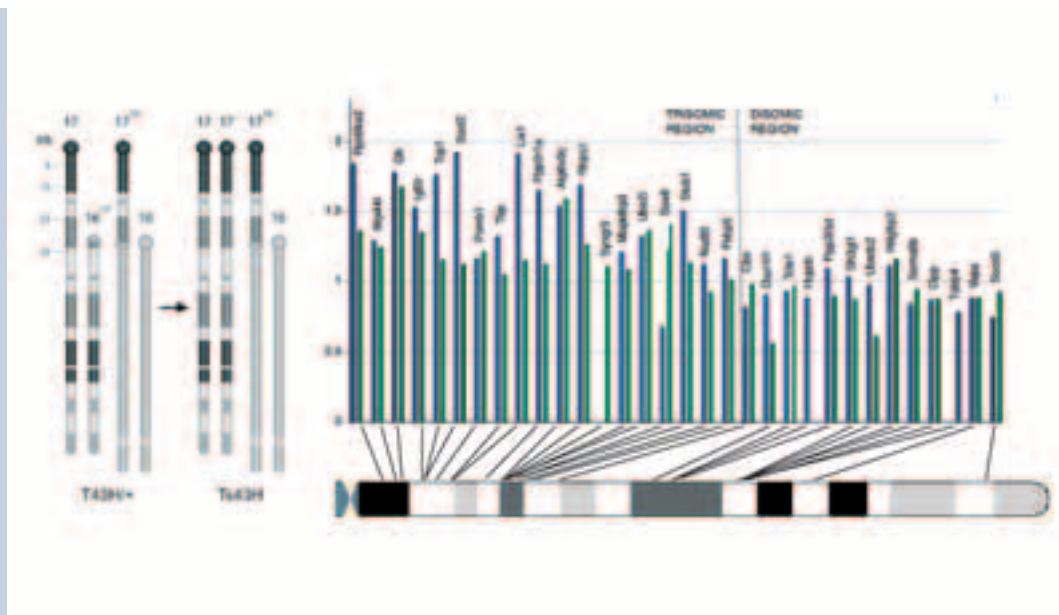
Research objectives

Illustrative abstract

contribution of specific orthologous genes to particular developmental disorders. To distinguish between the specific effects of dosage-sensitive genes and the nonspecific effects of a large number of arbitrary genes a new mouse model of segmental trisomy, designated Ts43H/Ph, was developed.

By using the BAC array comparative genome hybridization, the distal end of the trisomy was identified, indicating that the trisomy triplicates >310 known genes within the proximal 30 Mb of mouse chromosome 17 (Chr17). The trisomic mice exhibited cognitive defects (such as, difficulties in learning) analogous to those observed in patients with Down Syndrome.

Quantitative analysis of the brain expression of 20 genes inside the trisomic interval and of 12 genes lying outside on Chr17 revealed a 1.2-fold average increase of mRNA steady state levels of triplicated genes and a 0.9-fold average downregulation of genes beyond the border of trisomy. The authors propose that systemic comparisons of unrelated segmental trisomies will elucidate the pathways leading from the triplicated sequences to the complex developmental disorders such as observed in patients with Down Syndrome.

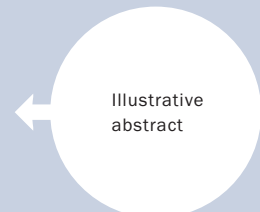


Tomáš Vacík, Michael Ort, Soňa Gregorová, Petr Strnad, Radek Blatný, Nathalie Conte, Allan Bradley, Jan Bureš, and Jiří Forejt: Segmental trisomy of Chromosome 17: A mouse model of human aneuploidy syndromes. *Proceedings of the National Academy of Sciences of the United States of America* 102:4500–4505, 2005

Auxins inhibit endocytosis in plants and stimulate their own transport from cells

• **Institute of Experimental Botany**

Regulation of intracellular traffic of some proteins to their proper position within a cell is one of the mechanisms for signalling compounds (hormones and growth regulators) to control physiological processes in cells. In animal cells, this way of regulation is often based on the control of a specialised intracellular transport of proteins in membrane vesicles, the so-called constitutive cycling. The process of constitutive cycling consists of two repeated, consecutive steps: translocation of proteins from plasma membrane into cell (endocytosis) and their transport back to the plasma membrane (exocytosis). Even if some proteins in plants exhibit constitutive cycling, no such effect(s) of any plant

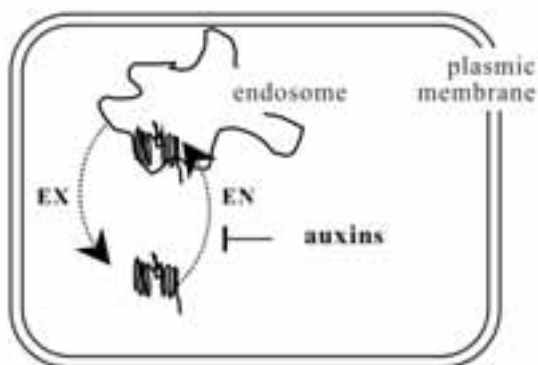


hormone and/or growth regulator on intracellular traffic of proteins has been observed so far.



This work demonstrates that auxins, the major regulators of plant growth and development, can inhibit endocytosis. This effect is specific to biologically active auxins and it is independent of gene expression and proteosynthesis.

Auxins inhibit endocytosis of several plasma membrane proteins, including PINs, i.e., regulators of auxin efflux from cells. Once endocytosis is inhibited, the incidence of PINs on the plasma membrane increases and, consequently, the capacity for efflux of auxins is larger. In this way, auxins can stimulate their own efflux from cells. The biological significance of inhibiting endocytosis by auxins and of regulation of their own efflux from cells was proved during gravitropism (i.e., the reaction of plant organs to the change of direction of gravity stimulus), which is connected with asymmetric auxin distribution. In *Arabidopsis thaliana* roots the asymmetric auxin distribution correlates with the intensity of endocytosis of PIN proteins.

These observations reflect a novel mechanism of action of plant hormones: auxins inhibit endocytosis and thus control, among other things, the intracellular trafficking of PIN proteins and concomitantly their abundance and activity on the cell surface; in this way auxins regulate their own cell-to-cell transport.



Scheme of endocytosis inhibition by auxins

- EX exocytosis
- EN endocytosis
-  PIN proteins
-  inhibition

Paciorek T., Zažímalová E., Ruthardt N., Petrášek J., Stierhof Y.-D., Kleine-Vehn J., Morris D. A., Emans N., Jürgens G., Geldner N., Friml J.: Auxin inhibits endocytosis and promotes its own efflux from cells. *Nature* 435:1251–1256, 2005
In collaboration with the laboratory of Dr. Jiří Friml (ZMBP, University of Tübingen, Tübingen, Germany)

Connecting the navigational clock to sun compass input in monarch butterfly brain • Institute of Entomology

In their spectacular annual fall migration from North America to overwintering sites in Mexico, monarch butterflies (*Danaus plexippus*) use the angle of plane of polarized light together with a time compensated sun compass for navigation.

In collaboration with the laboratory of Prof. Steven M. Reppert, MD (University of Massachusetts Medical School), we have identified in monarch eyes photoreceptors specialized for detection of polarized light in the UV spectrum. Furthermore, we have discovered and characterized molecular

Illustrative
abstract

neural wiring connecting the circadian biological clock with a signal pathway of polarized light entering the brain of the migratory butterfly.

Due to the constant movement of the sun during the day, information from the circadian clock is critical for maintaining the constant direction of the butterflies' migration, often exceeding thousands of miles. The monarch butterfly represents the first organism in which such unique molecular neural pathway was identified. The result of this research was reported in several international journals including the prestigious American journal, *The Scientist*.



Monarch butterflies at winter quarters

Sauman, I., Briscoe, A., Zhu, H., Shi, D., Froy, O., Stalleicken, J., Yuan, Q., Casselman, A. and Reppert, S. M. (2005). Connecting the navigational clock to a sun compass input in the monarch butterfly brain. *Neuron* 46, 457–467 (IF 14.439)

Molecular mechanisms underlying proliferation and differentiation of embryonic stem cells

• Institute of Experimental Medicine

Embryonic stem (ES) cells are cell lines derived from early embryos. They can both be propagated in an undifferentiated status and induced to differentiate into various differentiated cell types, which makes them a promising tool in cell therapies. Understanding molecular mechanisms that are responsible for such unique properties of ES cells is crucial for clinical use of human ES cells.

Although the detection of several components of the fibroblast growth factor (FGF) signalling pathway in human embryonic stem cells has been reported, the functionality of that pathway and effects on cell fate decisions are yet to be established. We have determined that undifferentiated human ES are abundant in several molecular-mass isoforms of FGF-2, and that the expression pattern of these isoforms remains unchanged under conditions that induce hESC differentiation. Significantly, FGF-2 is released by human ES cells into the medium, suggesting an autocrine activity.

Expression of FGFRs in undifferentiated human ES cells follows a specific pattern and initiation of differentiation is accompanied by profound changes in FGFR expression. When human ES cells were exposed to exogenous FGF-2, extracellular signal-regulated kinases were phosphorylated, however, proliferation of human ES cells was not affected. Chemical inhibition of FGF signaling caused rapid cell

← Illustrative abstract

differentiation, suggesting an involvement of autocrine FGF signals in the maintenance of proliferating human ES cells in the undifferentiated state. Concluding from our data, we proposed that this endogenous FGF signaling pathway can be implicated in self-renewal and/or differentiation of human ES cells.

Cyclin dependent kinase inhibitor p27^{Kip1} (p27) becomes dramatically elevated during differentiation of mouse ES cells. In our experiments, various aspects of differentiation of EBs produced from normal and p27-deficient mouse ES cells were analyzed to address the biological significance of this elevation. We have found that embryoid bodies (EBs), three-dimensional aggregates of differentiating ES cells, lacking p27 a) grew significantly larger, b) suffered from elimination of cells positive for cytokeratin endo-A (TROMA-1) and, c) showed formation of cavities originating from cells positive for Lewis-X. Together, our data pointed to a dual role of p27 in mouse ES cells, with one role played in regulation of proliferation and the other role played in establishing some other aspects of a differentiated phenotype.

Dvořák P., Dvořáková D., Košková T., Vodinská M., Najvirtová M., Křekáč D., Hampl A. Expression and a potential role of fibroblast growth factor 2 and its receptors in human embryonic stem cells. *Stem Cells* 2005, 23:1200–1211. IF = 5.500

Bryja V., Čajánek L., Pacherník J., Hall A. C., Horváth V., Dvořák P., Hampl A. Abnormal development of mouse embryoid bodies lacking p27^{Kip1} cell cycle regulator. *Stem Cells* 2005, 23:965–974. IF = 5.500

Dvořák P., Hampl A. Basic fibroblast growth factor and its receptors in human embryonic stem cells. *Folia Histochemica et Cytobiologica* 2005, 43:203–208. IF = 0.672

Illustrative
abstract

Identification of candidate genes of the metabolic syndrome • Institute of Physiology

The metabolic syndrome affects upwards of 15 to 25 percent of the adult population in developed countries and is characterized by the clustering of multiple risk factors for diabetes and cardiovascular disease, including insulin resistance, dyslipidemia, and increased blood pressure. A predisposition to a metabolic syndrome has a significant genetic component, however, human studies are difficult owing to the complex mix of genetic and environmental factors that contribute to this syndrome. Therefore, genetically defined animal models are often used for such analyses. In a large international study, genes predisposed to the development of a metabolic syndrome were identified using a new method, genetical genomics, i.e., a combination of classical linkage analyses with global gene expression profiling, in a unique set of rat recombinant inbred strains. So far, 73 candidate genes, important especially for the pathogenesis of human essential hypertension have been identified.

N. Hübner, C. A. Wallace, H. Zimdahl, E. Petretto, H. Schulz, F. Maciver, M. Müller, O. Hummel, J. Monti, V. Zídek, A. Musilová, V. Křen, H. Causton, L. Game, G. Born, S. Schmidt, A. Müller, S. Cook, T. W. Kurtz, J. Whittaker, M. Pravenec, T. J. Aitman: Integrated transcriptional profiling and linkage analysis for disease gene identification, *Nature Genetics* 37:243–253, 2005

List of
other
studies

1. Restriction of recombination in the evolutionary history of the plant sex chromosomes (Institute of Biophysics)
2. Why are the palaeorefugial peat bog insects a scientific priority of nature conservation? (Institute of Entomology)
3. A new animal model of psychosis (Institute of Physiology)
4. Mitochondrial glycerophosphate dehydrogenase – new site of reactive oxygen radicals production (Institute of Physiology)
5. Induction of systemic anticancer resistance by targeted polymeric drugs (Institute of Microbiology)
6. Virulence factors in *Neisseria meningitidis* (Institute of Microbiology)
7. New enzyme activities in the biosynthesis of lincosamide antibiotics and a new type of lincosamide resistance: A gate to new hybrid compounds with improved antibacterial and antimalarial effects (Institute of Microbiology)

8. New cytokinins with significant biological activities (Institute of Experimental Botany)
9. Unique resource for genomics of rye and wheat (Institute of Experimental Botany)
10. Chromosomal aberrations in lymphocytes of healthy subjects and risk of cancer (Institute of Experimental Medicine)
11. Cloning and molecular analysis of the regulatory factor HLMYB1 in hop (*Humulus lupulus L.*) and the potential of hop to produce bioactive prenylated flavonoids (Institute of Plant Molecular Biology)
12. New photosystem I antenna organisation in chlorophyll B containing cyanobacterium *Prochlorothrix hollandica* (Institute of Plant Molecular Biology)
13. Identification of potential human oncogenes by mapping the common viral integration sites in avian nephroblastoma (Institute of Molecular Genetics)
14. Transcription factor c-Myb is involved in the regulation of the epithelial-mesenchymal transition in the avian neural crest (Institute of Molecular Genetics)
15. A new technique in tooth development study (Institute of Animal Physiology and Genetics)
16. Laboratory minipig is a highly valuable biomedical model (Institute of Animal Physiology and Genetics)
17. Clonal vertebrates in nature – model of spiny loaches of the genus *Cobitis* (Institute of Animal Physiology and Genetics)

6 • Bio-Ecological Sciences

The section consists of six institutes with the following research objectives:

The structure, function and evolution of biodiversity of photoautotrophic organisms and fungi: the origins and causes of their variation, dynamics of populations, communities and ecosystems; application of selected results in the Průhonice Park • Institute of Botany

The structure, functioning and development of aquatic ecosystems • Institute of Hydrobiology

Spatial and functional dynamics of biological, ecological and socio-economic systems interacting with the global change of climate • Institute of Systems Biology and Ecology

Parasitism and parasite-host relationships at the organismal, cellular and molecular levels
• Institute of Parasitology

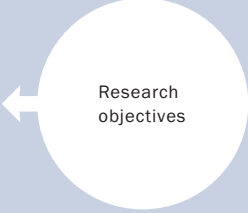
Relationships between the structure and function of the decomposer food web in soil
• Institute of Soil Biology

The biodiversity and ecology of vertebrates: Implications in conservation and sustainable management of natural populations • Institute of Vertebrate Biology

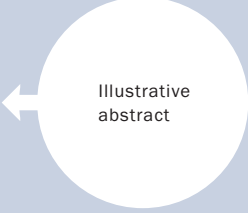
Function analysis of proteins unique for the protist *Trypanosoma brucei* • Institute of Parasitology

The protist *Trypanosoma brucei* is a causative agent of African sleeping sickness, while closely related flagellates are responsible for a number of other serious diseases of man and animals. Present treatment of millions of people infected with these parasites is based on decades old therapeutics, against which resistance is increasing.

The aim of our research is the identification of proteins essential for the parasite's survival that



Research objectives



Illustrative abstract

represent suitable pharmacological targets, since they have no homologues in the host cell. By means of RNA interference, we are studying proteins that participate in the processes unique to the trypanosome cell, such as RNA editing, RNA *trans*-splicing and respiration via an unusual respiratory chain. Using a number of phenotypic assays we have not only established which proteins are indispensable for the parasite, but also identified their function(s).

Lukeš J., Hashimi H., Zíková A. Unexplained complexity of the mitochondrial genome and transcriptome in kinetoplastid flagellates. *Curr. Genet.* 48:277–299 (2005)

Horváth A., Horáková E., Dunajčíková P., Verner Z., Pravdová E., Šlapetová I., Cuninková L., Lukeš J. Down-regulation of the nuclear-encoded subunits of the complexes III and IV disrupts their respective complexes but not complex I in procyclic *Trypanosoma brucei*. *Mol. Microbiol.* 58:116–130. (2005)

Foldynová-Trantírková S., Paris Z., Sturm N. R., Campbell D. A., Lukeš J. The *Trypanosoma brucei* La protein is a candidate poly(U) shield protein that impacts spliced leader RNA maturation and tRNA intron removal. *Int. J. Parasitol.* 35:359–366 (2005)

Vondrušková E., van den Burg J., Zíková A., Ernst N. L., Stuart K., Benne R., Lukeš J. RNA interference analyses suggest a transcript-specific regulatory role for MRP1 and MRP2 in RNA editing and other RNA processing in *Trypanosoma brucei*. *J. Biol. Chem.* 280:2429–2438 (2005)

Illustrative
abstract

Photochemical destruction of organic matter and its effects on water ecosystems • Institute of Hydrobiology

The Institute of Hydrobiology, ASCR, in cooperation with the University of South Bohemia and University of Maine (US) have identified a natural source of an ionic metal species for surface waters: photochemical liberation of organically bound metals by solar radiation. This process explains high concentrations of aluminium and iron oxyhydroxides in lake sediments long before the onset of atmospheric acidification, since the beginning of soil formation in catchments. Oxyhydroxides of Al and Fe play an important ecological role, affecting the ability of lake and marine sediments to bind phosphate and trace metals.

We show that transport of Al and Fe oxyhydroxides to sediments occurs via the following sequence of processes: (i) Soil organic acids dissolve and bind metals, and export them from terrestrial to aquatic systems. (ii) Photochemical decomposition of organic-metal complexes liberates a significant portion of organically-bound aluminium and iron as ions. (iii) The liberated ions hydrolyse, precipitate as oxyhydroxide particles, and settle. The photo-liberation of ionic aluminium species is a potential source of toxicity to fish and zooplankton.

Kopáček, J., Hejzlar, J., Kaňa, J., Porcal, P., Klementová, Š.: Photochemical, chemical, and biological transformations of dissolved organic carbon and its impact on alkalinity production in acidified lakes. *Limnol. Oceanogr.* 4:106–117 (2003)

Kopáček, J., Klementová, Š., Norton, S. A.: Photochemical production of ionic and particulate aluminum and iron in lakes. *Environ. Sci. Technol.* 39:3656–3662 (2005)

Kopáček, J., Borovec, J., Hejzlar, J., Ulrich, K. U., Norton, S. A., Amirbahman, A.: Aluminum Control of Phosphorus Sorption by Lake Sediments. *Environ. Sci. Technol.* 39:8784–8789 (2005)

Porcal, P., Hejzlar, J., Kopáček, J.: Seasonal and photochemical changes of DOM in an acidified forest lake and its tributaries. *Aquat. Sci.* 66:211–222 (2004)

Kopáček, J., Marešová, M., Norton, S. A., Porcal, P., Veselý, J.: Photochemical Source of Metals for Sediments. *Environ. Sci. Technol.* (submitted)

Illustrative
abstract

Synopsis of research on a house mice hybrid zone • Institute of Vertebrate Biology

Two house mouse subspecies, *Mus musculus musculus* and *M. m. domesticus*, form a long and narrow hybrid zone (HZ) running in Europe from Denmark to the Black Sea. Despite long-term interest in this contact zone we still have limited information about proximate mechanisms maintaining the HZ and thereby keeping the parental taxa in parapatry. To solve this question, we conducted a study of another

part of the mouse HZ during the last 10 years.

Having analysed more than 1,500 mice from 125 localities, we first characterized the genetic variation outside of and within the Czech-Bavarian transect across the HZ. While most of the nuclear markers have the same centre and show a similar transition in terms of frequencies from one taxon to another, we found that one marker located on mitochondrial DNA shifts from the centre and this shift is random when two transects are compared. To determine factors which keep the two mouse taxa apart and prevent intermixing of their genomes, we transported some mice to the laboratory and studied fitness components of parental and hybrid individuals.

Behavioural studies focusing on assortative mating indicate that salivary signals (androgen-binding protein) most probably participate in subspecies specific recognition but are not themselves efficient enough to noticeably impede the gene flow. Hybrid male sterility is among presumed factors which can prevent gene flow between diverging subpopulations and in a pivot study we showed that genes causing spermatogenetic breakdown are widespread in wild *M. m. musculus*. A conceptual contribution concerning misuse of the hypothesis of complementary genes implemented in different ways in behavioural ecology and genetics of speciation was discussed by Piálek and Albrecht.

Bímová, B., Karn, R. C., Piálek, J.: The role of salivary androgen-binding protein

In reproductive isolation between two subspecies of house mouse: *Mus musculus musculus* and *Mus musculus domesticus*. *Biol. J. Lin. Soc.* 84(3): 349–361(2005).

Božíková, E., Munclinger, P., Teeter, C., Tucker, P. C., Macholán, M., Piálek, J.: Mitochondrial DNA in the hybrid zone between *Mus musculus musculus* and *Mus musculus domesticus*: a comparison of two transects. *Biol. J. Lin. Soc.* 84(3): 363–378 (2005).

Munclinger, P., Božíková, E., Šugerková, M., Piálek, J., Macholán, M.: Genetic variation in house mice (*Mus*, *Muridae*, *Rodentia*) from the Czech and Slovak Republics. *Folia Zool.* 51(2): 81–92 (2002).

Piálek, J., Albrecht, T.: Choosing mates: complementary versus compatible genes. *Trends Ecol. & Evol.* 20(2): 63 (2005).

Vyskočilová, M., Trachtulec, Z., Forejt, J., Piálek, J.: Does geography matter in the hybrid sterility in house mice? *Biol. J. Lin. Soc.* 84(3): 663–674 (2005)

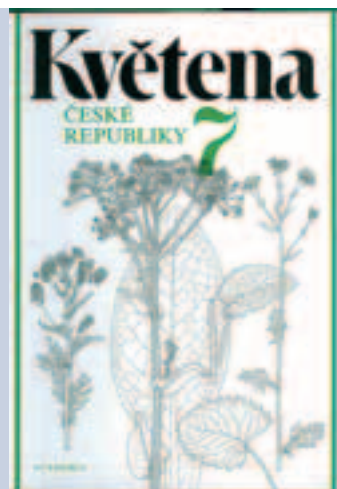
Flora of the Czech Republic 7 • Institute of Botany

Series editors: Slavík B. & Štěpánková J.

Volume editors: Štěpánek J. & Štěpánková J.

Academia, Publishing House of the Czech Academy of Sciences, Praha 2004

(767 pp., 128 tabs., 53 maps, 1 coloured photograph).



Among the basic works of Czech botanical literature, the nine-volume *Flora of the Czech Republic* is the most extensive and comprehensive encyclopedia, critically evaluating the flora of this country from the viewpoint of taxonomy and chorology. It is a complex and critical taxonomic and chorological study including karyological, ecological and phytosociological characterizations of individual species, based on original studies of plant material by modern methods. The present volume covers the order Asterales with three families (*Asteraceae* s. str., true composites; *Ambrosiaceae*; and *Cichoriaceae*, excl. *Taraxacum*). Volume seven includes 96 genera with 402 species numbered throughout (additional, unnumbered, species are treated in less detail using special notes). The team of authors of this volume consists of 26 botanists. The text is supplemented with 128 tables of original drawings.

← Illustrative abstract

List of
other
studies

1. A European monograph of oscillatoriacean Cyanobacteria (Institute of Botany)
2. Time of introduction still determines the current distribution of alien plants after several millennia of invasions (Institute of Botany)
3. Dracunculoid nematodes parasitic in vertebrates (Institute of Parasitology)
4. Role of nuclear receptor and Ras-like signaling during epidermal development in the nematode *Caenorhabditis elegans* (Institute of Parasitology)
5. Sexual selection in the bitterling fish: the role of female choice and male mating tactics (Institute of Vertebrate Biology)
6. Emmonsiosis of subterranean rodents in Africa and Israel (Institute of Vertebrate Biology)
7. On the separation of net ecosystem exchange into assimilation and ecosystem respiration: review and improved algorithm (Institute of Systems Biology and Ecology)
8. Photosynthesis in dynamic light: systems biology of unconventional chlorophyll fluorescence transients in *Synechocystis* sp PCC 6803 (Institute of Systems Biology and Ecology)
9. Diversity of soil microbial community in process of primary succession on post-brown-coal-mining sites (Institute of Soil Biology)
10. Grazing as a management tool for permanent grasslands in protected landscape areas (Institute of Soil Biology)

Research
objectives

7 • Social and Economic Sciences

The section included five institutes working in the following areas:

The economic aspects of accession to the European Union and EMU • Economics Institute

The human being in the contexts of life-span development • Institute of Psychology

Sociological analysis of long-term processes in Czech society in the context of European integrational policies, development of the knowledge-based society and of human, social and cultural capital
• Institute of Sociology

Harmonization of law in the European Union and its impact on the systems of law in member states in the context of the information society • Institute of State and Law

The search for identity: Intellectual and political conceptions of the modern Czech society between 1848–1948 • Masaryk Institute

T. G. Masaryk – *Za ideálem a pravdou 4 (1900–1914) [The Ideal and the Truth]* • Masaryk Institute

The fourth volume of the biography of Masaryk has the same literary conception as the previous volumes. Between 1900 and 1914, Masaryk became actively involved in politics. A small Popular Party was established with Masaryk's assistance in 1900, having at its disposal the daily, *Čas*. The destructive experience of the fading Hilsner affair and the overall political situation motivated Masaryk to focus his work on the advancement of the spiritual, religious and political level of the Czech public life. His visits to the USA in 1902 and 1907 were related to similar concerns. His long-term interest in Russia resulted in the publication of a work on Russia. While a deputy starting in 1907, the significant aspect of his work was the increasing criticism of the political system of the Habsburg Empire, especially its foreign policy. He also increasingly opposed the oppression of non-German and non-Hungarian nationalities in the Empire. When the war broke out in 1914, Masaryk, at sixty four, decided that the only morally justified course in the struggle for a democratic and independent Czechoslovakia was on the side of the Allies.

Illustrative
abstract



T. G. Masaryk speaking at an election meeting in Krásno on 17 January 1910

Drawing by F. Hlavica

Polák, S. Prague, Masaryk Institute, ASCR, 2005, 712 pp. ISBN 80-86495-34-5

The recurring Sudeten German question • Institute of Sociology

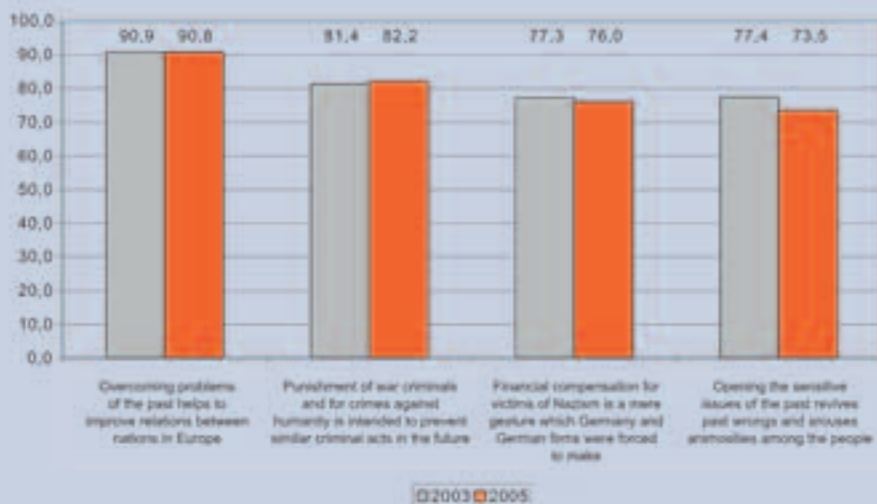
This report presents a summary overview of the issue of the development of the conflicts between ethnic Czechs and Germans from the mid-19th century, when the political transformation of the Habsburg monarchy sharpened the discord between Czechs, striving to get a stake in the execution of political power, and Germans, defending the exclusive standing as a nation state and envisioning the extension of its dominant position in Central Europe. The strategic aims of the foreign-based resistance campaigns led by T. G. Masaryk and E. Beneš resulted ultimately in the establishment of an independent Czechoslovak Republic in 1918.

The Versailles Treaty system ensured the demise of the Habsburg monarchy and the rise of the successor states, but it also laid the foundations for the next world war. Middle Europe, with the Czechoslovak Republic at its heart, continued to be threatened by ethnic conflicts. This was also reflected in the attitudes of Sudeten Germans, who rejected the Czechoslovak Republic as an imposed, artificial formation. The peace of the 1920s ended with the foundation of the Sudeten German movement by K. Henlein, which fostered radical nationalism. The author reviews the contradictory situation of Czechoslovakia in 1938 and of President E. Beneš in the critical days around the Munich Conference, when with their policy of appeasement Great Britain and France opened the door to German expansion. The author draws on American and British written sources and traces the origin of the plan for the post-war transfer of Sudeten Germans especially in the view in political circles of the Western allies.

The Sudeten question entered into Czech-German relations also after the end of the Second World War, when during the Cold War there was a conflict between the Czechoslovak democratic exile communities and organisations of the resettled populations. The study reviews in detail the course of Czech-Sudeten dialogue after the change in regime in 1989. The interpretation of Czech, German, and Sudeten German concepts is presented comprehensively in their international and socio-economic contexts. The book's concluding section contains key documents relating to the issue. The work is remarkable for the breadth of its scope, and the author has made good use of his many years of research on Czech-German relations and his own active involvement in the course of the dialogue.

Houžvička, V. 2005. Návraty sudetské otázky [The Recurring Sudeten German Question]. Prague: Nakladatelství Karolinum. 546 p. ISBN 80-246-1007-8

← Illustrative abstract



Views on issues concerning the past (expressed in different years)

Research on “Czech-German relations after the Czech Republic’s accession to the European Union”. Institute of Sociology, ASCR, Department of Czech Border Areas. Prague/Ústí nad Labem 2005

One chapter of the monograph, *The Recurring Sudeten German Question*, deals with Czech attitudes on key issues of present-day Czech-German relations, one of which is the conflict in recent past. Debate on reinterpretation of the post-war transfer of Sudeten Germans, the role of President E. Beneš and other aspects of historic memory is reflected in extensive opinion polls conducted by the Institute’s department in Ústí nad Labem.

Illustrative abstract

Unifying Europe and human and civil rights • Institute of State and Law

The publication focuses on the highly topical and ever-developing role of human and civil rights in the unification of Europe. The author chose a multidisciplinary approach making the consideration of human rights possible not only with reference to constitutional, international and European law, but also from the standpoint of the theory of law and state, and while also examining the historical, philosophical and politological criteria.

The theory and the social and constitutional principles of human rights and the legal guarantees of the implementation and interpretation of human and civil rights in selected European states and in the Czech Republic are explored in individual chapters. Attention is also devoted to the constitutional codification not only of personal and political, but also social, cultural and economic rights in individual European states. The whole work culminates in the chapter dealing with the international and originating constitutional regulation of human and civil rights at the level of the European Union.

Blahož, Josef: *Unifying Europe and Human and Civil Rights* Prague ASPI 2005, 299 pp.

1. Beneš, Edvard. *Germany and Czechoslovakia* (Masaryk Institute)
2. *Correspondence of T. G. Masaryk and Karel Kramář* (Masaryk Institute)
3. *Returns to human capital under the Communist wage grid and during the transition to a market economy* (Economics Institute)

List of other studies

4. Indeterminacy, sunspots, and development traps (Economics Institute)
5. Inflation and balanced-path growth with alternative payment mechanisms (Economics Institute)
6. National character does not reflect mean personality trait level in 49 cultures (Institute of Psychology)
7. Well-being: Psychosocial context (Institute of Psychology)
8. Housing standards 2004/2005: Financing housing and refurbishing housing estates (Institute of Sociology)
9. Czech higher education at the crossroads. A sociological reflection on the investment approach to funding higher education (Institute of Sociology)
10. Problems of law-making in the Czech Republic, Polish Republic and Slovak Republic (Institute of State and Law)
11. Adjective civil law (Institute of State and Law)

8 • Historical Sciences

The section included six institutes with the following research plans:

The prehistoric and early historical development in central Europe in view of the latest results of archaeological research in Moravia and Silesia • Institute of Archaeology in Brno

The archaeological potential of Bohemia: Theoretical research, methodology and information systems, preservation of the national heritage • Institute of Archaeology in Prague

Investigation into and preservation of the source base on the history of science and culture in the Czech Lands, modern methods of processing and providing access to their information value, prospective strategy of working with electronic documents • Archives of the ASCR

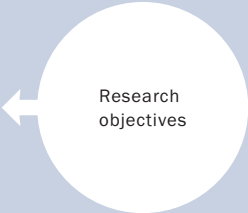
Research on the history of Czech visual arts in light of membership of the EU • Institute of Art History

Research on Czechoslovak history during two totalitarian regimes (1938–1989) and after the collapse of communism • Institute for Contemporary History

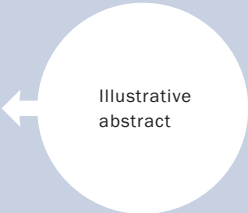
Czech historical space within the European context. Diversity, continuity, integration
• Institute of History

Die frühmittelalterliche Elite bei den Völkern des östlichen Mitteleuropas (mit einem speziellen Blick auf die großmährische Problematik) • Institute of Archaeology (Brno)

The issue of power elites, their formation, changes and manifestations in material culture belongs among cardinal themes within the studies of early medieval society in Central Europe. That's why the collection of altogether 22 contributions by specialists from Czech Republic, Poland and Slovakia deals with several groups of questions related to the most important components of early medieval societies. In addition to valuable essays of historical nature, which emphasize the engagement of Moravian elites in political struggle of the tenth century and its relation to later development (M. Wihoda, L. Jan, D. Kalhous), the manifestation of social stratification of the society in the 8th to 10th century in Central Europe is analysed as reflected in various archaeological findings, esp. on the period burying grounds (for example B. Kavánová, P. Kouřil, L. Poláček). Further studies assess individual categories of exclusive findings, arms in the first place (for example J. Košta, K. Jaworski). Also comprehensive essays are presented, that strive to find a more complex view of West-Slavic elites of Early Middle Ages on the



Research objectives



Illustrative abstract

basis of archaeological findings and written sources (for example A. T. Ruttkay, L. Leciejewicz, T. Štefanovičová). Many archaeological discoveries and findings are published in the collection for the first time.

Kouřil, P., Edt.: Die frühmittelalterliche Elite bei den Völkern des östlichen Mitteleuropas (mit einem speziellen Blick auf die großmährische Problematik). – The Elites of Early Middle Ages Among the Nations of Southern Central Europe (with Special Reference to the Matters of Great Moravia). – Materialien der internationalen Fachkonferenz - Papers of International Specialized Conference, Mikulčice, 25.–26. 5. 2004. – Spisy Archeologického ústavu AV ČR, Brno – Papers of the Institute of Archaeology, ASCR, Brno, Vol. 25, Brno: 379 pages (2005).

Illustrative
abstract

Hortfunde der frühen Bronzezeit in Böhmen • Institute of Archaeology (Prague)

The aim of this research, supported by the Czech Science Foundation (Project 404/03/0372), is to classify the Early Bronze Age hoards found in Bohemia. Archaeologically it concerns the period of the Únětice culture, named after the cemetery excavated towards the end of the 19th century at the village of Únětice north of Prague. This culture flourished between 2300 and 1700 B. C. in two approximately equally long phases. The older one is at the close of the Late Eneolithic and the later one at the onset of the Bronze Age.

Hoard of metal objects are a common feature of the Bronze Age and are an important source of cultural information. According to the commonly accepted definition, a hoard contains at least two items deposited intentionally together at the same time. In some cases, even a single intentionally deposited object may be perceived as a certain form of hoard and in such a case, the context of the object should be known but this rarely occurs. In these instances, such items, sometimes described as “singular” finds, may be considered as originating from a hoard that has been dispersed by ploughing, for example.

The book records 117 indisputable hoards from 105 sites, 25 less certain “hoard finds” with a low informative value, and “singular” finds from 122 sites, giving a total of more than 2,000 individual objects, which are recorded with relevant data (metal fabric, material group, size, and weight) in tables, described in catalogue form and photographically illustrated. The number of hoard finds of the Early and the Older Bronze Age in Bohemia is estimated at around 300.

The research concentrates mainly on three lines of enquiry: the dating of the objects, their origins and their interpretation. The hoards are dated according to the classical Reinecke chronological system introduced in 1924 (stage A1, A2, A2/B1), which has proved to be the most suitable system for the Czech material since other chronological systems are too detailed. All Czech hoards are part of the younger period of the Únětice culture and at present no hoard is known from the earlier, Late Eneolithic, period.

Composition of the items within the hoards indicates that Bohemia was situated at the interface between two production circles: southern (area along the Danube) and northern, which corresponded with the area of the “northern” Únětice culture (Sachsen, central Germany, Silesia).

Copper in the neck ring and rib shape as well as finished items (torques, roar shaped pins, wire tutuli, etc.) entered what is now the Czech Republic from the Danube production circle through southern Bohemia. The production areas of the “northern” Únětice culture supplied the area of the Únětice culture mainly with finished items made by smelting (e.g., daggers with a smelted handle, decorative chains, heavy oval rings) and items made of amber. Material moved between both circles through the Czech Lands from the north to the south and vice versa, but the exchange of metal products between the present Czech and Moravian Únětice cultures has yet to be demonstrated.

The interpretation of hoards is highly problematic. However, they may be divided into two basic groups: hoards deposited for mundane practical reasons and usually destined to be recovered, and hoards deposited as a ritual enactment of permanent disposal. Current predominating opinion is that most of the hoards from the early Bronze Age were ritual deposits. It is practically impossible to apply this basic division to the Czech hoards since almost no accurate contextual data are available.

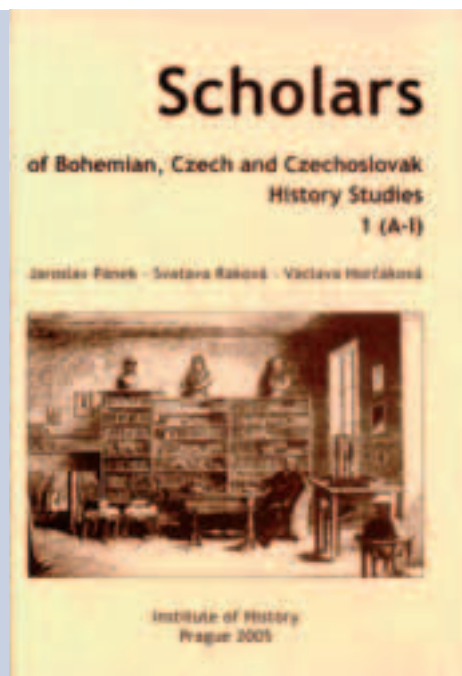
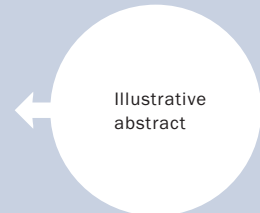


Some objects deposited in hoards indicate the highly developed skill of prehistoric metal founders. The richly decorated brooches with chains were found in the cache at Stará Boleslav. The individual links were cast in intricate moulds. The chains were sewn on clothes to prevent losing the brooch. The finds indicate that the chains could have been a part of complex ornaments.

Photo by J. Škoda

Václav Moucha: Hortfunde der frühen Bronzezeit in Böhmen. Praha, 2005. 511 pp. incl. 217 tables, 24 figs. in the text, 1 folding map. ISBN 80-86124-57-6

Scholars of Bohemian, Czech and Czechoslovak history studies • Institute of History



This bio-bibliographical lexicon in three volumes is the first publication to provide systemized information about scholars in Bohemian, Czech, and Czechoslovak history studies, scattered throughout the world that serves to significantly enhance their respective knowledge “reservoirs”, and improve scholarly communication and contacts. The set contains about 480 items, such as, historians who live and work outside the Czech Republic, or Czechs who died after the year 2000. Each item is structured into two uniformly organized parts. In the short biography, the basic life and professional data of each scholar are presented – home and/or office address, website (if available), higher education, university and other academic degrees, professional career, organizational activities (membership of professional associations, editorial boards, etc.), and the scope of scholarly interests.

The bibliographical part is divided between the works devoted to scholars (mostly bibliographies) and the ones produced by him/her in the field of Czech/Czechoslovak history: books, editions of sources, participation in collective works, and studies published in professional journals, periodicals, festschrifts and other journals. The introduction analyses the recent and contemporary state of research on Czech history, its emphasis and draws some general conclusions about the chances, opportunities and limitations of studying the history of a small nation outside of its territory. The lexicon is in English (introduction, scholarly apparatus, most of the entries), German and French (entries by authors writing in their respective languages). The personal, geographical, and subject indices facilitate orientation in the volumes.

Pánek, J. Raková, S. Horčáková, V.: *Scholars of Bohemian, Czech and Czechoslovak History Studies*. Vol. I.–III. Prague, Institute of History 2005, 445 pp., 468 pp., 390 pp.

The history of Czech fine arts, Part V: 1939–1958 • Institute of Art History

The fifth volume of this major series, launched in the 1980s, covers the 1940s and 1950s, a period in which every area of life – including art – was hit by two successive totalitarian regimes: first the Nazi occupation of Czechoslovakia and then the rise of communist power, which was at its harshest primarily in the 1950s. Leading historians of art from the Institute of Art History of the Czech Academy of Sciences and other institutions have set the development of art in this period in its broader philosophical, political and social contexts.

But they also offer a detailed analysis of all kinds of artistic expression, from the official art that served the ends of the political authorities to a variety of artistic movements and groupings (Skupina/Group 42, SVU/Fine Arts Society, Mánes, Surrealism, Existentialism and others) and also areas until recently almost entirely ignored by the art history community (for example, drawing and painting in Nazi concentration camps or the School of Art in Zlín). Each branch of fine arts is given a separate chapter: architecture, painting, drawing and print-making, sculpture, photography, stage design, design, glass-making, ceramics and typography.

František Gross, *A large interior*
1946 painting, oil on canvas,
180×140.5 cm
National Gallery in Prague



Illustrative
abstract

Authors of the studies include: Anděla Horová, Vojtěch Lahoda, Ivana Panochová, Eva Petrová, Tereza Petišková, Jana Pauly, Antonín Dufek, Jiří Hilmera, Ludvík Ševeček, Sylva Petrová, Polana Bregantová, Pavel Halík, Ivo Hlobil, Lenka Bydžovská, Milena Lamarová, Miroslav Petříček, Rostislav Švácha. Rostislav Švácha – Marie Platovská (eds.), Dějiny českého výtvarného umění V: 1939–1958 [The History of Czech Fine Arts, Part V: 1939-1958] Prague: Academia 2005, 525 pp. ISBN 80-200-1390-3

Prague, May 1945: History of an uprising • Institute for Contemporary History

This book is devoted to military and political consequences of the Prague Uprising. Based on a detailed research both in domestic and foreign archives, the author analyses the topic without any ideological prejudices, also making use of a wide range of professional bibliography on the subject. The first part of the book deals with the genesis of the idea of an armed uprising, presenting a portrait of domestic resistance, including their cooperation with the Czechoslovak government-in-exile and the Allies, who provided material assistance to resistance groups throughout the occupied Europe.

Consequently, the book has also focused on the occupying power, be it a survey of security measures aimed at preventing any escalation of unrest, or the political plans of K. H. Frank [Germany's supreme commander in occupied Czechoslovakia], as he saw a solution to the overall situation in having the Czech Lands seized by U. S. troops. The run of events during the uprising has been interpreted in the context of international politics in reference to the Allied military operations carried out towards the end of World War II. The author concludes that all fighting would have been senseless following the surrender of Germany; therefore, the Czech National Council approved the agreement on German troops withdrawing from Prague.

Kokoška, S.: Prague, May 1945: History of An Uprising. Prague, Lidové noviny Publishers, 2005, 277 pp.

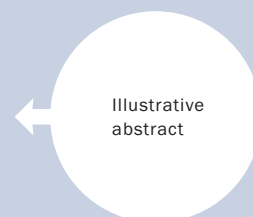
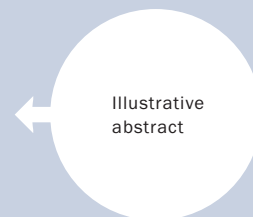
Dissent in the normalization period • Institute for Contemporary History

The book contains the most interesting interviews selected among 120 original biographic stories of the former dissidents and communist officials. Volume I contains 30 interviews with former Czechoslovak dissidents, who, to some extent and at different levels, participated in opposition activities. On the other hand, Volume II records 20 narrations of pre-November officials of the Communist Party of Czechoslovakia at various levels, from the district committees up to the CPCz Central Committee Politburo.

The interviews recorded by the ICH Oral History Centre follow within the framework of a research project with application of the oral history methods. They should contribute to a broader knowledge of the normalization era. The biographic interviews have not been merely focused on historical events or on the activities in party and political functions or, on the other hand, on the dissidents' activities; they also reflect the social and family backgrounds and personal hobbies. By intention, the book has ambiguously been titled "Victors? Vanquished?" and completes the historical page that cannot be recorded in the written archive materials.

Vaněk, M. – Urbášek, P.: Victors? Vanquished? Biographic Interviews. Vol. I. The Dissent in the Normalization Period. Vol. II. The Political Elites in the Normalization Period. Prague, Prostor Publishers, 2005. 1960 pp.

1. Southeast. A window into the Gravettian lifestyles (Institute of Archaeology, Brno)
2. Zur Unterscheidung des vorlangobardischen und elbgermanisch-langobardischen Nachlasses (Institute of Archaeology, Brno)
3. The onset of the early Middle Ages in Bohemia. Archaeological research at a large settlement site of the Prague-type culture at Roztoky (Institute of Archaeology, Prague)
4. The people of Lake Chad (Institute of Archaeology, Prague)



5. Slavism and sciences and humanities in the 19th and 20th centuries (Archives of the ASCR)
6. Jihlava town tax registers 1425–1442 (Archives of the ASCR)
7. Topography of the town Jihlava in the first half of the 15th century (Archives of the ASCR)
8. Political culture in Central Europe (10th–20th century) (Institute of History)
9. The Bosnian issue in the 19th and 20th centuries (Institute of History)
10. The manorial administrative system in late medieval Bohemia: The Rosenberg Domain, 1418–1472 (Institute of History)
11. Over the Mountain You Will Find a Valley: A study of the flight into Egypt in the art of the late Middle Ages and Renaissance (Institute of Art History)
12. Alfons Mucha: Slovanstvo bratrské /Fraternal Slavdom (Institute of Art History)
13. Epigraphica et Sepulcralia I (Institute of Art History)
14. The political trials in post-1945 Czechoslovakia and the “Slánský case” (Institute for Contemporary History)

9 • Humanities and Philology

The section consists of six institutes with the following research objectives:

Creation of a lexical database of the Czech language at the beginning of the 21st century
 • The Czech Language Institute

Integrated research on the Czech language and its variants • The Czech Language Institute

Czech literature from the earliest times to the present, its history, theory, interpretation and documentation • Institute of Czech Literature

Cultural identity and cultural regionalism in the process of forming the ethnic picture of Europe
 • Institute of Ethnology

Trans-disciplinary research on selected key questions of philosophy and related fields of the humanities, logic, classical and medieval studies, and theory of science in particular. Editing and publication of relevant texts and electronic databases • Institute of Philosophy

Research and editorial outputs in comparative Slavonic linguistics, Palaeoslavonic and Byzantine studies, comparative history of Slavonic literatures, history of Slavonic studies in the Czech Lands
 • Institute of Slavonic Studies

Religions, histories, languages, literatures and cultures of African and Asian countries
 • Oriental Institute

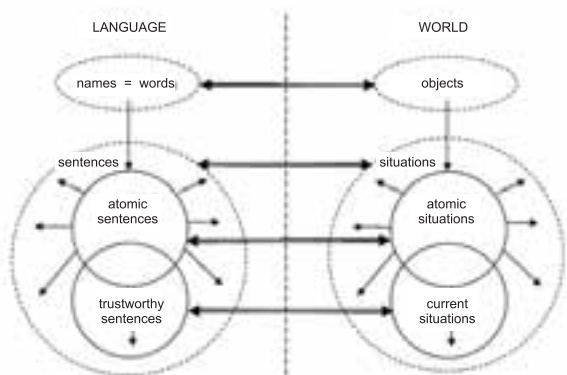
Chapters from analytic philosophy • Institute of Philosophy

A historical introduction to analytic philosophical thinking, which is the result of about ten years of the author's scientific and pedagogical work on the topic. The first part of the book is devoted especially to the towering figures of the “classical” analytic philosophy (i.e., of the period from the end of the nineteenth to the first half of the twentieth century): G. Frege, B. Russell, R. Carnap and L. Wittgenstein. The discussion of the development of their philosophical views is devised to bring light especially on the nature of the linguistic turn and of other key features of the analytic philosophical thought. The second part of the book is devoted to more recent problems: to formal semantics, analytic

Research
objectives

Illustrative
abstract

philosophy of mind and to the post-analytic philosophical thought.



In his classic *Tractatus logico-philosophicus*, Ludwig Wittgenstein arrived at the conclusion that the key to understanding a language's ability to "make known" the world is in realising that language and the world share a certain form: a sentence reveals a "state of affairs" because it consists of words arranged in a certain order analogous to the arrangement of objects that form this "state of affairs".

Jaroslav Peregrin: Chapters from Analytic Philosophy, Filosofia, Prague 2005

Religion and society in South and Southeast Asia: Tradition and modernity • Oriental Institute

The book examines the interaction between religion and traditional values on one hand and social modernization on the other. This interaction was studied in the regions of South and Southeast Asia. The book includes four comprehensive studies devoted to the four major religions of the area. Three of them, *Hinduism: Tradition and Modernity* (S. Vavroušková), *Islam in India* (D. Marková) and *Christianity in South Asia* (J. Holman) deal with South Asia. The fourth study, *Buddhism and Modern Southeast Asian Politics* (J. Bečka) focuses on Myanmar (Burma), Cambodia, Laos and Thailand.

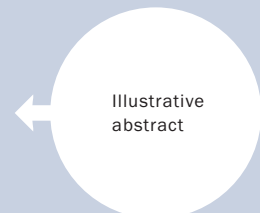
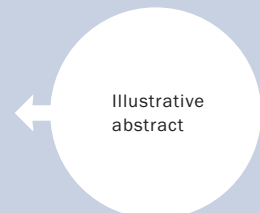
The authors approached the subject as though it were two sides of a coin in which modernization trends in Asian societies often influence their religious systems, while on the other hand, religions, for their part, have a diverse impact upon social, cultural and political developments. The book includes a brief essay by D. Marková on the problems of secularism and secularisation in India, underscoring the specific situation in the country which was born from the interaction of Muslim minority with Hindu majority.

Vavroušková, S. (ed.), *Náboženství a společnost v jižní a jihovýchodní Asii: tradice a současnost* [Religion and Society in South and Southeast Asia: Tradition and Modernity]. Oriental Institute, ASCR, Prague 2005, 368 pp., ISBN 80-85425-57-2

History of Czech Literature, 1945–1989 Parts I (1945–1948) and II (1948–1958) • Institute of Czech Literature

The first two volumes of the *History of Czech Literature 1945–1989* are part of a vast project mapping the fortunes of Czech literature during the repressive era of Communism. The first volume focuses on 1945–1948, a period of very inconsistent domestic politics in which the distinctive attempt for post-war reconstruction of the differentiated literary life and multiform literary production gradually succumbed to the pressure of the totalitarian conception that literature serves as an instrument of Communist policy and the ideal of a classless society.

The second volume describes the launching of socialist realism which followed the Communist coup in February 1948, a period when literature and culture were "building socialism", and the first



manifestations of the nascent conflicts of writers with the power structure emerged in the second half of the 1950s. It also includes an appraisal of the work of writers in exile and writers who stayed, opting unwillingly for self-imposed “inner emigration” beyond the official communication.

A history of literature follows the traditional scholarly structure of poetry, prose, drama and literature. It focuses on the whole spectrum of literary production – the belles-lettres for adults, and non-fiction literature, popular reading and literature for young people and children – but it also underscores the artistic value of individual works and their ability to address the present-day reader. Regarding circumstances in which Czech literature of the second half of the 20th century arose and was received, the volume also pays attention to questions of literary life and its cultural and political relationships. Surprisingly, compared with other literary histories, it investigates the secondary life of literature in media, i.e., in film, radio and television. After publishing the remaining two parts and subsequent publication of the whole in book form, the *History of Czech Literature 1945–1989* aspires to be an essential guide to the stated period and a starting point for another, more comprehensive volume.

Pavel Janoušek and coll.: “History of Czech Literature 1945–1989” Part I (1945–1948) and II (1948–1958);

<http://www.ucl.cas.cz/texty.html> B

Editor-in-chief: Pavel Janoušek, editors: Petr Čornej, Blahoslav Dokoupil, Pavel Janáček, Vladimír Křivánek, Jiřina Táborská

Illustrative
abstract

New academic dictionary of foreign words • The Czech Language Institute



The *New Academic Dictionary of Foreign Words* contains more than 100,000 definitions of currently used words, phrases, abbreviations and symbols of foreign origin. The user will find words here which have been part of the vocabulary corpus for decades, but also expressions which have become part of the contemporary usage quite recently, such as *generikum* (generic), *nanotechnologie* (nanotechnology), *skiatlon* (skiathlon), *roaming*, *sampler*, *komunitární* (communitary), *pentekostální* (Pentecostal), *preemptivní* (pre-emptive), etc. The alphabetical dictionary is complemented by a special supplement *Stručný přehled jazyků světa* (A Brief Overview of the Languages of the World)

The dictionary provides comprehensive information about the loanwords in Czech: their spelling, pronunciation, etymology, the part-of-speech and morphological characterisation, stylistic classification and their use in context. Along with *Slovník spisovného jazyka českého pro školu a veřejnost* (Dictionary of Standard Czech for Schools and the General Public) and *Pravidla českého pravopisu* (The Rules of Czech Orthography), it is among the basic reference books which are indispensable for all users of the Czech language.

Nový akademický slovník cizích slov. J. Kraus et al., Academia, Prague 2005, 879 pp. ISBN 80-200-1351-2

1. Culture, Society, Tradition: Collected papers in ethnology, folkloristics and sociocultural anthropology (Institute of Ethnology)
2. Music societies in Brno, 1860–1918 (Institute of Ethnology)
3. Folk painting on glass (Institute of Ethnology)
4. Easter carols in Bohemia (Institute of Ethnology)
5. Aristotle: The Politics, Book 2: A new translation (Institute of Philosophy)
6. Tomáš Machula: St. Thomas Aquinas. The division and methods of the science. Questions V and VI of his Commentary on the De Trinitate of Boethius; Translation and Introduction (Institute of Philosophy)
7. The Earth is Full of Thy Creation. Three studies on the attitude of Christianity toward nature (Institute of Philosophy)
8. LIMUP – The database of liturgical manuscripts of the Utraquist provenance preserved in the Czech Republic [on-line] (Institute of Philosophy)
9. The Arabic oneirology in the Middle Ages and at the present time (Oriental Institute)
10. Comprehensive Czech-Russian dictionary (Institute of Slavonic Studies)
11. Ukrainian dialects in Slovakia (Institute of Slavonic Studies)
12. Sancti Gregorii Magni, Romani pontificis, XL Homiliarum in Evangelia in versione bohemo-slavonica (Institute of Slavonic Studies)
13. A history of Czech literary reflection, 1970–1989 (IV) (Institute of Czech Literature)
14. Studies on semantization of the form (Institute of Czech Literature)
15. Dictionary of verbal, nominal and adjectival phrases and collocations (The Czech Language Institute)
16. The dictionary of place-names in Bohemia, Part I (The Czech Language Institute)



3



3

Cooperation with Universities and the State of Educating Scientists

Cooperation of the ASCR with universities has focused principally on joint departments, joint grant projects, and the education of students of doctoral study programmes (DSP) based on joint accreditation. The activity of university employees within bodies of the ASCR, i.e., the Academy Assembly, the Council for Sciences and the Supervisory Committee, and in special councils at the Grant Agency of the ASCR, all contributed to strengthening the mutual coordination of work. Similarly, a number of ASCR researchers worked in university groups, for example, university and faculty science councils.

Frequent meetings were held involving senior representatives of the ASCR and universities. Close cooperation exists between the Presidium of the University Council and the Czech Rectors' Conference. University and ASCR researchers collaborate closely. They conducted 649 joint projects supported by the Czech Science Foundation and the Grant Agency of the ASCR. There were also 21 cooperation contracts with universities. A **General Cooperation Contract** was signed in 2005 between the **ASCR** and the **University of Silesia** in Opava, as was a **Cooperation Agreement on the Implementation of Doctoral Study Programmes (DSP)** between the **ASCR** and the **University of Silesia**. Given the reorganisation of some institutes of the ASCR, a few joint departments were either amalgamated or dissolved. Their number at the end of 2005 totalled 50.

The newly-established ASCR and university joint departments are as follows:

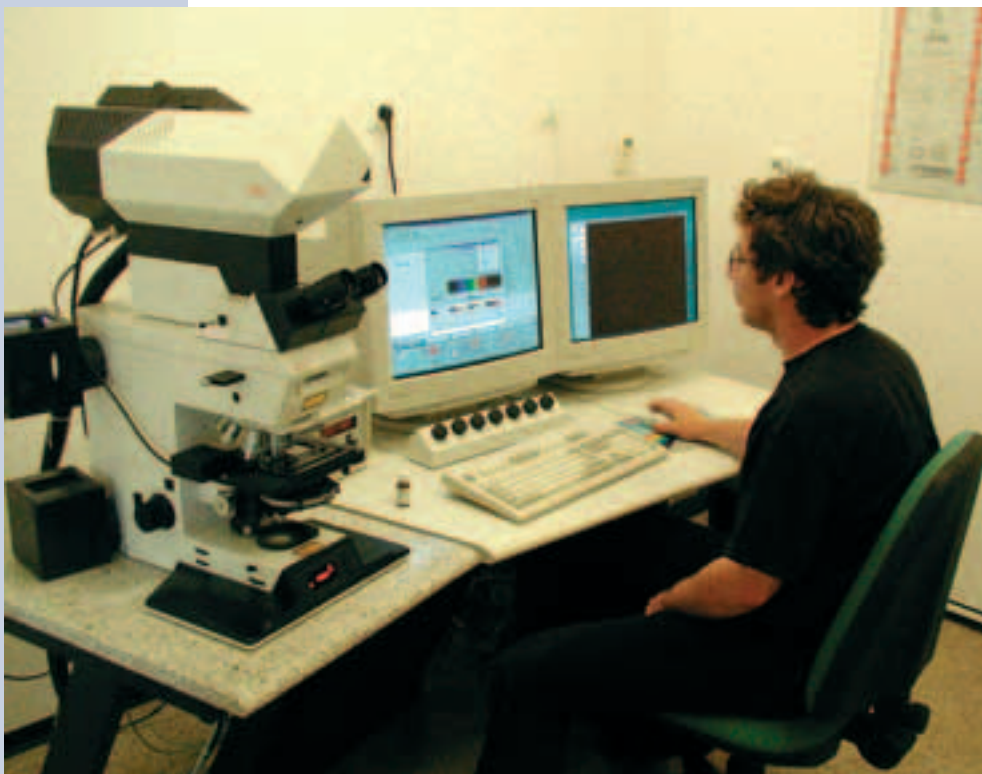
Joint Department of Regenerative Medicine consists of the Institute of Experimental Medicine, ASCR, Institute of Clinical and Experimental Medicine, and Charles University in Prague.

Centre of Intelligent Systems and Structures comprises the Institute of Thermomechanics, ASCR and the VŠB Technical University in Ostrava.

The Cell Biology Laboratory encompasses the Institute of Physiology, ASCR and the First Faculty of Medicine of Charles University in Prague.

Collaboration with universities at general research centres, fundamental research centres (a programme operated by the Ministry of Education, Youth, and Sports) and joint departments produced some significant results.

In inaugurating the **Doctoral Teams Programme**, the Czech Science Foundation financed and continues to finance 70 doctoral projects, in which 11 ASCR institutes receive grants or are joint recipients in 31 projects.



A confocal microscope for studying fine structures of cells and tissues as well as their immunohistochemical properties

Institute of Experimental Medicine

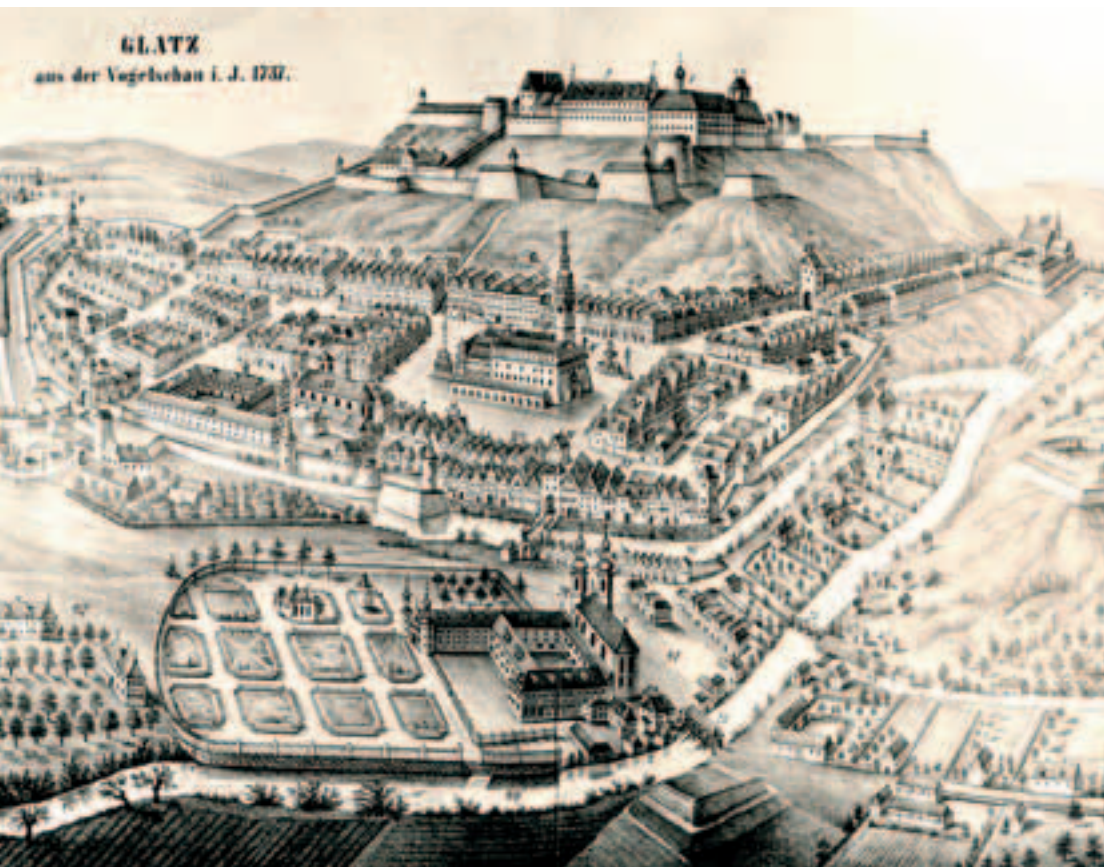
Collaboration with universities has experienced a positive development, thanks to a ruling by the Accreditation Commission of the Ministry of Education, Youth, and Sports extending the accreditation of doctoral study programmes.

As in previous years, attention was given during 2005 to training future research workers. **Courses of Research Fundamentals** were organised, mainly for first and second year students of doctoral study programmes, at the Head Office of the ASCR in Prague and at the institutes in Brno. The courses, whose principal aim is to familiarise students with the fundamental principles of presenting the results of scientific work, were taken by a total of 348 DSP students, with students of the biological and chemical sciences predominating (215).

A total of 2079 doctoral study programme students attended ASCR institutes in 2005, be it in the form of full-time study, extramural study, or a combination of the two. The number of DSP graduates who obtained PhD. degrees rose to 220. However, the number of new DSP students whose supervisors work at ASCR institutes fell slightly in comparison with the year 2004 (391).

256 foreign DSP students were trained at ASCR institutes, 18 of which successfully completed their doctoral study programmes within each institute's scope of accreditation. In general, the number of foreign students at ASCR institutes has been growing and continues to grow to the present time.

The increased number of **ASCR employees working at universities** also contributed to closer ties between ASCR institutes and universities and the improved quality of cooperation. A total of **1872** employees of ASCR institutes taught at universities in 2005. The number of seminars, lectures, and tutorials offered are shown in the tables below. Some 508 employees of ASCR institutes worked at universities part-time, whilst 342 university employees worked part-time at ASCR institutes.



A view of Kladsko in 1737 in “Kladsko: Transformations of a Middle European region”

Historical Atlas

		2001	2002	2003	2004	2005
1	Graduate students trained at Institutes (full-time, extramural or combined study)	1 325	1 574	1 786	1 939	2 079
2	Undergraduates working on their theses at Institutes	922	988	959	1 097	1 143
3	Graduates newly accepted for doctoral study programmes (DSP)	304	388	420	421	391
4	DSP students who completed their training at Institutes	194	174	161	204	220
5	Undergraduate students at Institutes	413	683	691	691	763
6	Number of semestral lectures, seminars and tutorials given by ASCR employees at universities	2 008	2 196	2 316	2 292	2 666
7	Teaching by ASCR employees at universities in hours	51 328	55 402	56 392	60 329	66 006

← The main forms of cooperation with universities in 2005

44



4

Cooperation with the business sphere and other institutions

One of the priorities anchored in the conceptual documents of the ASCR is the conversion of the results of basic research into practice. The Council for Cooperation of the ASCR with Business and Application Sphere was set up in 2005 to support this process, with its first meeting taking place on 27 October 2005. The mission of the Board is to seek ways to use the results of research done at ASCR institutes in social and industrial practice, as well as to support the Academy's institutes whilst transferring knowledge into the application sphere. The Board's activity should contribute to setting the principles of the Academy for protection of intellectual ownership, compilation of regulations for material interest of the institutes and researchers in practical use of their results, as well as the patent and licence agenda of the Academy.

Subjects from the business and application sphere were partners of some ASCR institutes during their work on several dozen grant projects of the Czech Science Foundation. More than one third of projects in the programme, Support for Projects of Targeted Research and Information Society, were carried out in cooperation with industrial partners in innovations at various stages. Also, the Nanotechnology for Society programme, newly announced in 2005, will contribute considerably to a higher intensity of cooperation with the business and application sphere thanks to the emphasis placed on the participation of partners from the application sphere in individual projects. The direct cooperation, based on agreements between business subjects and ASCR institutes, contributes significantly to the process of transfer of technologies and knowledge. Also, business contracts share significantly in the transfer of research results into the application sphere. The results of research obtained at the Academy are applied in industrial enterprises, agriculture, protection of the environment and cultural monuments, in health care and in examining the state of Czech society.

Projects supported by the Ministry of Trade and Industry of the Czech Republic are of great importance for the transfer of **new technologies** and in the **innovation process**, especially in the TANDEM programme. Academy institutes participated in projects of the Czech Ministry of Education, Youth and Sports and also the Ministry of Health. Application of research results is documented in the following examples:

Research into degradation processes of steel used for thick-walled tubes in thermal electrical power stations • **Institute of Physics – Integrity and Security of Steel Constructions, a.s., Bratislava**

Measurement, average coarseness and homogeneity of coatings of steel, resistant to corrosion in a saline environment

- **Institute of Physics – Aviation Research and Testing Institute in Prague – HVM Plasma Ltd., Prague**

Performance of personal dosimetry of aircraft crews, the results of which were submitted to individual aviation companies

- **Nuclear Physics Institute – CSA, a.s – Travel Service, Ltd. – Fischer Air, Ltd. – ABA Air a.s.**

Contribution to standardisation of programme equipment for the automobile industry

- **Institute of Information Theory and Automation – Faculty of Electrical Engineering, Czech Technical University - Unis Ltd.**

Comprehensive analysis of the development of damage to iron mounted axles and evaluation of resistance of material to breakage. The findings obtained lead to optimising the technology for manufacturing iron mounted axles and to a higher safety of operation

- **Institute of Physics of Materials – Bonatrans a.s.**

Implementation of a plasma reactor for gasification of solid organic substances and vitrification of inorganic substances with a new type of plasmatron which is usable for designing equipment for waste disposal and production of energy gases from waste and biomass

- **Institute of Plasma Physics – Envitech – University of Ghent**

Reduction of uncertainties in specifying measurement of frequency stability and time intervals in ultra-sensitive calibration frequency sources and clocks

- **Institute of Radio Engineering and Electronics**

Vibro-diagnostic system for measurement of blade oscillation in turbine rotor in operational conditions

- **Institute of Thermomechanics – Starmans Electronics Ltd., Prague – Škoda Power Ltd., Plzeň**

Development of special temperature readers for measurement of fast temperature changes

- **Institute of Thermomechanics – Faculty of Mechanical Engineering, Technical University, Brno**

Analysis of the causes of the breakdown of Družba oil pipeline in January 2005. Extremely low ductility of the tube material was identified where the crack first appeared

- **Institute of Theoretical and Applied Mechanics**

Derivation of LSF (Large Scale Flood) index for evaluation of combined extremity of meteorological elements prior to floods caused by rainwater. The index was demonstrated to have a strong capability of detecting flood danger 3–4 days before the culmination of major flows

- **Institute of Atmospheric Physics – Czech Hydrometeorological Institute**

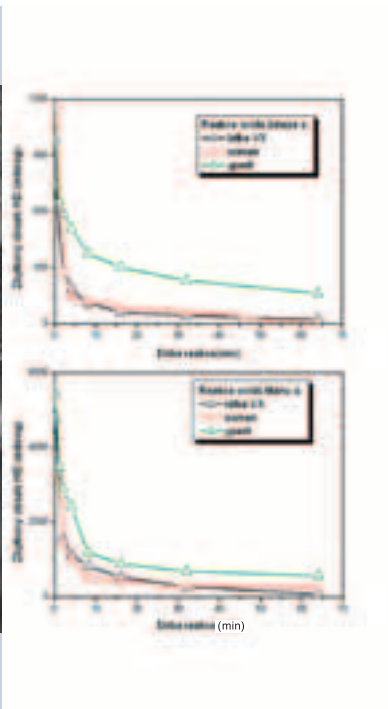
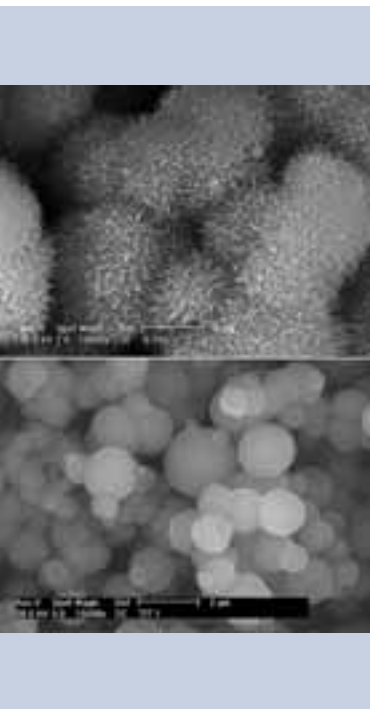
Development of apparatus for measuring spectral composition of radio signals in the case of electromagnetic logging of boreholes in slope deformations

- **Institute of Geonics – Geotest a.s.**

Czech Grammar Check, a computer programme checking not only spelling but also the grammatic structure of sentences, and conveying mistakes to the author of the text

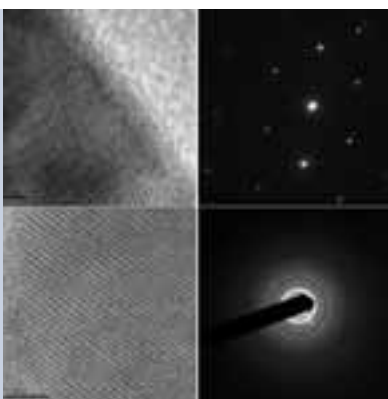
- **The Czech Language Institute – Microsoft.** After assessing the quality of the product, the company decided to buy the programme and integrate it in the Czech version of Microsoft Office 2003. It can be downloaded free of charge from the Microsoft website.

Effective cooperation also exists between the Academy's institutes and the business and application sphere in the areas of **health care** and **application of the results of research in chemistry**. The institutes of the Academy carried out or participated in many grant projects of the Czech Ministry of Trade and Industry,



Researchers at the **Institute of Inorganic Chemistry and the Military Technical Institute in Brno** developed and tested new powder materials based on Ti, Fe, Al and Zn oxides suitable for destruction of certain toxic compounds (yperit, sarin, soman, and VX).

The materials are inert and non-toxic, do not damage the detoxified objects, do not adhere to them, and can be easily removed when detoxification is completed. Together with **Precheza a.s. in Přerov**, the authors set up a pilot plant and developed a promising material, highly effective in destroying toxic chemicals.



Microscopic photographs of particles of typical active oxides and the course of disintegration of the individual types of toxic compounds depending on the material.

the Ministry of Agriculture and the Ministry of Health. Support for a number of projects with applicable output is provided by the Czech Science Foundation. Cooperation with the application sphere was conducted in the following projects in particular:

Mathematical model of the melting process for industrial glass

- **Institute of Inorganic Chemistry – Asahi Glass, Japan**

Establishment of conditions for removal of bubbles from industrial glass under reduced pressure

- **Institute of Inorganic Chemistry – Saint Gobain Recherche**

Development of a method for testing proton inserting electrode materials based on measurement of work function • **Jaroslav Heyrovský Institute of Physical Chemistry – Cegasa, Spain**

Research on electrode materials with $\text{TiO}_2(\text{B})$ led to submission of a patent application

- **Jaroslav Heyrovský Institute of Physical Chemistry – HPL, Switzerland**

Design and testing of a new technology for manufacturing aromatic oil from crude oil, used as emollient for improving properties of rubber • **Institute of Chemical Process Fundamentals – Paramo a.s., Pardubice**

Determining the characteristics of the course of hardening, development of the structure and resultant properties of three types of polymer hardening compounds – epoxide, polyurethane and organic-inorganic • **Institute of Macromolecular Chemistry – Synpo a.s. – DuPont**

Development of a new technology for preparation of glycol-peptide immuno-therapeutic Likopid • **Institution of Organic Chemistry and Biochemistry – Shemyakin-Ovchinnikov Institute of Bioorganic Chemistry, Russian Academy of Science, Moscow – Peptek a.s.**

Development of a drug form of iposomal and tetra-ether preparations for photo-dynamic therapy of malignant tumours within the framework of the international programme, EUREKA • **Institute of Physiology – RCD Ltd. Dobřichovice**

Verification of a technique for separating algae from the liquid phase in solar photo-bioreactors with a thin layer using a decanter, plate and jet centrifuges. Photosynthetic effectiveness of the system proposed is higher than 6 percent • **Institute of Microbiology – Westfalia Separator**

Testing of the effects of selected psycho-active drugs on the structure of lipid bilayer • **Institute of Experimental Medicine – 1st Medical Faculty of Charles University – Zentiva a.s.**

Development of scaffolds for artificial tissues • **Institute of Experimental Medicine – CartBank**

Identification of two main forms of a potential oncogenic protein CA IX (carbonic anhydrase IX) • **Institute of Molecular Genetics – Bayer Corp., USA**

Several hundred appraisals, assessments and analyses are compiled each year by workers of the Academy for the user sphere, including agencies of the state and territorial administration and administrative units of the EU and World Bank. Institutes in the fields of the social sciences and humanities participate significantly in these activities. The **Institute of State and Law** compiled 110 professional statements and provided consultations, primarily for institutions in the public sector. The **Archaeological Institute in Brno** produced 330 professional appraisals, determining in particular the conditions of protection of archaeological localities and archaeological cultural monuments. The Archaeological Institute in Prague conducted, in 122 cases, extensive archaeological research on the basis of agreement with an investor, and 12 geophysical measurements were also implemented, in which the most significant discovery can be considered the finding of at least fourfold ramparts around the Zámka fortification in the Bohnice area of Prague. The following examples illustrate the diversity of the topics addressed:

Continuation of a series of economic overviews entitled “Czech Republic”, the aim of which is to provide an accurate economic-political-social description of the current and expected development of the Czech Republic • **Economics Institute**

Opinion poll on foodstuff safety • **Institute of Sociology – Ministry of Agriculture of the Czech Republic**

Salvage archaeological research in the Opava city castle • **Institute of Archaeology in Brno**

Commencement of the activity of a conventional radiocarbon laboratory called the Czech Radiocarbon Laboratory (CRL) • **Institute of Archaeology in Prague – Nuclear Physics Institute**

Investigation of a burial site in Zlončice near Mělník, documenting a necropolis of a basic social unit from the early Middle Ages • **Institute of Archaeology in Prague**

Institute of Ethnology continued to issue the collected works of Antonín Dvořák in cooperation with the publishing firm Bärenreiter.

In addition to the aforementioned results and projects, workers of ASCR institutes participated in the compilation of many technical norms, analyses, methods, measurements, laboratory tests and diagnostic methods.

Institute	Patents granted		Inventions registered	Valid licence Contracts of which in 2005	
	In CR	abroad		Total	in 2005
Institute of Physics	1	1			
Institute of Plasma Physics	1		1	1	
Institute of Computer Science			1		
Institute of Information Theory and Automation		1			
Institute of Scientific Instruments			2	1	
Institute of Radio Engineering and Electronics	1		2		
Institute of Thermomechanics			4		
Institute of Geonics			1		
Institute of Rock Structure and Mechanics			3		
Institute of Inorganic Chemistry	3		2	2	1
Jaroslav Heyrovský Institute of Physical Chemistry			1		
Institute of Chemical Process Fundamentals	1	8	1	1	
Institute of Analytical Chemistry			2		
Institute of Macromolecular Chemistry	3	1	3	15	1
Institute of Organic Chemistry and Biochemistry	5	2	8	4	1
Institute of Entomology*	1	1			
Institute of Microbiology	4		1		
Institute of Experimental Botany		5	12	107	13
Institute of Experimental Medicine	3				
Institute of Plant Molecular Biology *	1				
Institute of Molecular Genetics	1		1	2	
ASCR total	25	19	45	133	16

Patents granted, invention registrations and licence contracts at the ASCR

* as of 1 January 2006 this institute was amalgamated into the Biological Centre of ASCR

5



5

International Cooperation

Cooperation within EU and NATO structures

The year 2005 was exceptional from the perspective of our first assessment of Czech membership of the **European Union**. The ASCR was actively involved in the implementation of the **Lisbon Strategy** and engaged in the process of the European strategy of economic growth in accordance with other specific goals of the Barcelona conference, i.e., the process of creating a European research and development policy and directly or indirectly support getting the institutes involved in European projects and programmes. To put into practice the resolution of the XXVI Academy Assembly, more staff was assigned to the existing **Department for European Integration (DEI)** and a new advisory body of the Academy Council was set up, the **Council for Supporting ASCR Participation in European Integration**. Both these bodies contributed to broadening and improving the quality of cooperation with research institutes in member states, to the creation of international research centres, and generally to the involvement of ASCR institutes in projects of the 6th Framework Programme. Institutes were informed about projects announced by the European Commission on an ongoing basis. A platform necessary for the exchange of information among researchers involved was created by organising seminars and distributing European documents, including legislation. As part of its participation, the Department ensured contacts with European organisations, delegates of the Permanent Mission of the Czech Republic in Brussels, and departmental and governmental organisations. The DEI cooperated closely with **CZELO**, the Czech contact office in Brussels (www.czelo.cz) and with the ASCR Technology Centre in coordinating and creating opinions in all areas of European science policy. The ASCR participated in the process of creating European science policy, mainly by compiling opinions of the aims, plans, and programmes of the EU (in particular regarding preparation of the 7th Framework Programme). Information on invitations to the individual programmes of the EC (including those over and above the scope of the 6th Framework Programme), links to European legislation, and information on other relevant EC documents can all be found in the **Research and development in the EU** section of the new ASCR website.

The participation of ASCR institutes in EC projects and in the Framework Programmes of the EC was monitored and evaluated on an ongoing basis during 2005. Indeed the participation of ASCR institutes in EC projects and programmes increased considerably last year. Work on projects of the 5th Framework Programme continued (a total of 34 projects) and projects of the 6th Framework Programme got underway successfully as ASCR institutes participated in **213 EC projects** by the end of 2005. In the process, the overall volume of funds passing through these projects to the ASCR budget reached the sum of **4.2 million EURO**. Research teams also came to terms with the introduction of new instruments in the 6th Framework Programme, i.e., the introduction of integrated projects (IP) for a total of 33 projects, the network of excellence (NoE) totalling 12 projects, and INTAS with 7 projects. By contrast, participation in Marie Curie (MC)

projects was relatively low – 11 projects and very few institutes made use of the MC instrument known as the “transfer of knowledge” (ToK – 2 projects). The involvement of institutes in other types of EC projects and in drawing from structural funds (a total of 5 projects on record) was also relatively small (see table).

Institutes of the 1st and 2nd Divisions of science were, as in the past, involved in Framework Programme projects to the greatest extent (Institute of Physics – 23 projects; Heyrovský Institute of Physical Chemistry – 11 projects; Institute of Plasma Physics – 9 projects; Institute of Atmospheric Physics – 9 projects; Institute of Physiology – 8 projects; Institute of Microbiology – 7 projects), whilst the number of projects involving institutes of the Humanities and Social Sciences Division has increased to a satisfactory extent (a total of 22 projects). One undoubted success is the fact that ASCR institutes more often took an active role as project coordinators (a total of 22 projects) and considerably increased their financial participation. Examples of these more costly projects include the LASERLAB-EUROPE project (Institute of Physics) and the Biomimetic Optical Sensors for Environmental Endocrine Disruptor Screening project (Institute of Radio Engineering and Electronics). The Institute of Sociology also involved itself as coordinator in an extensive programme known as the Central European Centre for Women and Youth in Science.

Selected principal instruments of the 6th Framework Programme

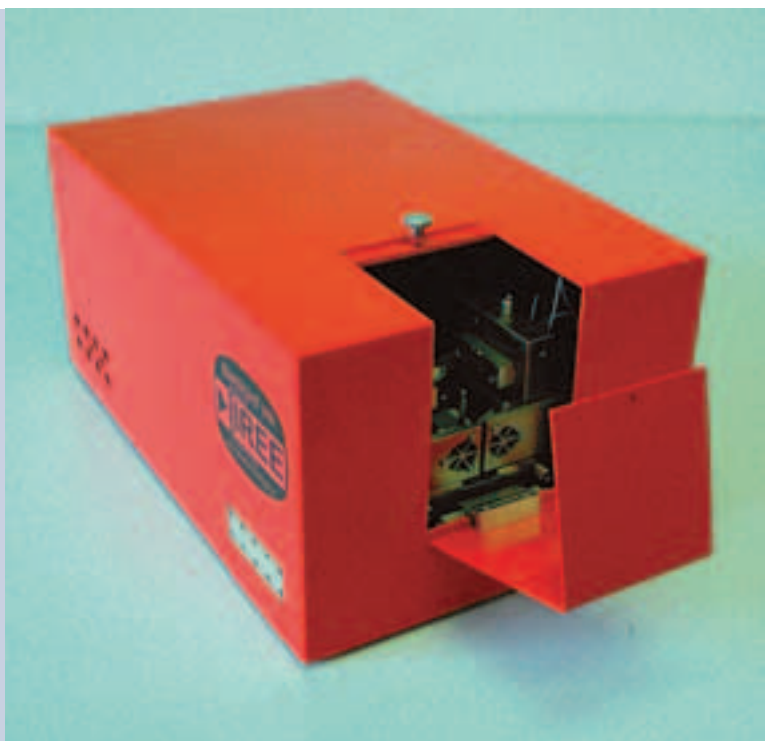
Type of instrument	Total number of projects
IP (Integrated Projects)	33
STREP (Specific Targeted Research Projects)	23
NoE (Network of Excellence)	12
Marie Curie	11
INTAS	7
SSA (Specific Support Actions)	9
CA (Coordinated Actions)	3
Other	28

The Academy of Sciences of the Czech Republic was also active in a number of international science organisations as a part of European science structures. ASCR representatives took part in negotiations, meetings, assemblies, and conferences convened by the European Commission and its organisations in the sphere of research, development, and innovation. The Academy is also represented in a number of top-level and advisory organisations of the European science structures, for example the European Commission’s advisory body **EURAB** (European Research Advisory Board). It is also represented in 4 working groups of **EASAC** (European Academies of Science Advisory Council) in programme committees of EU Framework Programmes.

The **CCM** (Czech Centre for Mobility) officially got underway in 2005 in the presence of representatives of the EC, Czech Ministry of Education, Youth, and Sports, and ASCR. The Centre is at the national CCM portal, which was put into operation and harmonised with the European portal during the year. During its first year of operation, the Centre oversaw 30 individual cases. For the most part, it answered the questions of scientists from other countries regarding conditions for foreigners who plan to work in the Czech Republic. Questions on the range of specialist employment positions offered were registered.

The Centre was helpful in dealing with certain protracted applications for long-term residence made by foreign researchers in the Czech Republic. It also worked together with the Czech Ministry of Education, Youth, and Sports on initiatives that led to discussions on the acceptance of the Charter for Science and Research Workers and the Code of Conduct for the recruitment of research workers. The ASCR has a representative on the **NATO Science Committee**, which in 2005 supported science projects that relate to

defence against terrorism or other threats to security (such as environmental disasters, disposal of hazardous waste, etc.) in accordance with its “Security Through Science” programme document of 2003.



A mobile sensor for detecting chemical substances impairing the functions of endocrines, based on optical excitation of surface plasmons

Institute of Radio Engineering and Electronics

ASCR's cooperation with other international governmental organisations

CERN (Conseil Européen pour la Recherche Nucléaire) continued to do well in 2005 with the construction of the largest accelerator in the world, the so-called Large Hadron Collider (LHC). It also continued building four giant detectors for the main experiments prepared for this accelerator. Czech institutes supplied all parts of the detectors, which they pledged as part of the ATLAS (A Toroidal LHC Apparatus), ALICE (A Large Ion Collider Experiment), TOTEM (TOTal Elastic Measurement), and COMPASS (Common Muon Proton Apparatus for Structure and Spectroscopy) projects. Czech researchers also took part in developing a new GRID network, which will be used to store and process experimental data. They also contributed outstanding work to renowned specialist journals and shared in 69 entries in international conference proceedings.

Cooperation with CERN enabled young Czech scientists and technicians to advance their qualifications, and the education of Czech secondary school teachers and the general public as well. Cooperation continued involving a number of institutes of the ASCR (Nuclear Physics Institute, Institute of Macromolecular Chemistry, Institute of Rock Structure and Mechanics, and the Institute of Physics) and the laboratories of the **JINF** (Joint Institute for Nuclear Research) in **Dubna** (a small “town of science” north of Moscow). Cooperation primarily involved experimental, theoretical, and mathematical physics, the physics of ions, the chemistry of transuranic elements, cooperation in radiobiology and medical physics, in geophysics, and in research into polymers.

Cooperation continued in the improvement and development of sensors and other experimental equipment. Two of the three current assistant managers at JINF laboratories are employees of ASCR

institutes. The Academy's institutes and the laboratories at the Joint Institute for Nuclear Research joined forces in 2005 to participate in 26 targeted projects (of a total of 44) with a capacity of 60 workers. An ASCR scientist is the governmental representative of the Czech Republic for the coordination of collaboration with the Joint Institute for Nuclear Research (which is headquartered in Dubna).

The ASCR and the Czech Science Foundation are members of the European Science Foundation (**ESF**). Both institutions have representatives in the top echelons of this prestigious organisation. The ASCR is also represented in three permanent science committees (for life and environmental sciences, physical and engineering sciences, and for social sciences). Participation from previous years in 20 à la carte programmes has continued, and institutes of the Academy also took part in EUROCORES (European Collaborative Research) programmes financed by the Czech Science Foundation. A number of top-level conferences were held in 2005, organised by the ESF in cooperation with national and international organisations as part of a new schedule. There was major interest in these conferences among ASCR institutes, considering mostly young researchers are allowed to meet the scientific elite.

The ASCR cooperates with the ESF and thirteen other national agencies (Research Councils) from within the EU in putting into practice the European HERA-NET project (Humanities in the European Research Area) within the 6th Framework Programme. The results of this ought to help the humanities forge ahead within the 7th Framework Programme. Czech cooperation with **UNESCO** in 2005 again concentrated mainly on MAB science programmes, the International Hydrologic Programme (IHP), and the International Geoscience Cooperation Programme (IGCP). The **MAB** (Man and the Biosphere) national committee dealt with the issue of biospheric reserves. The chairman of this committee, a specialist in the ecology of wetlands, represented the Czech Republic at the General Assembly of UNESCO in Paris in December 2005. Czech specialists involved in the IHP work primarily on projects, such as “Regional Cooperation of Danube Countries in Hydrology” and “Underground Water in Danger”. In the IGCP, the Czech Republic participates in 13 projects. A round-table meeting of ministers responsible for science was held at the 33rd General Conference of UNESCO in Paris. Prof. H. Illnerová took part in discussions on behalf of the Czech Republic. Discussions emphasised the fact that science institutions must make efforts to develop ways to encourage the creativity of young people and at the same time develop scientific cooperation between advanced and wealthy countries and less-advanced and poor countries (the North-South Programme) as well as among less-advanced countries themselves (the “South-South” African exchange programme 2005–2007).

ASCR's cooperation with international non-governmental science organisations

ALLEA (All European Academies), which brings together European academies of sciences, sponsored a number of events during 2005, primarily organising conferences and seminars which were attended by ASCR representatives. Examples include the workshop The Future of the Scientific Information Chain, and a meeting of the Standing Committee on Science and Ethics.

The **ICSU** (International Council for Science), founded in 1931, seeks primarily to coordinate international research of a global and multi-disciplinary nature. A General Assembly of the ICSU was held in 2005 and attended by the newly-appointed ASCR representative to the ICSU. Part of the General Assembly involved a joint science forum, which concentrated on two main topics: “Science and Human Well-being” and “Science for Sustainable Development”. The main aim of the General Assembly was to approve the ICSU Strategic Plan for the years 2006 to 2011. Organisational matters were attended to as well, such as elections for a new management.

The ICSU takes in the international science unions of all disciplines of science. The relevant science committees are partners of these international unions at the national level, whilst the Academy of

Sciences represents the entire Czech Republic on these committees. Their activities are monitored and evaluated by the Council for Foreign Relations on a regular basis. The ASCR pays the membership fees for 35 national committees of international unions and provides financial support for some of their activities.

The **IAP** (InterAcademy Panel) is a global organisation that brings together national science academies from around the world. As a member state institution, the ASCR endeavours to take the initiative and join programmes that this organisation announces. During 2005, the ASCR joined the effort "To Teach the Evolution Theory in Schools".

The **IAMP** (InterAcademy Medical Panel) is a similar organisation that unites national science academies throughout the world, but whose sphere of activity includes research in the realm of medicine. The ASCR is also a member and in 2005 sent its representative to a conference entitled "Forum on Biosecurity". The Academy nominated its representative for election to the IAMP Executive Committee, which is set to take place in April 2006.

The **UAI** (Union Académique Internationale) is an organisation which unites 58 member states throughout the world and is responsible for coordinating and in certain cases providing financial support for cooperation on projects in the sphere of humanities that go beyond national borders. ASCR institutes participate in six projects: *Moravia Magna*, *Clavis Monumentorum Literarum Bohemiae*, *Lexicon Iconographicum Mythologiae Classicae/Thesaurus Cultus et Rituum Antiquorum*, *Corpus Vasorum Antiquorum*, *Dictionnaire du Latin Médiéval*, and *Aristoteles Latinus*. Another project, the *Dictionnaire grec-vieux slave*, is also at the preparation stage.

The Vice President of the ASCR, its authorised representative at the UAI, was involved continually in evaluating other international projects.

The Czech Historical Society in Rome (**CHU**) together with the comparable department of the ASCR and the Faculty of Philosophy at Charles University in Prague continued its fundamental long-term research into Vatican sources with regard to the medieval and early modern history of the Czech Lands. In particular, it used heuristic devices for editing the Papal writings of Eugene IV (1431–1447) and publishing sources from the Palatina Library related to Czech history. It worked as part of the Association of Archaeological, Historic, and Art Historian Institutes (with its head office in Rome) and made its results accessible in a periodical published in Italian entitled "Bolletino dell'Istituto Storico Ceco di Roma".

International cooperative bilateral agreements

Currently many forms of international scientific cooperation are available, including 60 bilateral, inter-academy agreements. They form the legal framework for the exchange of mostly younger scientists from ASCR institutes to build new contacts with colleagues abroad and join international research teams. Such agreements allow scientists the opportunity to participate in important science events, to study in archives and libraries, and to undertake research in specific areas of interest (e.g., field studies by geologists and botanists in otherwise inaccessible areas). They also serve to support the work of bilateral commissions of historians.

Cooperation within the scope of bilateral projects has come more and more to the fore in recent years. For many researchers, such projects are the first step in getting Czech research teams involved in international programmes and projects. At present cooperation as part of joint projects is underway with partners in France, Italy, Canada, Germany, Portugal, Spain, Sweden, and the USA. Projects are mainly undertaken for two or three years. There were 146 such projects during 2005 as part of bilateral

agreements. The ASCR broadened its contacts to include a new partner in Great Britain, the Royal Society of Edinburgh (RSE).

Contracts that had already been signed were brought up to date on a regular basis. This meant that the opportunity also arose to find new possibilities for cooperation on joint projects with other partners and to seek out new and more effective forms of cooperation. In 2005, agreements were updated with, for example, the Spanish partner CSIC, with DAAD in Germany, with the Russian Academy of Medical Sciences, and with a partner in Thailand. Meanwhile, a tender is being prepared for joint projects with the Japanese partner, JSPS. A total of 730 people were sent abroad for 8,964 days as part of bilateral inter-academy agreements in 2005, with 631 specialists coming to the Czech Republic for 5,334 days.

Apart from these centrally promoted agreements, ASCR institutes also entered into agreements with their foreign partners. During 2005, 267 such agreements were in operation, with 1150 trips abroad undertaken under these. The ASCR also made use of its contractual contacts at the governmental level, through cultural agreements (with, e.g., Greece and Denmark) or agreements on scientific and technical cooperation (with, e.g., Slovenia, Austria, and France). Research teams from Czech universities participated in a number of international academy agreements. This involves joint projects as part of cooperation with the NSF in the USA, DAAD in Germany, GRICES in Portugal, and IN2P3 in France.



Opening ceremony at the Pierre Augere Observatory in Argentina on 13 November 2005. Scientists from the Institute of Physics participate in the Observatory's work

COST
projects

Examples of international projects at ASCR institutes in 2005

The Role of the Upper Troposphere and Lower Stratosphere in Global Change project “Influence of Atmospheric Chemistry on the Upper Troposphere – Simulation in the Wind Tunnel” • coordinator: Institute of Environmental Physics, University of Bremen; participants: Institute of Thermomechanics and 24 other European institutes.

Nanoscale and Ultrafast Photonics • participants: Institute of Radio Engineering and Electronics and institutes from 18 other European countries

Plasma Polymers and Related Materials • coordinator: Charles University in Prague; participants: Nuclear Physics Institute, Institute of Physics, Institute of Physiology, and 27 other Czech and European institutes

Entomopathogenic Nematodes (Heterorhabditidae and Steinernematidae), their Interaction with Insect Populations to Facilitate Biotechnology and Field Application • participants: Institute of Entomology and 10 institutes in other countries



Bubble plate column for measuring transition between the gaseous and the liquid state

Institute of Chemical Process Fundamentals

VI-RM – The European Virtual Institute for Reference Materials • coordinator: OPTIMAT Ltd. Glasgow; participants: Nuclear Physics Institute and institutes in 13 other European countries

CANDIDOZ – Chemical and Dynamical Influences on Decadal Ozone Change • participants: Institute of Atmospheric Physics and the Czech Hydrometeorological Institute together with research institutes in Finland, Switzerland, Great Britain, France, Denmark, Norway, and Germany

5th EU
Framework
Programme

RealReflect – Real Time Visualization of Complex Reflectance Behaviour in Virtual Prototyping • participants: Institute of Information Theory and Automation together with partners from Germany, France, and Austria (completed in 2005)

Development and construction of on-line optical sensor of glucose in a bioreactor (part of the MATINOES project)
• Institute of Chemical Process Fundamentals together with 8 European institutes

AERO-NEWS – Health Monitoring of Aircraft by Nonlinear Elastic Wave Spectroscopy • coordinator: Katholieke Universiteit, Leuven; participants: Institute of Thermomechanics, Institute of Physics and 18 other European institutes

PICTURE – Pro-active Management of the Impact of Cultural Tourism upon Urban Resources and Economies • coordinator: University in Liege, participants: Institute of Theoretical and Applied Mechanics and another 11 partners from 10 European countries

EII – European Interferometric Initiative • participants: Astronomical Institute, institutes in another 14 countries and two international astronomical organizations: the European South Observatory (ESO) and the European Space Agency (ESA)

BRACCIA – Brain, Respiration and Cardiac Causalities in Anaesthesia • participants: Institute of Computer Science and 7 other partner institutes in Great Britain, Germany, Norway, Switzerland, and Slovenia

IMAGES – Induced Microseismics Applications from Global Earthquake Studies • coordinator: Schlumberger Cambridge Research; participants: Geophysical Institute, Faculty of Mathematics and Physics at Charles University in Prague, University of Potsdam, University of Berlin, IPGP Paris

EURATOM • The Institute of Plasma Physics is the signatory of an association agreement and coordinator of Czech participation in the European community EURATOM, which focuses on the peaceful use of nuclear energy and brings together 23 associations from 21 European countries.

NEWATER – New Approaches to Adaptive Water Management under Uncertainty • Institute of Hydrodynamics together with 37 institutes in 15 EU countries

A-granites and related rocks in the history of Earth • coordinator: University of Helsinki, participants: Institute of Rock Structure and Mechanics and institutes in 23 other countries

Towards Atomistic Materials Design (Psi-k) (ESF) • Institute of Physics of Materials and 16 institutes in 16 European countries

Prevention of Environmental Pollution by Sewerage Tunnel Failures • coordinator: University of Leeds, participants: Institute of Geonics, VŠB Technical University in Ostrava, Tula State University, Design and Research Institute Hidrospetsproekt Moscow, St. Petersburg State University of Transport

Speleothems and Other Cave Sediments from Siberia (INTAS) • GeoForschungsZentrum Potsdam; participants: Institute of Geology and 6 institutes in Germany, Switzerland, Russia, and the Czech Republic

European Research Programme for the Partitioning of Minor Actinides and High Active Wastes Issuing the Reprocessing of Spent Nuclear Fuel • coordinator: CEA Saclay, France; participants: Institute of Inorganic Chemistry and 24 other institutes from academic and industrial sectors in 10 European countries

Molecular Orientation, Low Band Gap Materials and New Hybrid Device Concepts for the Improvement of Plastic Solar Cells • J. Heyrovský Institute of Physical Chemistry and 12 other institutes

Gene therapy: integrated approach to the treatment of neoplastic illnesses (GIANT) • (EU) Institute of Macromolecular Chemistry together with 4 leading European institutes in the field

The development of new materials to fight HIV, supported by the European Union Descartes Prize • Institute of Organic Chemistry and Biochemistry and research teams from 5 other European institutes

The Effect of Cd36 Transgene on Cardiovascular Risk Factor Clustering in the SHR • coordinator: Howard Hughes Medical Institute International Program, participants: Institute of Physiology and 3 other institutes in Europe and the USA

Targeting-Tumour-Vascular/ Matrix Interactions, ANGIOTARGETING • coordinator: The University of Bergen, Norway, participants: Institute of Experimental Medicine and 13 other European institutes

RESISTVIR – Co-ordination of Research on Genetic Resistance to Control Plant Pathogenic Viruses and their Vectors in European Crops • Institute of Plant Molecular Biology – a project involving a network of 50 European institutes for studying resistance to viral diseases among plants

Human Monoclonal Antibodies from a Library of Hybridomas • Institute of Molecular Genetics together with 4 other European institutes



The sampling of sediment and ichthyological research on the Elbe near Přelouč

Institute of Vertebrate Biology

New chitosan formulations for the prevention and treatment of diseases and dysfunction of the digestive tract (hypercholesterolemia, overweight, ulcerative colitis and celiac disease) (EU) • coordinator: University of Ancona, Italy, participants: Institute of Animal Physiology and Genetics and 6 other institutes in Russia, Lithuania, and Spain

ALARM – Assessing Large-scale Environmental Risks with Tested Methods • Institute of Botany and another 52 institutes from around Europe

ALTERnet – A Long-Term Biodiversity, Ecosystem and Awareness Research Network, Network of Excellence • coordinator: Centre for Ecology and Hydrology at Charles University; participants: Institute of Hydrobiology and another 24 institutes in 17 European countries

Diagnostic and Epidemiological Markers for Tracking of Endemic and Resurgent European Leishmaniasis (EU) • Institute of Parasitology and 12 other European institutes

Models for Assessing and Forecasting the Impact of Environmental Key Pollutants on Marine and Freshwater Ecosystems and Biodiversity • coordinator: Umweltforschungszentrum (UFZ), Leipzig – Halle GmbH, Germany; participants: Institute of Vertebrate Biology and 25 other institutes in 14 countries

The Conservation of Vital European Scientific and Biotechnological Resources: Microalgae and Cyanobacteria, COBRA • Institute of Soil Biology and Institute of Botany and 6 other institutes in France, Germany, Portugal, and Great Britain

Consumption, Household Welfare, and the Dynamics of Property Prices (Marie Curie International Reintegration) • Economics Institute together with Charles University and universities and other institutes in 15 European countries

Central European Centre for Women and Youth in Science • Institute of Sociology and 5 other European institutes

Online Dictionary of National History of Sciences, Bibliographies and Archival Sources (UNESCO) • Archives of the ASCR together with the International Union for the History and Philosophy of Science, Division for the History of Science (IUHPS/DHS)

L'Europe centrale et Méditerranée (Barrande) • Institute of Archaeology in Prague together with the Faculty of Arts at Charles University in Prague and the Centre d'Études Celtiques – Sorbonne (France)

Totalitarianism and the boundaries of tolerance: the example of the communist regime in Czechoslovakia, 1948–1989 • (Hannah Arendt Prize, Institut für die Wissenschaft vom Menschen, Vienna), joint participants: Institute for Contemporary History, University of Ostrava, and the Institute of Social Sciences of the Slovak Academy of Sciences

Die Musik in Geschichte und Gegenwart (MGG) (project by Bärenreiter Kassel publishers) • participants: Institute of Ethnology, together with partners from around the world

Antecedentes Hispanos del Método de la Janua linguarum de Comenio (Ministry of Science and Technology of Spain) • participants: Institute of Philosophy, together with scholars at the University in Palma de Mallorca

European Language Atlas (Atlas Linguarum Europae) (UNESCO) • The Czech Language Institute together with universities in Budapest, Uppsala, Poznan, Sibiu (Romania) and Bamberg and other partners in 51 European countries

The regular convention of the Visegrad Four (V4) Science Academy Forum was held in the Polish town of Wrocław during 2005. Among the items on the agenda were fundamental issues concerning common science policy and research within the EU, issues of membership of international science organisations, and a joint approach in supporting candidates from V4 countries to occupy management positions in these organisations (ICSU, ESF, ALLEA and others). The report of the panel for awarding prizes to young scientists from the Academies of Sciences of the V4 countries was presented and the best projects were selected. Preparations for the 7th EU Framework Programme and other subjects of common interest were discussed. Talks of the Academies of Sciences of V4 countries will continue at another meeting in April 2006, this time in Prague.

Other
involvements in
international
relations

The **International Human Rights Network of Academies and Scholarly Societies** continued its intensive activity during the year 2005. This organisation regularly protests against injustices done to certain scientists in some countries. Representatives of the ASCR also took an active part in supporting these protests. Both the former and present presidents of the ASCR intervened in certain cases by sending personal letters. For example, Prof. H. Illnerová wrote to Muammar Kadaffi in Libya seeking freedom for 5 Bulgarian nurses and 1 Palestinian doctor, whilst Prof. V. Pačes sent a letter to the Israeli Prime Minister asking that barriers against Palestinian students gaining access to schools be removed.

Modelling 2005 • joint organiser: Mathematical Institute; 128 participants, 65 of these from abroad.

35th International Symposium on Multiparticle Dynamics • joint organiser: Nuclear Physics Institute; 134 participants, 116 of these from abroad.

4th European-African Conference on Wind Engineering • organiser: Institute of Theoretical and Applied Mechanics; 225 participants, 212 of these from abroad.

Engineering Mechanics 2005 • organisers: Institute of Thermomechanics, Institute of Theoretical and Applied Mechanics, Faculty of Engineering, Brno University of Technology, and ŽŽDAS a.s., Žďár nad Sázavou; 213 participants, 17 of these from abroad

The Impact of Human Activity on the Geological Environment • organiser: Institute of Geonics; 216 participants, 184 of these from abroad

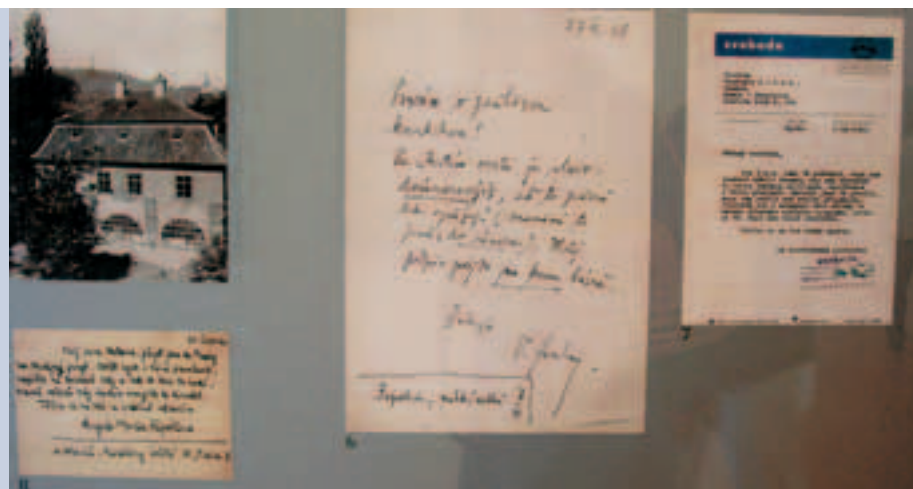
International Symposium on Auxins and Cytokinins in Plant Development • organiser: Institute of Experimental Botany; 180 participants, 125 of these from 28 other countries

The Annual Meeting of the Network of European Neuroscience Institutes • organiser: Institute of Experimental Medicine; 60 participants from abroad

6th International Symposium in the series "Recent Advances in Plant Biotechnology: From Laboratory to Business" • organiser: Institute of Plant Molecular Biology; 151 participants, 75 of these from 14 other countries

8th Heart of Europe Bio-Crystallography Meeting • organiser: Institute of Molecular Genetics ; 99 participants, 88 of these from abroad.

A selection of international conferences organised by ASCR institutes in 2005



An exhibition was mounted during the 3rd Congress of Czech Literary Studies to mark the centenary of the birth of the poet Vladimír Holan.

Institute of Czech Literature

GDN Global Conference Research for Results in Education • joint organiser: Economics Institute (CERGE-EI); 105 participants, 101 of these from abroad

Conference on the Prevention of Risk Behaviour • organiser: Institute of Psychology; 250 participants, 80 of these from abroad

Castrum bene, International Castellological Conference • organiser: Institute of Archaeology in Brno; 84 participants, 47 of these from abroad

Political Culture in Central Europe in the European and Global Context – Specialized Theme No. 2, 20th International Congress of Historical Sciences (Sydney, 7 July 2005) • organisers: Institute of History, ASCR, Institute of History of the Polish Academy of Sciences; 90 participants, 84 of these from abroad

The Future of the Lost Cultural Heritage • organiser: Institute for Contemporary History; 132 participants, 73 of these from abroad

3rd Congress of Czech Literary Studies • organiser: Institute of Czech Literature; 150 participants, 82 of these from abroad

International
cooperation
of ASCR
institutes
in 2005

	1	2	2a	3	3a	3b	3c	4	5	6	7	8	8a
I. Mathematics, Physical and Earth Sciences Division													
Section 1	36	2 259	1 880	1 098	815	254	386	33	156	140	179	65	40
Section 2	26	651	627	649	475	47	280	6	53	128	66	38	26
Section 3	18	509	442	369	280	39	181	10	33	61	36	43	22
Total	80	3 419	2 949	2 116	1 570	340	847	49	242	329	281	146	88
II. Life and Chemical Sciences Division													
Section 4	36	1 104	1 029	757	370	143	573	17	97	88	106	74	31
Section 5	6	1 389	1 129	1 026	425	175	701	39	172	137	169	93	43
Section 6	13	497	420	396	248	79	230	27	80	50	26	56	25
Total	55	2 990	2 578	2 179	1 043	397	1 504	83	349	275	301	223	99
III. Humanities and Social Sciences Division													
Section 7	22	254	230	225	208	78	8	2	12	68	57	16	12
Section 8	32	354	262	241	228	155	11	3	24	71	43	15	6
Section 9	39	250	198	266	277	122	3	14	76	57	125	13	2
Total	93	858	690	732	713	355	22	19	112	196	225	44	20
Others in total	3	149	149	35	23	3	1	0	1	5	8	4	4
ASCR in total	231	7 416	6 366	5 062	3 349	1 095	2 374	151	704	805	815	417	211

- 1 Number of conferences attended by scientists from other countries (organised or co-organised by the institute)
 2 Number of journeys abroad undertaken by staff members of institutes
 2a of this, beyond bilateral agreements
 3 Number of scientists and scholars actively participating in international conferences
 3a Number of papers read at the conferences
 3b of this, invited papers
 3c Number of posters
 4 Number of ASCR employees teaching at universities abroad
 5 ASCR employees serving on editorial boards of international journals
 6 Members of bodies of international scientific governmental and non-governmental organisations (societies, committees)
 7 Lectures given at the institutes by their guests from abroad
 8 Number of foreign grants and projects financed from other countries
 8a of this, within the framework of EU programmes



6

Public Tenders in Research and Development

6

As in previous years, the specific financial resources of the budget chapter of the ASCR were used to support programme and grant projects. These resources are distributed on the basis of the results of public tenders in research and development as announced by the Academy or its Grant Agency. The amount of specific resources in 2005 was lower than in previous years due to the completion of the **Scheme of the development of investigative research in key branches of science**, but still amounted to 533 million CZK. Of this sum, 221 million CZK was earmarked for supporting grant projects and 312 million CZK for programme projects. The difference in the nature of programme and grant projects lies in the fact that the content of successful programme projects must meet the objectives of the programme specified during the announcement process itself, whilst research grant projects as supported through the Grant Agency of the ASCR primarily draw on the individual activity of the researchers.

Name of programme	Number of projects
The Modern Society and its Transformations	4
Support of Beginner Researchers	0
Information Infrastructure in Research	8
Regional and International Cooperation in Research	100
Public Health	3
Safe and Quality Food	3
Exploitation of Natural Resources	1
The Landscape and Settlements in Future	3
Progress	7
Safe and Economical Transport	2
Total	131

Programmes announced by the Academy

The final evaluation of the 19 projects handled as part of the **Scheme of the development of investigative research in key branches of science** and completed by December 31st 2004 was undertaken in 2005. The quality of the results and the effectiveness of funds use were assessed by the Council for Sciences of the ASCR based on the final reports of project leaders. Sixteen projects were evaluated as having been completed with outstanding results and 3 projects as successfully completed. The completion of these projects was accompanied by the completion and evaluation of the entire programme, in which 2,403 million CZK of specific resources had been invested since

1996. A number of high-quality results were achieved as part of the “Programme of Support of Basic Research in Key Scientific Spheres”. Indeed many of these results were of top-level international standard.

The year 2005 was also the final year of implementing the 58 projects of the **Scheme of targeted research and development support**, which continued on from 2001 to 2003. These projects and the programme as a whole came to an end on December 31st 2005 and their final evaluation has been earmarked for the first quarter of 2006. A total of 45 million CZK of specific resources was provided for carrying out projects in 2005, with support provided throughout the programme (since 2000) reaching the sum of 444 million CZK.

All 43 projects of The Information Society, a thematic programme of the **National Research Programme I**, got underway on July 1st 2004 and continued during 2005. In addition to that, another 33 projects were supported from January 1st 2005 onwards on the basis of results of a public tender. A total of 36 percent of the proposers were successful in this public tender. Support for continuing projects in 2005 amounted to a total of 111.6 million CZK, whilst 89.4 million CZK was invested in handling newly-commenced projects, meaning a total of **201 million CZK of specific resources**.

A new programme entitled **The Support of Targeted Research Projects** got underway on January 1st 2005. This is a sub-programme of the National Research Programme I, classified under the sectional programme “Integrated Research”, scheduled to function between January 1st 2005 and December 31st 2009. Work began on 28 projects on January 1st 2005 and on another 25 projects on July 1st on the basis of results of public tenders. The support of projects initiated in 2005 amounted to **65.7 million CZK of specific resources**.

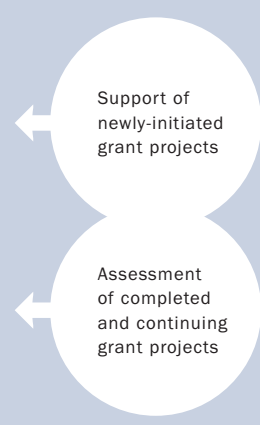
The Government of the Czech Republic approved a new programme called **Nanotechnologies for Society** in a resolution taken on August 17th, 2005. This material was subsequently presented to the European Commission via the Ministry of Foreign Affairs so it could undergo notification proceedings. Based on the positive statement of the European Commission, **a public tender was announced on December 14th 2005** for the support of projects with an anticipated start date of July 1st 2006. The “Nanotechnologies for Society” programme has been announced to function between July 1st 2006 and December 31st 2012.

The Grant Agency of the ASCR

A total of 221 million CZK in specific resources was allocated to the Grant Agency of the Academy (GAAS) from the Academy budget in the year 2005. This figure included resources for the acquisition of investment facilities and was distributed to support the handling of newly initiated and continuing grant projects. A further 345 thousand CZK was distributed in support of medical research. This sum was provided to the Academy as the sponsorship contribution of PRO.MED.CS a.s.

Work on **71** standard research grant projects began on January 1st 2005 on the basis of results of public tenders announced the previous year, with a total of **38,444** thousand CZK being assigned to these. Approximately **18,570** thousand CZK was also assigned to **50** junior projects that got underway at the same time. The sum of **1,096** thousand CZK was used to support **7** supplementary publication projects.

In the first weeks of 2005, the Departmental Councils (DCs) of the GAAS assessed the standard of project work and the results of grant projects completed by December 31st 2004, and the progress of grant projects continuing during 2005. The basis of evaluation consisted of reports provided by the grant holders, which, for projects which had been completed, were supplemented with printouts of the most significant work completed during implementation. A total of 85 standard research projects with a



Support of newly-initiated grant projects

Assessment of completed and continuing grant projects

duration of 2 to 5 years were completed by the end of 2004. An average of more than 7 papers per project were issued in the course of project work, most of them in prestigious and reviewed periodicals. A total of 38 junior research projects were completed after having been carried out from 1 to 3 years. The number of results published was more than 2 per project, which is adequate given the length of time spent on implementation and the young age of the research teams.

The DCs further appraised the procedure of handling 261 standard and 111 junior research grant projects, whereupon a total of 160,825 thousand CZK was invested during 2005 (38,219 thousand CZK of this on junior projects).

This year also saw the Grant Agency of the ASCR organise the XVIth round of the tender for granting support to new grant projects. A total of **390** proposals were submitted in the public tender for standard research grant projects, with **235** proposals being submitted in the tender for junior research grant projects. A total of 2,001 requests for reports by intellectual evaluators were sent out to evaluate 597 proposals for both types of research grant projects. Some 935 reports were received from intellectual evaluators in the Czech Republic and 1,006 reports from foreign intellectual evaluators, i.e., around 3.4 reports for project proposal. The management at GAAS decided to grant support to **102** standard projects (27 percent of the proposals received for the tender) and **70** junior research grant programmes (28 percent of the proposals received). The reason for the lower success rate in the tender in comparison with most previous years was the considerable increase in the number of applications made.

A standard algorithm was used to allocate resources among Departmental Councils. This took into consideration the overall requirements of bids in a given Departmental Council, the total research capacity of the project, and the statistically estimated costs of a unit of research capacity. The largest number of applications in the last 13 years was submitted in the XVIth round of the tender for research grants. The GAAS introduced a new method of submitting grant proposals during 2005, viz., an on-line system. What is more, communication with members of the Departmental Councils was also initiated over the Internet. This method of processing grant proposals provides a whole host of advantages, but also generates pitfalls, which mainly ensue from the inexperience of a number of users. Neither did the staff at the secretariat nor the members of the Departmental Councils and examiners have sufficient experience with the newly-introduced system. For this reason, we consider it a success that a sufficient number of compiled reports were obtained for the majority of proposals made, just as is specified in the Principles of GAAS Activity. (More detailed information on the success of individual branches and on the financial resources allocated is found in Tables.)

A total of 20 proposals were submitted to the public tender for supplementary publication grant projects. Two appraisals from Czech intellectual evaluators were obtained for all proposals. Even in this case, the amount invested in supporting this type of project was low given the number of proposals submitted. The management of the GAAS decided to award **9** grants of the total **1,096** million CZK as recommended by the DCs.

The progress
and results
of public
tenders in
2005

Disciplines		Number of proposals	Number of projects financed	Percentage of projects financed	Special grants (in thousand CZK)
1	Mathematics and physics, informatics	57	16	28,1	6 155
2	Technical sciences and cybernetics	29	6	20,7	4 046
3	Earth and space sciences	36	9	25	4 932
4	Chemical sciences	61	14	23	9 085
5	Medical sciences and molecular biology	28	6	21,4	4 344
6	Bio-ecological sciences	63	9	14,3	7 370
7	Social sciences and economics	17	3	17,6	807
8	Historical sciences	24	6	25	1 269
9	Humanities and philology	9	2	22,2	436
Total		324	71	21,9	38 444

Grant projects launched in 2005

Disciplines		Number of proposals	Number of projects financed	Percentage of projects financed	Special grants (in thousand CZK)
1	Mathematics and physics, informatics	18	4	22,2	1 618
2	Technical sciences and cybernetics	16	5	31,3	2 028
3	Earth and space sciences	24	10	41,7	2 590
4	Chemical sciences	23	6	26,1	2 042
5	Medical sciences and molecular biology	18	6	33,3	2 527
6	Bio-ecological sciences	52	13	25	5 531
7	Social sciences, economics	17	3	17,6	781
8	Historical sciences	13	2	15,4	724
9	Humanities, philology	9	1	11,1	729
Total		190	50	26,3	18 570

Junior research grant projects launched in 2005



7

7

Science Communication

Science communication at the ASCR during 2005 was manifested in a variety of ways in presenting science to the public at nearly all ASCR institutes and departments.

The ASCR Press Department worked with scientists to popularise science in both national and regional periodicals and in weeklies and monthlies, over the radio and on television.

The Press Department provided the lay and professional public with information on individual events at the ASCR through **45 press releases**. It also compiled a list of **5,436 reports** including **“ASCR”** by **monitoring** press, radio, and television. It held **21 press conferences** on science and research topics.



Science and Technology Week 2005: Jim Al-Khalili talking in Science Café Roxy

The public responded rather well to **Science and Technology Week 2005** (STW). This event was organised by the Press Department of the ASCR with partners from this country and abroad. Science and Technology Week 2005 took place simultaneously with European Science Week, November 7–13. For the first time it was held also in Brno and České Budějovice, at the ASCR institutes there. The number of lectures and activities in Prague also rose.

One new joint organiser was the National Technical Museum, where ASCR scientists gave lectures and where a thematic exhibition was also held. The Press Department of the ASCR again cooperated with the British Council, which organised Science Cafés in Prague and Brno. One other joint organiser was the American Science Information Center, which invited American physicist M. Korey to Prague.

Even as the number of joint organisers increased, so too has the number of media partners. These included Czech Radio 1 (Český rozhlas – Radiožurnál), Czech Radio – Leonardo, *Respekt* magazine, *Učitel'ské noviny* (Teacher's News), the Science World portal, etc. Forty-five lectures were given during STW 2005. More than 3000 attended. During Science Week, a Round Table meeting on the World Year of Physics took place, taped and broadcast by Czech Radio 2 (Český rozhlas 2). All lectures were online via the Internet with an estimated 2,000 listeners.

STW also included five thematic exhibitions, whilst an interactive game for young people entitled “In Search of the Philosophers' Stone” was organised at the Geophysical Institute.

Fifty-four institutes took part in **Open Doors Days**, which attracted 8,000 students and the general public. A record number of 12,000 people attended Science and Technology Week 2005. Media interest in this was also high this year. Our monitoring revealed 50 cases of information being released about this activity.

The Institute of Experimental Medicine and the Czech Neuroscience Society organised **European Mind Week** in cooperation with the Press Department. This event took place March 14–20, 2005. An average 120 people attended each lecture.

Other events included a lecture and interactive presentation entitled **Earthquake, Tsunami, and Eruption** in cooperation with the Geophysical Institute in January 2005 and organised by the Press Department. The **Physics at Each Step** lectures for secondary school students April 12–14 was part of the World Year of Physics. In association with the Swiss Embassy and the Press Department, the Swiss astronaut Claude Nicollier lectured on **Exploring Space** in October 2005. Lectures for the public and students entitled **Epilepsy in Children – A Different Illness?** were also organised by the Press Department.

A press conference on the subject of Global Stocks of Oil and the Prospects for its Extraction: The Energy Concept of the Czech Republic was held in cooperation with the **Council for the Popularisation of Science**, which last year continued its reorganised activity.

The Centre of Administration and Operations and the Press Department also participated in a project of the 6th Framework Programme entitled **Academic Internet Television Network Showcases the Best of Good Practice Activities**. A principal aim is creating an Internet portal to disseminate information about “the best good-practice project” in Information Society Technologies (IST), e-area, the selection of appropriate national projects supported by European programmes and their presentation at a conference, and the creation of audio-video formats based on the winning projects. The efforts of the Czech team resulted in their winning the main prize. The prize in the **Best Good Practice Projects** competition was won by Irina Zálišová (EPMA/BMI Praha), for whom we created the necessary conditions. Press Department activity on the project has continued into the year 2006.

The Press Department again published the monthly **Academic Bulletin** plus two special editions in 2005. Twelve issues of **Information Monthly** helped inform the professional public.

The regularly updated website of the Press Department can be used for information about past events.

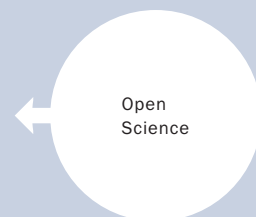


Zdeněk Drozd of the Faculty of Mathematics and Physics, Charles University giving one of the Physics at Each Step lectures in the Academy of Sciences

During 2005, **14** exhibitions were mounted in the ASCR building, organised by the Press Department. Of this number, **4** were presentations by ASCR institutes, **1** entitled **Estonia in Documents**, was held in association with the Estonian Academy of Sciences, **3** were related to Science and Technology Week 2005, and **6** were art exhibitions. The exhibition of photographs taken by František Bahenský and Jiří Woitsch of the Institute of Ethnology on research trips to Romania, Transylvania, and Maramuresh marked 15 years of the Institute for Contemporary History of the ASCR. A unique collection of photographs by Alexandr Paul from the Osvobozené Theatre (organised to mark the 100th anniversary of the birth of Jiří Voskovec and Jan Werich), and an anthology of the graphic art of Oldřich Kulháněk, were also appreciated by those visiting the exhibitions.

Another significant project in the sphere of promoting the popularity of science and its results is the **Open Science** project, which concentrates on furthering the education of teachers and creating interest in science among secondary school students.

The Open Science project was approved within the SPD 3 (Single Programming Document for Objective 3) of the Nomenclature of Territorial Units for Statistics (NUTS) Prague region, which is a Ministry of Labour and Social Affairs effort. It is jointly financed by the European Social Fund, the state budget, and the City of Prague budget. This began September 1st 2005 and continues until August 31st 2007.



The Academy of Sciences of the Czech Republic is the main project partner, the others being Charles University's Faculty of Science, the Czech Technical University Faculty of Electrical Engineering, the Czech Society of Biochemistry and Molecular Biology, and Krátký [Short] Film Praha, a.s. The media partners are Czech Radio 1 (Český rozhlas 1 – Radiožurnál) and Czech Radio (Český rozhlas) – Leonardo.



Private view of the exhibition *Osvobozené Theatre in photographs by Alexander Paul* to mark the centenary of the birth of Jiří Voskovec and Jan Werich.

Jana Koubková singing in the ASCR in February 2005

The project prepared 150 places for students at 24 science institutes. In addition, 236 secondary school students applied following the preparatory stage (media presentation and work with target groups – teachers and students).

The whole project can be visited at www.otevrena-veda.cz.



80

Summary of the Use of Financial Resources

8

The overall support of research and development from the state budget in the year 2005 increased by 12.2 percent. However, its share in gross domestic product of 0.55 percent remained at the 2003 level. The lessened ratio of the GDP thus continued into its fifth year and indicated another deferral of the fulfilment of the Lisbon Strategy of the European Commission and the National Research and Development Policy.



State support of research and development in CR (in % GDP)

1997	0.43
1998	0.48
1999	0.51
2000	0.54
2001	0.54
2002	0.52
2003	0.55
2004	0.54
2005	0.55

The expenditure of the budget chapter of the Academy of Sciences of the Czech Republic rose by only 10.4 percent compared to the previous year. Institutional expenditures rose a little more slowly than in 2004 in relation to the increase in overall expenditures on research and development from the state budget, while targeted expenditures actually fell because the “Scheme of the Development of Investigative Research in Key Branches of Science” ended in 2004 without recompense.

The Academy of Sciences administered a total of 6 747.8 million CZK during 2005, 4 566.9 million CZK of which was drawn from its own budget chapter.

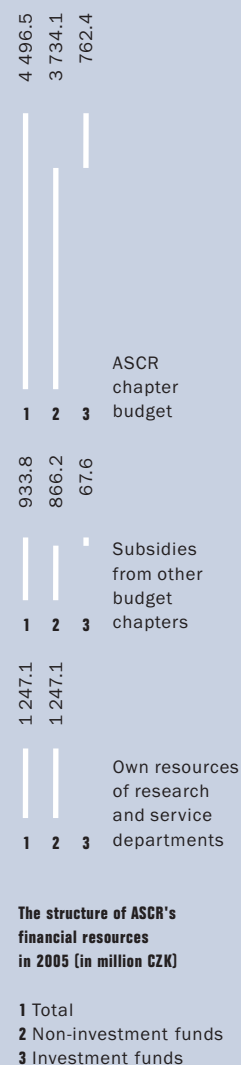
Institutional expenditures provided for research intentions and to assure a research infrastructure amounted to 87.9 percent of the total volume of budget resources. The total volume of specific resources attained in public tenders for research and development rose by almost 13.5 percent compared to 2004. As usual, most came from the Czech Science Foundation: a total of 456.6 million CZK in 2005, i.e., more than 35 percent of all specific funds which the Czech Science Foundation distributed.

Non-investment Academy funds in the year 2005 were generated as follows: 64.2 percent of resources came from its state budget chapter, 14.6 percent were transfers from other state budget chapters, and 21.2 percent its own revenues and extra-budgetary resources. The percentage of the latter component has shown a slight upward trend in recent years.

The investment funds of the ASCR were generated as follows: 92 percent of resources from its own state budget chapter and 8 percent being transfers from other state budget chapters.

Summary of the Use of Financial Resources

The structure of financial resources (in million CZK)		Non-investment funds	Investment funds
Approved chapter budget		3 806.6	633.2
Amended ASCR chapter budget		3 734.1	762.4
of this:	Subsidies to allowance organisations to the Head Office of the ASCR	3 473.3	636.6
	Blocked resources	255.9	125.8
	Blocked resources	4.9	
Sources of the ASCR chapter reserve fund		50.5	19.9
Subsidies from other budget chapters		866.2	67.6
of this:	Czech Science Foundation grants	435.4	21.2
	Projects of other departments	430.8	46.4
Own resources of research and service departments		1 247.1	
of this:	Main activity orders	107.0	
	Sales of publications	155.4	
	Sales of goods and services	137.1	
	Licences	472.6	
	Conference fees	17.7	
	Foreign grants and donations	166.4	
	Rent	48.4	
	Own funds resources	54.8	
	Other	87.7	
Total resources		5 897.9	849.9
Structure of the costs of organisation (in million CZK):		in %	
Employees' salaries and other payments for work done		39.73	2 183.6
Mandatory insurance paid by the employer		13.52	743.4
The purchase of material		14.30	786.1
The purchase of energy, water, and fuel		2.97	163.0
The purchase of services		10.34	568.5
Repairs and maintenance		4.65	255.7
Travel expenses		3.13	172.2
Depreciation of fixed assets		7.28	400.2
Total other costs		4.08	224.0
The institutes and service departments of the ASCR used a total of		100.00	5 496.7



The structure of costs is stable and has not changed for a number of years. The total costs of research institutes and service departments rose by 9.4 percent over 2004, as did the amount of employees' salaries and wages. Other types of costs rose more slowly, with the exception of the depreciation of fixed assets, which rose by more than 16 percent. This indicates a more economical use of funds at ASCR institutes.

The creation of investment resources and their use

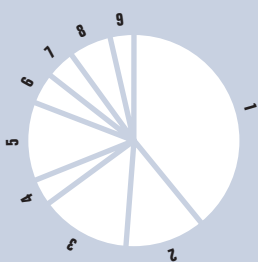
Sources of investment funds are primarily formed through institutional and targeted subsidies from the state budget and through budget resources from depreciation. The data for the Academy of Sciences as a whole can be summarised as follows:

Total investment resources (in million CZK)	1 356.9
of this:	
Depreciation	400.2
Transfer of income from operations	2.2
Receivers and co-receivers	67.6
Foreign grants and donations	104.6
Subsidies from the state budget: institutional	747.8
specific	34.5
These resources were used to fund:	
Buildings	443.5
Acquisition of instruments and equipment	614.0
Maintenance and repairs	31.0
Other	11.0
Total used on the acquisition of fixed assets	1 099.5
Fixed asset renewal fund increased by	135.2
Transfer to the ASCR reserve fund	122.2
Sum returned to the state budget	0.0

Given the fact that it is increasingly necessary to catch up with delays due to insufficient resources in the previous decade in terms of the maintenance and renewal of scientific instruments, the modernisation of laboratories, and the maintenance and reconstruction of buildings used, the ASCR again increased the amount of investment resources within the limits of the expense budget of its chapter. At the same time, subsidies for depreciation remain a significant supplement to investment resources.

Investment subsidies in the most significant building operations in 2005 included the continuation of constructing an infrastructure for molecular and cell biology, genomics, biotechnology and biochemistry (INFRAGEN), completion of the Archives building in Prague, construction of a biotechnological centre for the Institute of Animal Physiology and Genetics in Liběchov, completion of Building B of the book depository of the Academy's Library in Jenštejn, construction of a multi-purpose building for the biological institutes in České Budějovice, construction of a lecture hall for the Institute of Scientific Instruments in Brno, and continued reconstruction of the chateau at Liblice.

Even though the consequences of the floods of 2002 are undoubtedly set to appear to a greater or lesser extent for some time to come, the elimination of flood damage at the ASCR has essentially come to an end with the construction of the Archives building in Prague and the completion of Building B of the book depository in Jenštejn.



The structure of costs of the institutes and service departments in %

- 1 Employees' salaries and other payments for work done 39.73
- 2 Mandatory insurance paid by the employer 13.52
- 3 The purchase of material 14.30
- 4 The purchase of energy, water and fuel 2.97
- 5 The purchase of services 10.34
- 6 Repairs and maintenance 4.65
- 7 Travel expenses 3.13
- 8 Depreciation of fixed assets 7.28
- 9 Other costs 4.08

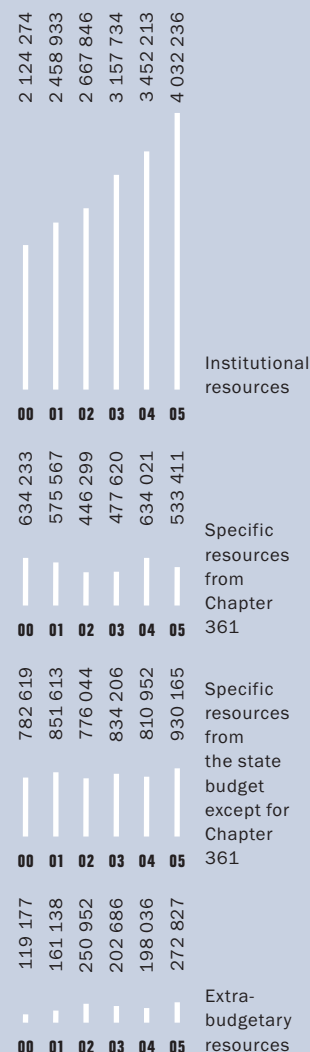
Analysis of employment and the drawing of wage funds

The number of employees and average monthly earnings for individual categories of employees at the institutes are as follows:

Category	Average full-time equivalent employees	Average monthly earnings in CZK
Scientist (attested)	2 288	35 471
Research assistant	1 476	23 689
Technical specialist with university education	361	21 846
Technical specialist R&D with secondary education	55	18 242
Technical specialist with secondary education	1 097	17 053
Technical and financial staff	889	23 077
Manual worker	646	13 200
Operator	305	11 503
Total for ASCR (non-inclusive of Academia Publishing House and Optical Development Workshop)	7 117	24 768

The average monthly salary/wage of all employees at the Academy of Sciences in 2005 was 24 650 CZK. The year-on-year increase of 6.3 percent against 2004 was due to wage tariff increases from 1 January 2005.

An analysis of wage resources shows that the ASCR paid 77.7 percent of its payroll costs from institutional sources (as restricted by a wage limit) in 2005. Specific and extra-budgetary resources are the predominant source of salaries and wages.



The development of ASCR's financial resources in the last six years (in thousand CZK)



Appendices

A

1

Advisory and Auxiliary Bodies of the Academy Council

Editorial Board

Council for the Economy

Council for Support of ASCR Participation in European Integration of Research and Development

Council for Science Popularisation

Council for Cooperation of the ASCR with Business and Application Sphere

Council for Cooperation with Universities and Graduate Study Programmes

Council for International Affairs

Housing Committee

Academy Coordinating Committee to Include ASCR Institute Scientists in the Highest Qualification Rank

Evaluation Committee on Scientific Activities and Results of Academy Institutes and Their Research Objectives for Mathematics, Physics and Earth Sciences

Evaluation Committee on Scientific Activities and Results of Academy Institutes and Their Research Objectives for the Life and Chemical Sciences

Evaluation Committee on Scientific Activities and Results of Academy Institutes and Their Research Objectives for the Humanities and Social Sciences

Committee on Scientific Information

Information Technology Committee

Committee on the Environment

Legal Committee

Departmental Expert Committee for the Approval of Projects of Experiments on Animals

Association of South Moravian Institutes of the ASCR

Publication Results at the ASCR

A

2

Total
publication
results at
the ASCR

Type of publication	Publication results			
	Year 2004 Issue		Year 2005 Issue*)	
	Czech	Foreign Language	Czech	Foreign Language
Books	190	38	157	39
Chapters in books	539	215	447	204
Papers in scientific journals	1099	3022	951	2409
Conference proceedings	43	33	26	26
Contributions to proceedings	731	1603	639	1240
Translations	37		15	
Reviews		410		280
Professional articles in newspapers	263		201	
Research reports		319		263

*) figures for the year 2005 are incomplete, as publications with an assignment of the given year are also issued during the following year
Note: aggregate figures for ASCR are not the sum total of the data from the branches of science, considering that researchers from several institutes can share in one effort. Such effort is counted in each institute and in the total only once.

Publication
results in
scientific
sections

Type of publication	Section 1–3				Section 4–6				Section 7–9			
	Year 2004		Year 2005		Year 2004		Year 2005		Year 2004		Year 2005	
	Issue		Issue*		Issue		Issue*		Issue		Issue*	
	Foreign	Foreign	Foreign	Foreign	Foreign	Foreign	Foreign	Foreign	Foreign	Foreign	Foreign	Foreign
Books	20	13	29	10	10	8	9	7	160	17	128	22
Chapters in books	57	60	46	23	46	56	11	78	436	99	394	102
Papers in scientific journals	253	1269	236	932	130	1639	183	1387	716	143	536	115
Conference proceedings	10	23	8	11	9	3	2	10	24	7	14	5
Contributions to proceedings	307	869	302	840	182	652	170	436	245	91	147	68
Translations		1		0		1		0		35		15
Reviews		3		5		1		2		406		273
Pro-articles in newspapers		27		20		53		53		181		132
Research reports		127		108		18		16		175		139

* figures for the year 2005 are incomplete, as publications with an assignment of the given year are also issued during the following year
Note: aggregate figures for ASCR are not the sum total of the data from the branches of science, considering that researchers from several institutes can share in one effort. Such effort is counted in each institute and in the total only once.





THE ACADEMY
OF SCIENCES
OF THE CZECH
REPUBLIC

**Section of Mathematics,
Physics and Informatics**

1

Astronomical Institute
Institute of Computer Science
Institute of Information Theory and Automation
Institute of Physics
Mathematical Institute
Nuclear Physics Institute

Section of Applied Physics

2

Institute of Physics of Materials
Institute of Plasma Physics
Institute of Electrical Engineering
Institute of Hydrodynamics
Institute of Scientific Instruments
Institute of Radio Engineering and Electronics
Institute of Theoretical and Applied Mechanics
Institute of Thermomechanics

Section of Earth Sciences

3

Geophysical Institute
Institute of Atmospheric Physics
Institute of Geology
Institute of Geonics
Institute of Rock Structure and Mechanics

**Section of Chemical
Sciences**

4

Institute of Analytical Chemistry
Institute of Chemical Process Fundamentals
Institute of Inorganic Chemistry
Institute of Macromolecular Chemistry
Institute of Organic Chemistry and Biochemistry
J. Heyrovsky Institute of Physical Chemistry

**Section of Biological and
Medical Sciences**

5

Institute of Animal Physiology and Genetics
Institute of Biophysics
Institute of Entomology
Institute of Experimental Botany
Institute of Experimental Medicine
Institute of Microbiology
Institute of Molecular Genetics
Institute of Physiology
Institute of Plant Molecular Biology

**Section of Bio-Ecological
Sciences**

6

Institute of Botany
Institute of Hydrobiology
Institute of Systems Biology and Ecology
Institute of Parasitology
Institute of Soil Biology
Institute of Vertebrate Biology

**Section of Social and
Economic Sciences**

7

Economics Institute
Institute of Psychology
Institute of Sociology
Institute of State and Law
Masaryk Institute

**Section of Historical
Sciences**

8

Archives of the ASCR
Institute of Archeology (Brno)
Institute of Archeology (Praha)
Institute of Art History
Institute for Contemporary History
Institute of History

**Section of Humanities
and Philology**

9

The Czech Language Institute
Institute of Czech Literature
Institute of Ethnology
Institute of Slavonic Studies
Oriental Institute

Design by Richard Maršák Studio, 2006
Published by Academy of Sciences of the Czech Republic, 2006