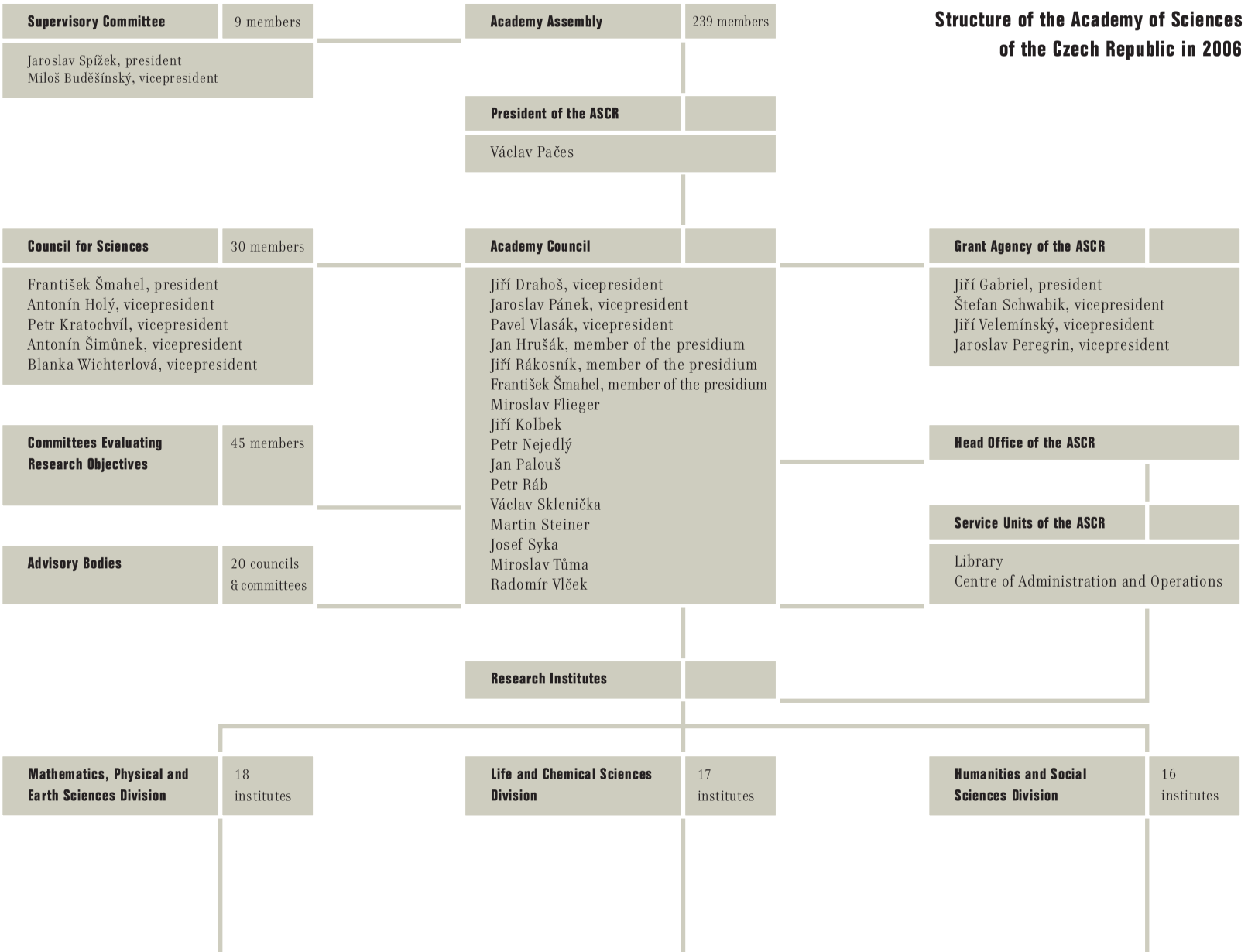
2006

ACADEMY OF SCIENCES OF THE CZECH REPUBLIC — ANNUAL REPORT

Structure of the Academy of Sciences of the Czech Republic in 2006



A giant tadpole
of the extinct frog genus
Palaeobatrachus from
the former crater lake of
the Lower Miocene site
of Randecker Maar
in Germany

detail

THE ACADEMY
OF SCIENCES
OF THE CZECH
REPUBLIC

Foreword by the President

Dear Readers,

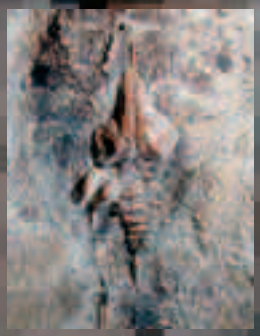
This report on the activities in 2006 of the Academy of Sciences of the Czech Republic shows that we have made some progress towards overcoming the consequences of the previous situation and also in achieving high standards in our research and other efforts. However, to attain genuine scientific excellence at a number of our institutes, a great deal remains to be done.

The Academy and its Institutes underwent substantial changes commencing 1 January 2007. The ASCR Institutes became public research establishments by which they gained more independence and new opportunities to advance their research work. At the same time, however, they have become far more accountable than previously for the efficient expenditure of the public funds entrusted to them. Their challenge is to make the best possible use of the changed legal and economic situation of the Academy's Institutes and the other components to enhance the quality of this common endeavour.

That is why the work of the newly elected councils and directors of the Institutes ought to be even more crucial and scrupulous than was that of their predecessors, by giving full material and moral support to excellence in science, and making reforms where excellence is missing. And it will be up to the Academy of Sciences of the Czech Republic, founder of the Institutes, to be exacting in assessing their research in this respect.

If we adhere to these principles, we can look towards the future of the Academy with clear-headed and defensible optimism.

Václav Pačes



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1 Introduction

For the Academy of Sciences, the year 2006 was extraordinary in that all institutes prepared to change over to a new legal and economical form of organisation and activities. Considerable work brought about the transformation of the institutes and other units funded by the Academy of Sciences of the Czech Republic to public research institutions (v.v.i., the Czech acronym). in compliance with Act No. 341/2005 Coll., effective 1st January 2007. At the same time the institutes, individuals and teams continue their basic programme, namely, research work. (The results achieved last year are presented in Section 2.)

In 2006, both the Academy Council and Council for Sciences updated the **Concept for Research and Development of the Academy of Sciences of the Czech Republic for 2005—2008** which was accepted whereby the National Research and Development Policy was proclaimed by the Czech Government. Both bodies also directed research within the ASCR, including issues of supporting scientific excellence of research, the Grant Agency of the ASCR and the system of funding science.

Cooperating with the **Council for Research and Development** and the Ministry of Education, Youth and Sports of the Czech Republic, ASCR representatives helped resolve issues of research and development in the Czech Republic. Included were updating basic trends of research, analysing the research and development status in the Czech Republic in relation to other countries, improving the effectiveness of research and development evaluation in 2006 and discussing a draft of the new Community Framework on State Aid for Research and Development and Innovation. The ASCR reflected on the relevant government decree and adopted an attitude toward the **Ethics Code of Research Workers** and **Career Rules of University-educated Staff Personnel of the ASCR.** The ASCR also adopted an attitude toward the recommendations of the European Commission on a European Charter for researchers and on how its provisions on Rules of Conduct for enrolling researchers apply to the ASCR.

An important event in the Academy's life was the adoption of new **Statutes of the ASCR** (decree No. 614 of the Czech Government issued on 24th May 2006) effective from 1st January 2007. The Statutes change ASCR institutes into public research institutions. On 30th June 2006, the Ministry of Education, Youth and Sports received the data and registration papers of all ASCR institutions necessary for them in the Register of Public Research Institutions. Before having the above documents issued, the Institute of Radio-Engineering and Electronics was renamed the Institute of Photonics and Electronics of ASCR. The ASCR President issues instruction for holding the first elections of Councils of the ASCR institutes as public research institutions. Other regulations of activities of the institutes as public research institutions include

organisation manual, rules of procedure of the institutes' councils, rules of procedure of the Supervisory Committee, rules for internal wages management of funds, records and discharge regulations. Moreover, constituting supervisory committees of the ASCR institutions were formed. The current directors of the ASCR institutions and other units were entrusted with managing them until new directors are nominated.

During 2006, a **new composition of the Academy Assembly of the ASCR** gradually began to evolve and is scheduled to continue to 2010. The new Assembly is composed of 60 percent of the previous Assembly members and 40 percent of new members, which is favourable for both continuity of its operation and developing new initiatives and subjects. Membership of the Academy Council and the Council for Sciences of the ASCR was unchanged. Only minor changes were made in structures and of advisory and service bodies of the ASCR.

XXIXth session of the Academy Assembly, 14 December 2006, Národní dům (National House) in Vinohrady, Prague

In 2006, the ASCR comprised 53 work centres 51 of which were for research and 2 service (a list of them is included in Appendix 1). The number of ASCR centres was reduced against 2005 via merging some centres starting from 1st January 2006, namely both research in the Institute of Thermomechanics, five research and one service ones in the Biology Centre, two research centres in the Masaryk Institute/Archives, one service centre with the Centre of Administration and Operations (Academia Publishing House) and one with the Institute of Plasma Physics (the Development Optical Workshop).

The Academy Council directed the merging process of the ASCR centres which did not cause any considerable problems, organisationally and economically. The Academy Council also monitored the **internal restructuring measures** ordered by the management of the ASCR institutes based on the intra-academy and inter-departmental evaluation. An organisation and personnel audit of the Head Office and the Centre of Administration and Operations of the ASCR in 2005 proposed a new structure of the Head Office.

In 2006, the ASCR established a new tool for financial and moral support of scientific excellence at the ASCR, namely, the **Academic Premium – Praemium Academiae,** its purpose being to support outstanding scientists working on the international level, and reflecting favourably on the ASCR and Czech science.

Research at the Academy's Institutes concentrated on 63 **research objectives** in 2006. Four **new research objectives** were approved for 2007–2013. For the Institutes of Biophysics, of Experimental Medicine and of Molecular Genetics, the research objectives are to create a prospective new research infrastructure established with **EU Structural Funds.** The fourth research objective involves the Centre of Administration and Operations and is an extension and improvement of the infrastructure supporting activities of all ASCR institutes.

In targeted financing, the Academy Council approved the report on the final evaluation results of 58 projects of the **Programme of Support of Targeted Research and Development** that was completed by 31st December 2005. Work on the projects of the programmes **Information Society** and **Support of Targeted Research Projects** continued and a new programme **Nanotechnologies for Society** was started (see details in Chapter 6).

RNDr. Jiří Gabriel, DSc. became President of the **ASCR Grant Agency** in 2006, and RNDr. Štefan Schwabik, DSc. (inanimate sciences) and RNDr. Jiří Velemínský, DSc. (life sciences) were nominated vicepresidents. Doc. PhDr. Lýdia Petráňová, CSc. (humanities and social sciences) was nominated vicepresident, effective1st January 2007. The Ministry of Finance proposed Ing. Helena Jansová to the Supervisory Committee of the GAAS. One third of GAAS members were replaced in a by-election. The Academy Assembly approved at its autumn session **new Statutes of the ASCR Grant Agency** presaging positive changes (such as, reducing the administration, raising standards) including operations and consolidating its role in the ASCR (detailed information on grant projects is found in Chapter 6).

Scientists receiving ASCR awards in the Villa Lanna

In 2006, as in previous years, the ASCR presented awards for outstanding achievements in scientific work.

ASCR Awards

The ASCR Awards for Outstanding Scientific Results of Major Significance to research teams consisting of the following from Institutes indicated:

Institute of Computer Science, Prof. Ing. Zdeněk STRAKOŠ, DSc., head of the team, Prof. Ing. Miroslav TŮMA, CSc., Doc. Dr. Ing. Miroslav ROZLOŽNÍK for: **Analysis, Implementation and Application of Krylov Methods**

J. Heyrovský Institute of Physical Chemistry, Prof. Ing. Vladimír MAREČEK, DSc., and Prof. RNDr. Zdeněk SAMEC, DSc., for: **Organized Layers in Polarized Liquid Interfaces**

Institute of Art History and other institutions (as listed): PhDr. Polana BREGANTOVÁ, PhDr. Lenka BYDŽOVSKÁ, CSc., Prof. PhDr. Ivo HLOBIL, CSc., PhDr. Anděla HOROVÁ, Doc. PhDr. Vojtěch LAHODA, CSc., Mgr. Ivana PANOCHOVÁ, PhD., PhDr. Marie PLATOVSKÁ, Prof. PhDr. Rostislav ŠVÁCHA, CSc., PhDr. Antonín DUFEK, PhD. (Moravian Gallery, Brno), Doc. Ing. Arch. Pavel HALÍK, CSc. (Technical University, Liberec), PhDr. Jiří HILMERA, CSc. (retired), Jana PAULY (National Technical Museum, Prague), Mgr. Tereza PETIŠKOVÁ (J. E. Purkyně University, Ústí nad Labem), PhDr. Eva PETROVÁ (retired), Prof. PhDr. Sylva PETROVÁ (University of Sunderland, United Kingdom), Prof. PhDr. Miroslav PETŘÍČEK, Dr. (Charles University, Prague), PhDr. Ludvík ŠEVEČEK (Regional Gallery of Fine Arts in Zlín) for: **The History of Czech Fine Arts V (1939—1958).**

The ASCR Awards to Young Researchers for Outstanding Achievements to

Dr. Filip KADLEC, born in 1971 (Institute of Physics) for: **Attainment of Original Experimental Methods in Time-differentiated Terahertz Spectroscopy of Condensed Materials**

Zdeněk KAPLAN, PhD., born in 1972 (Institute of Botany) for: **Taxonomy and Nomenclature of the Family Potamogetonaceae**

Ing. Martin LUX, born in 1971 (Institute of Sociology) for: **Socio-economical Research on Housing**

The Awards of the Academy of Sciences for Exceptionally Successful Programmes and Grant Projects to

A research team at the Institute of Physics of Materials, made up of Ing. Oldřich SCHNEEWEISS, DSc., Ing. Yvonna JIRÁSKOVÁ, CSc., RNDr. Jiří ČERMÁK, DSc., RNDr. Milan SVOBODA, CSc., for: **Surfaces and Interfaces of Construction Materials and Application of Modern Technologies and Computer Modelling**

A research team from the Institute of Inorganic Chemistry, composed of Ing. Bohumil ŠTÍBR, DSc., RNDr. Bohumír GRÜNER, CSc., RNDr. Josef HOLUB, Ing. Mario BAKARDJIEV, CSc., RNDr. Drahomír HNYK, CSc., Ing. Zbyněk PLZÁK, CSc., Ing. Jiří FUSEK, CSc., for: **Cluster-borane Analogues of Cyclopentadienyl Anion and Ferrocene**

Ing. Petr ŠKRDLA, PhD., (Institute of Archaeology, Brno) for: **The Upper Paleolithic on the Middle Course of the Morava River: The Dolní Věstonice Studies.**

The ASCR awarded the **J. E. Purkyně Fellowship** to three outstanding scientists: Petr Svoboda, PhD. (Institute of Molecular Genetics), Radislav Sedláček, PhD, Dr. rer. nat. habil. (Institute of Molecular Genetics) and Ing. Pavel Izák, PhD. (Institute of Chemical Process Fundamentals). Twenty-eight young researchers were presented **The Otto Wichterle Award**, 11 working in the inanimate sciences, 11 working in life and chemical sciences and six working in the field of humanities and social sciences.

Jaroslav Pánek and Pavel Vlasák, vicepresidents of the ASCR, present The Otto Wichterle Award to exceptional scientists and scholars under 40

Honorary Medal

The DE SCIENTIA ET HUMANITATE OPTIME MERITIS Honorary Medal was awarded to

Prof. Dr. Theodor Wolfgang HÄNSCH, Max-Planck-Institut für Quantenoptik, Garching, Germany
Prof. Ing. Otto EXNER, Dr. Techn., DSc., Dr.h.c., Institute of Organic Chemistry and Biochemistry, ASCR
Prof. RNDr. Miroslav FIEDLER, DSc., Institute of Mathematics, ASCR

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

The B. Bolzano Honorary Medal for Merit in Mathematical Sciences

Prof. Ivan KIGURADZE, A. Razmadze Mathematical Institute, Tbilisi, Georgia
Prof. Imre CSISZÁR, DSc., Hungarian Academy of Sciences, Budapest, Hungary
Prof. Flemming TOPSØEME, PhD, University of Copenhagen, Denmark

The E. Mach Honorary Medal for Merit in Physical Sciences

Prof. Anatolyj NIKITIN, DSc., Institute of Mathematics, NAS of Ukraine
Prof. Peter Heinz DEDERICHS, Institut für Festkörperforschung, Jülich, Germany
Dr. Gerard JAMELOTOV, Université Paris-Sud, France

The J. Mendel Honorary Medal for Merit in Biological Sciences

Prof. Susan M. GASSER, PhD, Friedrich Miescher Institute for Biomedical Research, Basel, Switzerland
Prof. Dr. David L. DENLINGER, Ohio State University, USA
Doc. Ing. Antonín STRATIL, DSc., Institute of Animal Physiology and Genetics, ASCR

Jiří Drahoš, vicepresident of the ASCR, presents The G. J. Mendel Honorary Medal for Merit in Biological Sciences to Susan Gasser from Switzerland

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

Prof. MUDr. Helena TLASKALOVÁ-HOGENOVÁ, DSc., Institute of Microbiology, ASCR

The F. Palacký Honorary Medal for Merit in Social Sciences

Prof. Thomas DaCosta KAUFMANN, PhD., Princeton University, USA
Valentina Vladimirovna MARJINA, Dr. Hist. Sc., Institut slavjanovedenija RAN, Russian Federation
Prof. Dr. Christian LEQUESNE, French Centre for Research in Social Sciences (CEFRES), Prague
Prof. Frank I. MICHELMAN, Harvard University, USA

The J. Dobrovský Honorary Medal for Merit in Social Sciences

PhDr. Vladimír VAVŘÍNEK, CSc., Institute of Slavonic Studies, ASCR

The Jan Patočka Memorial Medal

Dr. Phil. Heinrich PFEIFFER, Dr.h.c.mult., Prof.h.c.mult., Alexander von Humboldt Stiftung, Bonn, Germany

Eleven prominent scientists were conferred the academic title "Doctor of Science".

Diplomas for the Doctor of Science degree were presented in the Academy's Library on 30 October 2006

The **Award for State Merit in Science** and other **national and other awards** are given to outstanding scientists:

The national **Award for State Merit in Science** was presented by the President of the Czech Republic to Prof. RNDr. Petr HÁJEK, DSc., Institute of Computer Science

Česká hlava (Czech Intellect) to Prof. RNDr. Jaroslav KURZWEIL, DSc., Institute of Mathematics by the Czech Government

Praemium Bohemiae prize given by the B. J. Horáček Foundation for the Czech Paradise Region to Prof. RNDr. Zdeněk CEPLECHA, DSc., J. Heyrovsky Institute of Physical Chemistry

Award of the Learned Society of the Czech Republic to RNDr. Petr DRÁBER, DSc., Institute of Molecular Genetics and PhDr. František HOFFMANN, CSc., Masaryk Institute/Archives

Award of the Czech Science Foundation to RNDr. Marek VANDAS, DSc., Astronomical Institute, Ing. Jan ŠMILAUER, Institute of Atmospheric Physics and co-researchers Prof. RNDr. Zdeněk KNÉSL, CSc., Institute of Physics of Materials and Doc. RNDr. Ing. Jaromír PLEŠEK, CSc., Institute of Thermomechanics

Medal of the Minister of Education, Youth and Sports of the Czech Republic to Prof. PhDr. František ŠMAHEL, DSc, Institute of Philosophy

Josef Hlávka Honorary Medal was awarded to PhDr. Vladimír VAVŘÍNEK, CSc., Institute of Slavonic Studies by the Josef, Marie and Zdenka Hlávka Foundation

The E. Votoček Medal for Merit in Science and Technology Development was awarded to Prof. RNDr. Antonín HOLÝ, DSc. of the Institute of Organic Chemistry and Biochemistry, and Prof. Ing. Pavel KRATOCHVÍL, DSc. of the Institute of Macromolecular Chemistry by the Chancellor of the Institute of Chemical Technology, Prague

Prof. RNDr. HOLÝ, DSc. received the **Gold Medal of Charles University,** Prague.

An **Honorary Medal** was presented to PhDr. Lagjima CHALOUPKOVÁ of the Oriental Institute by the President of Mongolia on the occasion of **800th anniversary of the Great State of Mongolia.**

The French order **Chevalier des Palmes d'Or** was awarded to three ASCR researchers: PhDr. Marcela SEDLÁČKOVÁ, Institute of Philosophy, Doc. PhDr. Lydia PETRÁŇOVÁ, CSc., Institute of Ethnology and Prof. Ing. Vladimír KUČERA, DSc., Institute of Information Theory and Automation

China State Award of the Hebei Province to RNDr. Blanka KALINOVÁ, CSc., Institute of Organic Chemistry and Biochemistry

The President of the Republic of India awarded PhDr. Dušan ZBAVITEL, DSc., Oriental Institute with the **Padma Brooshan** state medal

Prof. RNDr. Blanka ŘÍHOVÁ, DSc. of the Institute of Microbiology received the **Medal for Merit in Public Health** from the Russian Academy of Life Sciences

Twenty eight **young researchers,** whether doctoral graduates or young scientists, have achieved exemplary research recognition for their work at the Academy´s institutes.

The **Award of the Minister of Education, Youth and Sports** for outstanding students and graduates went to Ing. Petr SAZAMA, PhD., J. Heyrovský Institute of Physical Chemistry and František NĚMEC of the Institute of Atmospheric Physics.

The **Award of the Minister of Agriculture** for young scientists was given to Ing. Jiří ŠALPLACHTA, Institute of Analytical Chemistry.

The **Award of the Learned Society of the Czech Republic** in the category of "Young Scientist" was given to RNDr. Tomáš Obšil, PhD., Institute of Physiology and Ing. Petr Cintula, PhD., Institute of Computer Science who was also awarded the **Hlávka Award for Young Scientists.**

The **Hlávka Award** was given to Mgr. Tomáš Etrych, PhD., Institute of Macromolecular Chemistry, Ing. Filip Šroubek, PhD., Institute of Information Theory and Automation, Mgr. Naděžda Špačková, PhD., Institute of Biophysics and Ing. Alexander Deynek, PhD., Institute of Physics.

The **Award of the Czech Science Foundation** for the best post-doctoral project went to Dr. Vlada Filimoněnko, PhD. of the Institute of Experimental Medicine.

Cooperation between the ASCR and universities progressed successfully. The Academy negotiated a general contract on collaboration in doctoral study programmes based on cooperation of the ASCR and Charles University, and a contract on forming an association of the ASCR and Charles University for a doctoral study programme in biomedicine. A contract was concluded between the University of Technology, Brno and the Institute of Thermomechanics, which codifies the operation of a joint research and development department of mechatronics. Negotiations with the Czech Technical University to establish a joint department, the Institute of Applied Sciences, continued (for detailed information see Chapter 3).

The Academy supported the **cooperation between ASCR institutes and the business sphere,** particularly by organising presentations as well as contacts at the institutes with representatives of the fulfilment sphere. Projects of a Unified Programme Document 3 ('JPD3'), which either are conducted in ASCR institutes or in which the institutes participate, help to improve communication between science and the business sphere. An example is the Centre of Innovative Education at Liblice, directed by the Centre of Administration and Operations, where scientists, company managers, the state administration and local government representatives meet in regular seminars. In technology transfer and know-how protection, ASCR institutes cooperate with the Technology Centre in a project called the **Centre for Technology Transfer.**

On the regional level the Association of South-Moravian Centres cooperates with the South-Moravian Innovation Centre. They cooperate with the Central European Technology Institute (CETI) project sharing **EU structural funds.** The ASCR is a contractual partner of the project "Scientific and Technical Park at Jihlava". It also signed a **general contract on cooperation with the Pardubice Region,** taking up previous successful cooperation of some ASCR institutes and the Orlicko Association of Towns and Villages. Another project is the Innovation Centre and Entrepreneurial Incubation, a project of the JPD2 programme cooperating with research and industrial partners and the Technology Centre. This is the first instance of **cooperation by Prague industry and research** to support innovative processes, with institutes of the ASCR. The Academy also concluded a contract with L'ORÉAL Czech Republic, Ltd. on cooperation to select scholarship candidates of "L'ORÉAL for Women in Science" (for details see Chapter 4).

International contacts brought the signing of new implementing protocols for bilateral agreements between the ASCR and the Polish Academy of Sciences and Arts, the Polish Academy of Sciences, the Academy of Sciences of Russia and the Slovak Academy of Sciences. Moreover, negotiations for an Agreement on Scientific Cooperation between the ASCR and the Academy of Sciences and Technologies of the Arab Republic of Egypt for the period of 2007—2009 were approved. The Academy's representatives prepared for the 7th Framework Programme (2007—2013), both by reviewing the European Commission documents and direct negotiation in particular with European bodies. Experts representing the branches for the 7th Framework Programme were appointed members of the Programme Committees of the 7th Framework Programme. ASCR representatives also made preparations for and were engaged in activities of the Steering and Coordinating Committee for Preparation of Structural Funds, a horizontal programme committee (for details see Chapter 5).

Evaluation of scientific results is important for the Academy's work. To assess scientific efficiency and the ASCR's contribution to research and development in the Czech Republic, an analysis of scientometric data (indicators) was also made in 2006. The scientific production shows a rising trend evidenced by the number of original papers published in impact journals (according to the Web of Science database):

Published papers

Year	2002	2003	2004	2005	2006
CR	5920	6186	6173	7592	7494
ASCR	2021	2262	2189	2569	2642

The data of 2006 may be expected to rise slightly during 2007. The summary overview of publishing results is included in Appendix 5.

The most significant **promotion event** was the traditional "Week of Science and Technology 2006" held in coordination with the European Week of Science and Technology 6th to 12th December at ten locations in Prague, Brno, České Budějovice and Ostrava. Activities ranged from the popularization event "Science in the Streets", in conjunction with the "Czech Intellect" society in Prague and Pilsen. "Open Science" focused on supporting scientific and technical education of secondary school teachers and students. "Night of Scientists" also attracted the general public (for more information see Chapter 7).

Lecture in the Literární Café in the Academia Bookshop in Brno during the Science and Technology Week 2006

In **publishing activities,** the ASCR in 2006 published 22 books (Academia Publishing) and 17 publications by the institutes (see Chapter 6). It also published 58 journals although some were found non-productive and therefore the Academy Council decided to allocate funds to institutes corresponding with financing of research objectives, and only in special cases to take account of the professional quality of the particular journal and its international reputation.

Managing the state resources is important for the Academy's Management. Remuneration of employees of ASCR institutes and other units as public research institutions was discussed, and new rules of funding laboratory equipment were approved. In transforming the public research institutions, the Academy Council adopted a directive for approving activities of ASCR institutes and other units in handling the property and rights property. In this connection, the Academy Council decided to transfer immovable assets and management to some ASCR units. Within the scope of public administration control, the results of an economy audit and measures to remedy faults found in 10 institutes were discussed (information on the ASCR budget and its utilisation is included in Chapter 8).

Activities of scientific societies associated in the Council of Scientific Societies of the Czech Republic within the ASCR were positive in the field of science even at the international level. A special position among them has the **Learned Society of the Czech Republic** with which the ASCR concluded in 2006 a General Contract on Cooperation and Tangible Support of Activities. Generally, the number of multidisciplinary societies grows as do the numbers of their members and their contribution to education and international cooperation.

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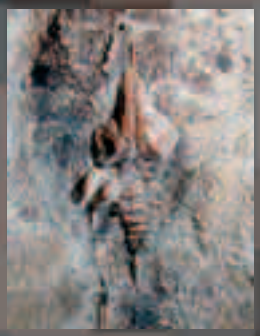


2 Scientific Activities and the Results of Basic and Targeted Research

The results of scientific activity at the ASCR are presented by section. The research objectives within whose bounds results were gathered are mentioned first. These are followed by an overview of the most notable studies accompanied by selected illustrative abstracts.

1 • Mathematics, Physics and Informatics

The section consists of six institutes, three in physics and three in mathematics and informatics. Their research objectives were as follows:

Research objectives

Astronomy and astrophysics • Astronomical Institute

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

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

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

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

List of studies

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

1. New diagnostic methods of magnetic reconnection in solar flares (Astronomical Institute)
2. White dwarfs in proper-motion surveys (Astronomical Institute)
3. Interacting galaxies — Magellanic Clouds and Milky Way (Astronomical Institute)
4. Linear optimization problems with inexact data (Institute of Computer Science)
5. The Lanczos and conjugate gradient algorithms in finite precision arithmetic (Institute of Computer Science)
6. A theory of interactive computation (Institute of Computer Science)
7. Optimal control of contact problems (Institute of Information Theory and Automation)
8. Blind separation for EEG and MEG signal processing (Institute of Information Theory and Automation)
9. Detection of forgery in digital photography (Institute of Information Theory and Automation)
10. Lower estimates of transition densities and bounds on exponential ergodicity for stochastic PDEs (Institute of Mathematics)
11. On selective optimality conditions in control of contact problems with strings (Institute of Mathematics)
12. There is no face-to-face partition of R^5 into acute simplices (Institute of Mathematics)
13. Measurement of the production of c and b quarks in the experiment H1 (Institute of Physics)
14. Prediction of anisotropic solute segregation at grain boundaries (Institute of Physics)
15. *Ab initio* DFT simulations of the mechanical, transport and chemical properties of nanostructures (Institute of Physics)
16. Hardness of covalent and ionic crystals (Institute of Physics)
17. Upper limit on primary photon fraction in cosmic rays with energies above 10 EeV (Institute of Physics)
18. Applications of X-ray laser for generating and probing dense plasmas (Institute of Physics)
19. Validation of neutron data libraries for design analyses of fusion devices (Nuclear Physics Institute)
20. Radiation damage to DNA-protein specific complexes: Estrogen response, element estrogen receptor complex (Nuclear Physics Institute)
21. Astrophysical S-factors for nuclear synthesis (Nuclear Physics Institute)

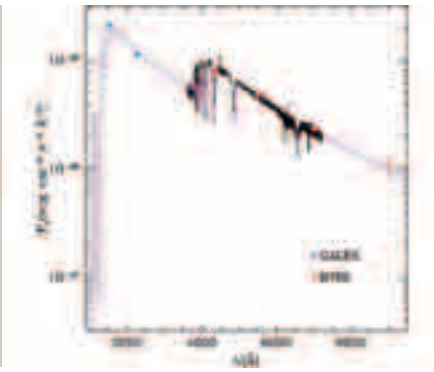
Illustrative abstract

White dwarfs in proper-motion surveys • Astronomical Institute

Studies of white dwarfs within our immediate solar neighborhood contribute toward our understanding of star formation and age of the Galactic disk in which our Sun lies. The New Luyten Two-Tenths (NLTT) catalog contains a large number of high-proper motion stars, many of which are likely white dwarfs. We selected white dwarf candidates from this catalog based on their proper-motion and photometric colors and obtained spectroscopy for 49 white dwarfs. Using the obtained spectra, we determined their atmospheric properties. Most of these stars are cool ($T < 10\,000$ K) and hence old (> 1 Gyr) hydrogen-rich (DA) white dwarfs out of which three also display elements heavier than helium, the remainder are cool helium-rich (DC). One star (NLTT 44986) is a very massive DA white dwarf (1.3 M_o) that exhibits a very high abundance Ca, Mg and Fe.

LP400-22 is listed in the NLTT catalog, and our analysis of its hydrogen-rich spectrum resulted in the discovery of a very low mass (0.17 M_o) white dwarf with a temperature of 11 080 ± 140 K. We checked our spectroscopic analysis against available ultraviolet GALEX and optical photometric colors to confirm its temperature and low-mass. LP 400-22 has a tangential velocity of 414 ± 43 km s^{-1}, making it one of the fastest white dwarfs known. These properties imply that this star evolved in a binary system, where the companion stripped the white dwarf of its envelope before completing its red-giant evolution. Most white dwarfs of such a low mass are found to be companions to neutron stars. We checked for

signatures for a companion without success. Therefore, one possible scenario for this star is it may have been in a double-degenerate binary, where the companion had gone through a supernova event that disrupted the binary, losing the remnant of the donor star with a high velocity and low mass.



White dwarfs in proper-motion survey

Optical (BVRI) and ultraviolet (GALEX FUV and NUV) photometry and the observed spectrum of LP400-22 compared to a model spectrum at an effective temperature of 11 000 K and a surface gravity of log g = 6.50

Kawka, A., Vennes, S.: Spectroscopic Identification of Cool White Dwarfs in the Solar Neighborhood. *Astrophys. J.,* 643, 402 (2006)
Kawka, A., Vennes, S., Oswalt, T.D., Smith, J.A., Silvestri, N.M.: LP400-22, A very low mass and high-velocity white dwarf. *Astrophys. J.,* 643, L123 (2006)

Illustrative abstract

A theory of interactive computation • Institute of Computer Science

The paper deals with the hot field of interactive computational systems as represented, e.g., by the Internet. Such systems differ from the classical computational systems by their unpredictable interaction with their environment, by being "always on", and by changing over time. This leads to a question of what a computational theory of such systems could look like. A simple model of interactive computations is designed in the paper. It consists of two parts: of a single computational component and of its environment. Both parts interact via infinite streams of input and output data. A number of results were proven for such a model, enabling its comparison with the classical models known from the theory of automata. The paper concludes that the computational power of classical and interactive systems is incomparable: each model computes with different objects. However, at the most, when classical models are allowed to compute for potentially infinite periods, the computational power of both models coincides. The paper has established the basis for the development of a theory of interactive systems.

Leeuwen, J. van, **Wiedermann, J.**: *A Theory of Interactive Computation.* A chapter in: Interactive Computation: The New Paradigm, pp. 119–142, in: Goldin, D.; Smolka, S. A.; Wegner, P. (eds.) Springer Verlag, XV, 487 p., 84 illus., hardcover, 2006

Illustrative abstract

Detection of forgery in digital photography • Institute of Information Theory and Automation

In our society, digital images are a powerful and widely used medium of communication, and they impact our lives significantly. But, the question is, How much can we trust a photograph which has not been obtained from a trustworthy source? In recent years, owing to the advent of low-cost and high-performance computers, more user-friendly computers, and the availability of many powerful and easy to control image processing and editing software packages, it has become possible to create, with a relative ease, image forgeries which are indistinguishable from authentic photographs by the naked eye. Therefore, there is a strong need for a reliable tamper detection system for digital images. Such a system will be useful in many areas, including forensic investigation, criminal investigation, insurance processing, surveillance systems, and journalism. The existing digital forgery detection methods are divided into active and passive (blind) approaches. The passive (blind) approach is regarded as the new

direction. It uses only the image function, assuming no explicit prior knowledge about the analysed image, and is based on a combination of several separate analysers. These analyses are concerned, for example, with detecting resampled, duplicated image regions, double JPEG compression and the inconsistency noise patterns. The main aim of image authentication is not to stop forgeries. A capable falsifier with enough experience can always come up with something new and create an undetectable forgery. The main goal is to make successful use of image forgery as strenuous as possible.

Mahdian, B., Saic, S.: Detection of Copy-Move Forgery Using a Method Based on Blur Moment Invariants. *Forensic Science International*. Elsevier, in press.

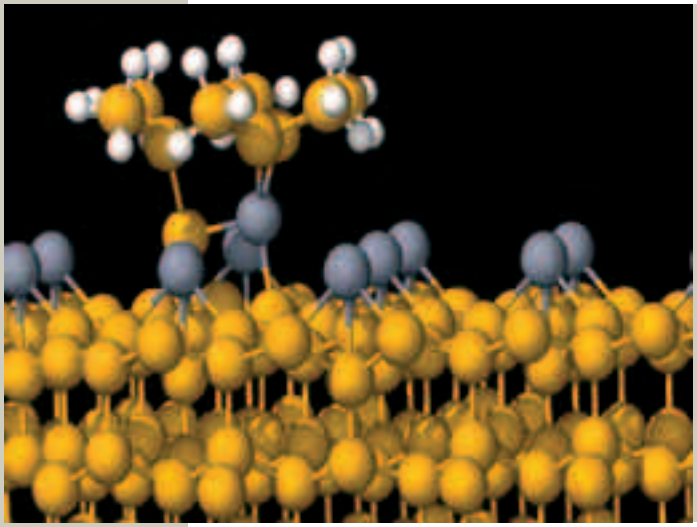
Illustrative abstract

Ab initio DFT simulations of the mechanical, transport and chemical properties of nanostructures

• Institute of Physics

Based on performed *ab initio* DFT (Density Functional Theory) simulations [1–4], we have unveiled promising new ways to control the catalytic reactions of metallic nanocontacts as well as new applications of the nc-AFM (non-contact Atomic Force Microscope) method in surface science. Namely, we have predicted the enhanced chemical reactivity of gold mono-atomic chains inducing the dissociation process of hydrogen molecules on the gold chains [1] accompanied by a decrease of the conductance in agreement with published experimental data. The simulations have also pointed out a strong dependence of the chemical reaction on the mechanical stress applied, which opens up a new way to control chemical reactions on/of nanosystems.

We have developed a simple analytical model describing interaction of an AFM tip with surfaces based on the *ab initio* simulations performed and experimental data enabling the chemical identification of individual atoms using the atomic force spectroscopy [4]. *Ab initio* simulations have also served to elucidate the origin of the dissipation process and the adhesion forces [2] obtained by the nc-AFM technique.



Ab initio DFT simulations of the mechanical, transport and chemical properties of nanostructures

The stick-and-ball model of an optimized atomic structure obtained from the *ab initio* calculation of the interaction between the nc-AFM tip and Sn/Si (111) surface. Here, the yellow balls represent silicon atoms, the gray and white balls are tin and hydrogen atoms, respectively

[1] P. Jelínek, R. Pérez, J. Ortega, and F. Flores: Hydrogen dissociation over Au nanowires and the fractional conductance quantum; *Phys. Rev. Lett.* **96**: 046803 (2006).
[2] N. Oyabu, P. Pou, Y. Sugimoto, P. Jelínek, M. Abe, S. Morita, R. Pérez, and Ó. Custance: Single atomic contact adhesion and dissipation in dynamic force microscopy; *Phys. Rev. Lett.* **96**: 106101 (2006).
[3] Y. Sugimoto, P. Pou, Ó. Custance, P. Jelínek, S. Morita, R. Pérez, and M. Abe: Real topography, atomic relaxations, and short-range chemical interactions in atomic force microscopy: The case of α-Sn/Si(111)-(sqrt[3]xsqrt[3])R30° surface; *Phys. Rev. B* **73**: 205329 (2006).

[4] Y. Sugimoto, P. Pou, M. Abe, P. Jelínek, S. Morita, R. Pérez, Ó. Custance: Atomic force microscopy based single-atom chemical identification; *Nature*, (accepted)

2 • Applied Physics

Research objectives

In 2006, the section was formed by seven institutes with the following research objectives:

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

Materials, structures, systems and signals in electronics, optoelectronics and photonics
• Institute of Photonics and Electronics

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

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

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

List of studies

1. Temperature effects on engineering stability of thermoplastic construction parts (Institute of Hydrodynamics)
2. Observation, assessment and modelling of the soil water regime, hydrological balance and atmospheric deposition under conditions of the changing environment (Institute of Hydrodynamics)
3. All-optical differentiators (Institute of Photonics and Electronics)
4. Principle and experimental setup for the fiber-based differentiator characterization (Institute of Photonics and Electronics)
5. Time interval measurement based on excitation of a surface acoustic wave filter (Institute of Photonics and Electronics)
6. Microstructure and mechanical properties of ultrafine grained aluminium alloys (Institute of Physics of Materials)
7. Conditions for a fatigue crack initiation in the vicinity of geometrical and material discontinuities (Institute of Physics of Materials)
8. Nanocrystalline materials prepared from amorphous precursors (Institute of Physics of Materials)
9. Electron Bernstein wave simulations (Institute of Plasma Physics)
10. Laser-produced stable plasma jets (Institute of Plasma Physics)
11. Reduced growth rate of tumors from melanoma B16 cells exposed to focused shock waves (Institute of Plasma Physics)

12. Event-related desynchronization/synchronization from intracerebral recordings (Institute of Scientific Instruments)
13. Optical sorting of sub-micrometer objects in movable interference fields of light (Institute of Scientific Instruments)
14. Electron microscopy of water containing samples (Institute of Scientific Instruments)
15. Biomechanical model of human head used in craniocervical injury assessment (Institute of Theoretical and Applied Mechanics)
16. Numerical modelling of wind load at the buildings (Institute of Theoretical and Applied Mechanics)
17. Binary nucleation of water and sodium chloride (Institute of Thermomechanics)
18. Development of a new methodology for the solution of nonlinear coupled problems on systems of independent meshes (Institute of Thermomechanics)
19. Thermodynamic properties of the working media for absorption refrigeration cycles (Institute of Thermomechanics)

Illustrative abstract

Temperature effects on engineering stability of thermoplastic construction parts • Institute of Hydrodynamics

The engineering stability and thermodynamic properties of thermoplastic polymeric materials have been determined in the course of different thermal regimes near the transition temperature from solid to plastic state. The mechanical properties change in this state from viscoelastic to viscoplastic, which results in a reduction of loading limits of thermoplastic construction parts. The change of mechanical properties (bulk modulus, shear modulus, viscosity, etc.) and thermodynamic properties (specific volume, thermal expansion, thermal capacity, etc.) is due to increased mobility of macromolecules and hence the inner energy which intensifies the rate of state transition. The computer simulation of the thermodynamic representation determines the material response to variations of temperature. The simulation employs only those mechanical and thermodynamic polymer characteristics that can be easily measured for solid and plastic polymer states. The transition polymer behavior is specified by the computation. In this way the temperature dependent properties were obtained for polystyrene, poly(methyl methacrylate), and polyvinyl chloride.

Slobodian, P., Říha, P., Rychwalski, R.W., Emri, I., Sáha, P., Kubát, J.: The relation between relaxed enthalpy and volume during the physical aging of amorphous polymers and selenium. *European Polymer Journal* **42**: 2824–2837 (2006)
Slobodian, P., Vernel, J., Pelíšek, V., Sáha, P., Říha, P., Rychwalski, R.W., Kubát, J., Emri, I.: Aging bulk modulus obtained from enthalpy and volume relaxations of a-PMMA and its blends with PEO. *Mechanics of Time-Dependent Materials* **10**: 1–15 (2006)
Říha, P., Hadač, J., Slobodian, P., Sáha, P., Kubát, J.: Thermodynamic phasing of a glass transition of amorphous polymers. *Proc. 22nd PPS Conference, Yamagata, Japan,* 2006
Slobodian, P., Hadač, J., Říha, P., Sáha, P., Kubát, J.: Effect of cooling rate on glass transition temperature and enthalpy and volume relaxation of Polystyrene. *Proc. 22nd PPS Conference, Yamagata, Japan,* 2006

Illustrative abstract

All-optical differentiators • Institute of Photonics and Electronics

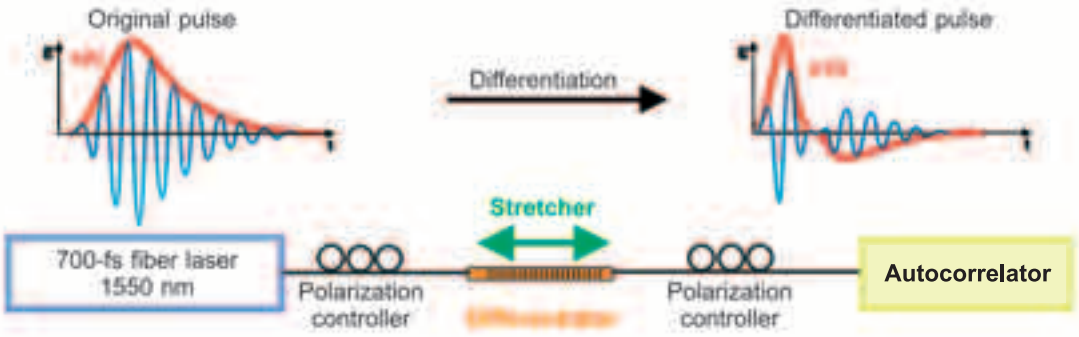
Optics-based signal processing systems and devices with operation speeds inaccessible to electronics (hundreds of GHz and more) are required for a wide variety of applications, including ultrafast computing, ultrahigh bit-rate telecommunications, ultrafast pulse shaping, and an analysis of ultrashort optical pulses. In collaboration with EMT-INRS, Université du Québec, Montréal, we achieved one of the basic signal processing devices, a universal all-optical temporal differentiator. Our devices calculate the time derivative of an envelope of an arbitrary optical field with temporal features as short as a few hundreds of femtoseconds. This corresponds to a processing speed of several terahertz, which is about three orders of magnitude faster than with the current state-of-the-art electronics-based systems and computers.

We demonstrated two devices [1–3], the first one based on an all-fiber implementation [1,2] and the second one based on bulk-optics components [3]. The first implementation is low-loss, low-cost, robust, and compatible with fiber optic technology; the other can be implemented using off-the-shelf components and thus is widely accessible for research laboratories.

In the fiber implementation, a special in-fiber-made filter based on a long-period fiber grating (LPFG) was made and tested [1,2]. Further, we developed a tuning technique [4] to get the desired performance. In the bulk optics-based implementation, the device consists of an imbalanced, symmetric Michelson interferometer. This technique is also extended for higher-order temporal derivatives – as "proof of the concept," we have successfully demonstrated the second-order temporal differentiation [3].

All-optical differentiators

Principle and experimental setup for the fiber-based differentiator characterization



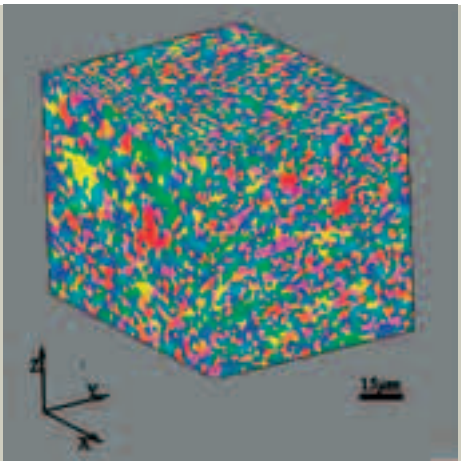
[1] R. Slavík, M. Kulishov, Y. Park, J. Azaña, and R. Morandotti, Temporal differentiation of sub-picosecond optical pulses using a single long period fiber grating, Conference on Lasers and Electro-Optics (CLEO/IQEC and PhAST), Long Beach, CA, USA, *Technical Digest*, paper CTuBB5, May 2006
[2] R. Slavík, Y. Park, M. Kulishov, R. Morandotti, and J. Azaña, Ultrafast all-optical differentiators, Optics Express, **14** (22), 10699–10707, 2006
[3] Y. Park, J. Azaña, and R. Slavík, Ultrafast all-optical first and higher-order differentiators based on interferometers, *Optics Letters* **32**, No. 6 (assigned issue), available on-line, 2007
[4] R. Slavík, Extremely deep long-period fiber grating made with CO_2 laser, *IEEE Photonics Technology Letters*, **18** (16), 1705–1707, 2006

Illustrative abstract

Microstructure and mechanical properties of ultrafine grained aluminium alloys • Institute of Physics of Materials

In the last decade, the process of severe plastic deformation (SPD) of bulk metallic materials has been shown to produce ultrafine grained (UFG) structures. Prominent among SPD techniques are equal channel angular pressing (ECAP). Bulk UFG materials produced by SPD techniques have consistently shown superior properties over their coarse-grained counterparts. An experimental investigation of the effect of different equal channel angular pressing routes on microstructure, mechanical and creep behavior was conducted on pure aluminium, binary Al-0.2wt%Sc and ternary Al-3wt%Sc alloys. The ECAP was performed at room temperature using different processing routes with a die that had a 90˚angle between the channels.

Transmission electron microscopy results have shown that one ECAP pass leads to a substantial reduction in the grain size (< 1μm) in the alloys under investigation. The microstructure is very inhomogeneous and the grain size varies with location. The grains subsequently evolve with further ECAP pressing into a reasonably equiaxed and homogeneous microstructure with a submicron grain size. There is little apparent dependence of mechanical and/or creep properties on the ECAP processing route. The tensile tests revealed a noticeable increase in mechanical properties after the first pressing. In UFG materials grain boundaries are in metastable, non-equilibrium state. These boundaries generate long-range elastic stress fields, which can be responsible for an observed improvement of yield stress and ultimate tensile strength. A saturation level of both parameters was attained after four ECAP passes. Based on the creep results, it is suggested that creep in the ECAP aluminium and its alloys occurs by lattice diffusion-controlled movement of dislocations being grain boundary sliding which is increasingly important for increasing the number of ECAP passes. It was found that the creep resistance of ECAP'd materials is increased considerably already after one ECAP pass. However, successive pressing had a noticeable decrease in the creep properties. The results indicate that an inhomogeneity of the ECAP microstructure in mesoscopic scale may influence the creep behavior of the pressed material.



Microstructure and mechanical properties of ultrafine grained aluminium alloys

Principle of the ECAP method

Microstructure of pure aluminium following four applications of the ECAP method. The grain size has been reduced by three orders on the average

Sklenička, V., Král, P., Ilucová, L., Saxl, I., Dvořák, J., Svoboda, M.: Inhomogeneity of microstructure and creep of ECAP aluminium — *Mater. Science Forum* **503—504**:245—250 (2006)
Sklenička, V., Dvořák, J., Kvapilová, M., Svoboda, M., Král, P., Saxl, I., Horita, Z.: Effect of equal-channel angular pressing (ECAP) on creep of aluminium alloys *Mater. Sci. Forum* **539—543**:2904—2909 (2007)

3 • Earth Sciences

Research objectives

The section is comprised 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 geomaterials, development of methods for their environmentally safe use, and interpretation of geodynamic processes • Institute of Rock Structure and Mechanics

List of studies

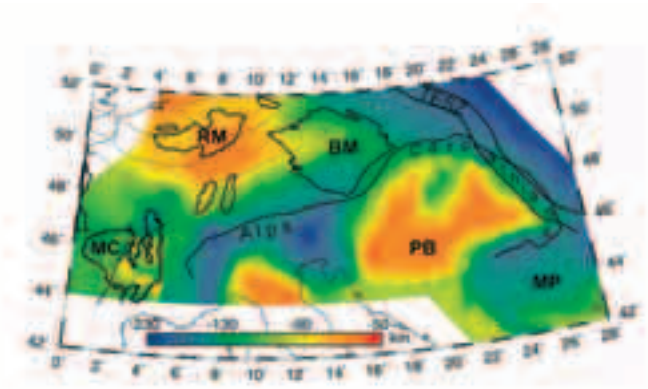
2. Mosaic of European lithosphere-geophysical models of the deep structure and development of continents (Geophysical Institute)
3. Rock magnetism and its applications in environmental studies (Geophysical Institute)
4. Overall pattern of long-term global change in the upper atmosphere (Institute of Atmospheric Physics)
5. Solar activity effects on atmospheric circulation (Institute of Atmospheric Physics)
6. Proton temperature anisotropy in the solar wind (Institute of Atmospheric Physics)
7. Weathering and erosion fluxes of arsenic in watershed mass budgets (Institute of Geology)
8. Tectonic and volcanic controls on hydrothermal silicification in marginal zones of the Ohře Rift (Institute of Geology)
9. Gigantism in tadpoles of the Neogene frog *Palaeobatrachus* (Institute of Geology)
10. Termination of underground coal mining and its impact on the environment (Institute of Geonics)
11. Improving of rock mass properties by grouting means (Institute of Geonics)
12. Geography of small towns (Institute of Geonics)
13. Oxycarbide glass with cobalt particles prepared on the base of poly [methyl(phenyl)] siloxanes and cobalt phthalate (Institute of Rock Structure and Mechanics)
14. Isoseismal maps drawing by the kriging method (Institute of Rock Structure and Mechanics)
15. Geopolymers for reconstruction of the historic royal palace in Ctesiphon (Al-Mada´in, Iraq) (Institute of Rock Structure and Mechanics)

Illustrative abstract

Mosaic of European lithosphere — geophysical models of deep structure and development of continents
• Geophysical Institute

The rigid outer layer of the Earth — the lithosphere, comprising the crust and the uppermost mantle, reaches depths varying from about 60 to 250 km. The topography of the boundary between the lithosphere and asthenosphere (Fig. 1) is thus much more distinct than the topography of the Earth's surface. The development of both reliefs is interconnected, as the processes, which have been active at the surface for more than four billion years, reflect to a large extent processes at depth. Though geophysics studies mainly present the structure and composition of our planet, we also model its development "imprinted" in a complicated structure of the lithosphere. Seismic tomography brings important information from properties of waves, which propagate within the Earth. Valuable data come from a directional dependence of wave velocities, i.e., seismic anisotropy. Results of these studies depict a complicated mosaic of blocks building a rigid Earth's envelope with a distinctly heterogeneous crust and systematically oriented large-scale fabrics of the mantle lithosphere [1]. The mosaic results from a long-term accretion of micro-continents and rock complexes from oceanic sources, and reflects geodynamic cycles of plate tectonics. The model can be applied both to the oldest part of the European lithosphere in Scandinavia [2] and to geologically youngest regions of the Mediterranean [3], where the plate tectonics is active even at present.

Babuška, V. and Plomerová J., 2006. European mantle lithosphere assembled from rigid microplates with inherited seismic anisotropy. *Phys. Earth Planet Inter.*, **158**, 264–280, doi:10.1016/J.pepi.2006.01.010
Plomerová, J., Babuška, V., Hyvonen, T., Vecsey, L., Kozlovskaya, E., Raita, T., and SSTWG, 2006. Proterozoic-Archean boundary in the upper mantle of eastern Fennoscandia, as seen by seismic anisotropy. *J. Geodyn.* **41**, 400–410
Plomerová, J., Margheriti, L., Park, J., Babuška, V., Pondrelli, S., Vecsey, L., Piccinini, D., Levin, V., Baccheschi, P., Salimbeni, S, 2006. Seismic Anisotropy beneath the Northern Apennines (Italy): Mantle Flow or Lithosphere Fabric? *Earth Planet. Sci. Lett.* **247**, 157–170

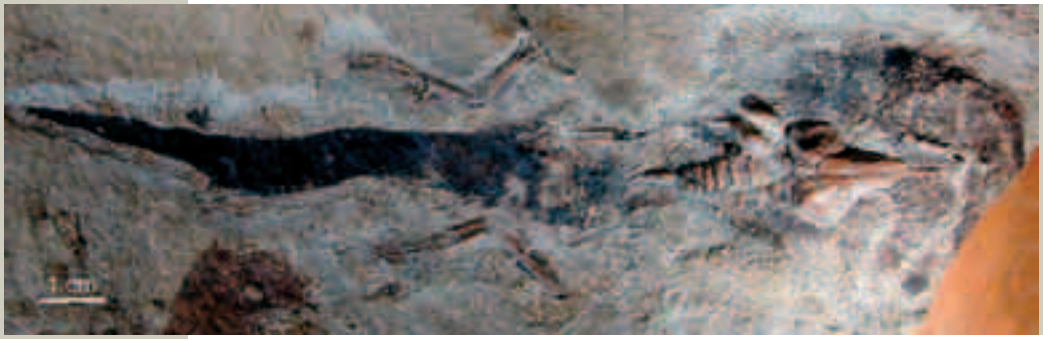


Lithosphere thickness of central Europe derived from static terms of relative residuals — P-wave travel-time deviations from standard radial Earth model. BM — Bohemian Massif, MC — French Massif Central, RM — Rhenish Massif, PB — Pannonian Basin, MP — Moesian Platform, TESZ — Trans-European Suture Zone

Illustrative abstract

Gigantism in tadpoles of the Neogene frog *Palaeobatrachus* • Institute of Geology

Three giant palaeobatrachid fossil tadpoles of the pipid-frog genus *Palaeobatrachus* are described at the Miocene of Randecker Maar, Germany. The largest one was 150 mm at the beginning of metamorphosis, whereas the smallest was 100 mm and approaching the end of metamorphosis. In contrast, normal palaeobatrachid tadpoles and their pipid relatives, both extinct and extant, rarely exceed 60 mm in length. Both ecological and pathological conditions are to be considered as conducive to the development of gigantism in tadpoles. Tadpoles that lack a thyroid gland become exceptionally large and arrest development at early hindlimb stages. However, the advanced metamorphic stages of the giant *Palaeobatrachus* tadpoles indicate that they were able to metamorphose, and thus were not athyroid. Environmental factors, including pond size and permanence, predators, duration of the growing season, may all contribute to tadpole gigantism in certain extant anuran species. We identify suites of ecological features that distinguish extant anurans with large tadpoles from high-latitude and high-altitude permanent lakes in temperate regions (e.g., certain Rana and Telmatobius) from tropical species, such as Pseudis paradoxa, whose tadpoles normally develop to a large size in temporary seasonal ponds. The paleoecology of Randecker Maar suggests that *Palaeobatrachus* tadpoles lived in a permanent semitropical lake, but one with few predators.



Gigantism in tadpoles of the Neogene frog *Palaeobatrachus* (Germany)

The giant tadpole of extinct frog genus *Palaeobatrachus* from the former crater lake of the Lower Miocene site of Randecker Maar in Germany

Roček, Z., Böttcher, R. A. Wassersug, R.: Gigantism in tadpoles of the Neogene frog *Palaeobatrachus*. Paleobiology 32, 4: 666–675 (2006).

4 • Chemical Sciences

Research objectives

This section totals six institutes whose research objectives were as follows:

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

Investigation of 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

Advanced polymer materials and supramolecular systems: Synthesis and research on their properties, phenomena and implementation of 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

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

List of studies

1. Determination of ethylglucuronide in serum by capillary zone electrophoresis (Institute of Analytical Chemistry)
2. Investigation of elution mechanisms in field-flow fractionation, i.e., new ways of characterization of particles by using gravitational field-flow fractionation (Institute of Analytical Chemistry)
3. CE/MS interface with open tubular enzymatic reactor electrospray needle for on-line analysis of proteins (Institute of Analytical Chemistry)
4. Analysis of bonding in molecules with a complicated bonding pattern. Application of molecular engineering in material science (Institute of Chemical Process Fundamentals)
5. Study of complexes with [{$C_5Me_4(CF_2)_nCF_3$}Rh] fragment (Institute of Chemical Process Fundamentals)
6. Making singlet oxygen useful not harmful (Institute of Inorganic Chemistry)
7. The use of a photoreactor to evaluate the activity of photocatalytic materials (Institute of Inorganic Chemistry)
8. Paleoenvironmental record in Lake Baikal sediments: Environmental changes in the last 160 ky (Institute of Inorganic Chemistry)
9. Grafted high-molecular-weight doxorubicin conjugates for treatment of solid tumors (Institute of Macromolecular Chemistry)
10. Liquid-crystalline polyurethane networks (Institute of Macromolecular Chemistry)
11. Recombinant glutamate carboxypeptidase II from human brain (Institute of Organic Chemistry and Biochemistry)
12. Copper(I)-directed formation of a cyclic pseudorotaxane tetramer and its trimeric homologue (Institute of Organic Chemistry and Biochemistry)
13. Quantification and rationalization of the higher affinity of sodium over potassium to protein surface (Institute of Organic Chemistry and Biochemistry)

14. New applications of single molecule fluorescence in biomembrane research
    (J. Heyrovský Institute of Physical Chemistry)
15. Layers of metal ions and nanoparticles at polarized liquid-liquid interfaces
    (J. Heyrovský Institute of Physical Chemistry)
16. New experiments with nanoparticles and clusters in molecular beams
    (J. Heyrovský Institute of Physical Chemistry)

Illustrative abstract

Determination of ethylglucuronide in serum by capillary zone electrophoresis • Institute of Analytical Chemistry

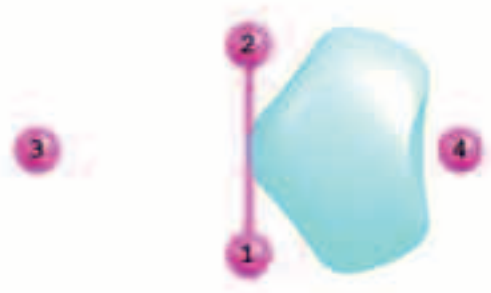
A very sensitive method for determining ethylglucuronide in human serum was developed. Ethylglucuronide is a marker of ethanol consumption that can be found in serum for a number of hours to days after alcohol intake. The method is simple, does not need any sample pretreatment and uses natural serum macrocomponents to cause the effect of transient isotachophoresis in zone electrophoresis to increase the sensitivity of the analyses. It simultaneously eliminates negative effects of other natural serum components, lactate and acetate, the contents of which also increase after alcohol consumption while their total contents are non-specific. The method is robust and can be used in a very broad range of concentrations of present macrocomponents. Sufficient sensitivity and clinical applicability were tested on analyses of serum samples from both volunteers and real patients. Electrophoretic analyses of ethylglucuronide and carbohydrate deficiency transferring of samples from patients treated for alcohol addiction unambiguously revealed cases of not following the treatment regime and abstinence.

(1) Křivánková, L., Caslavska, J., Malášková, H., Gebauer, P., Thormann, W.: Analysis of ethyl glucuronide in human serum by capillary electrophoresis with sample self-stacking and indirect detection. *Journal of Chromatography A* 1081: 2—8 (2005)
(2) Mrázková, M., Caslavska, J., Thormann, W., Křivánková, L.: Effects of lactate and acetate on the determination of serum ethyl glucuronide by CZE. — *Electrophoresis* **27**: 4772—4778 (2006)

Illustrative abstract

Analysis of bonding in molecules with complicated bonding pattern. Application of molecular engineering in material science • Institute of Chemical Process Fundamentals

Contemporary rapid development of material science is characteristic of the emphasis on preparation of new non-traditional materials with often unique physical, chemical and/or biological properties. The fact that the existence of desired unique properties is often typical of systems with non-classical structural features implies, however, that any attempts at rationalization of the synthesis of such non-traditional new materials depend on a reliable description of the structure of such materials which, in turn, is contingent on our understanding of the bonding arrangement in the corresponding molecules.



Multicentre bond in Li_4 cluster

Such a description is provided by theoretical quantum chemical calculations, and their application in material science represents a new, rapidly expanding scientific discipline known as molecular engineering.

A new original method enabling us to visualize and interpret the molecular structure has been proposed in the group of theoretical chemistry. The method known as the analysis of domain averaged Fermi holes was applied in recent years to the analysis of bonding in various molecules containing such non-classical bonding features as multiple metal-metal bonding, multicenter bonding, hypervalence etc., and the results contributed to elucidating the structure of these molecules.

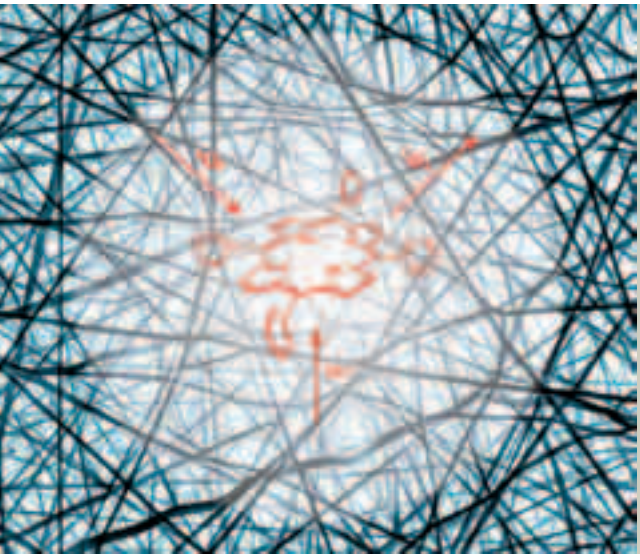
1. Ponec R., Bultinck P., Gutta P., Tantillo D. J.: Multicenter bonding in carbocations with tetracoordinated protons, *J. Phys. Chem. A,* **110**: 3785 (2006).
2. Ponec R., Cooper D. L.: Anatomy of bond formation. Bond length dependence of the extent of electron sharing in chemical bonds from the analysis of domain averaged Fermi holes, *Faraday Disc.* **135**
3. Ponec R., Yuzhakov G.: *Metal-metal bonding in* $Re_2Cl_8^{(2-)}$ *from the analysis of domain averaged Fermi holes, PCCP,* (submitted).

Illustrative abstract

Making singlet oxygen useful, not harmful • Institute of Inorganic Chemistry

The research team is engaged in investigating materials whose function is initiated by light, i.e., photofunctional materials. On a specially treated surface of these materials singlet oxygen can be generated. Singlet oxygen is an energetically rich form of molecular oxygen with the lifetime on the order of millionths of seconds. High reactivity and ability to degrade biomolecules makes singlet oxygen dangerous to microorganisms, the same properties, however, could be used for a good purpose in preparation of bactericidal materials activated by light.

Photochemical studies of sensitizers, dyes that are able to transfer the absorbed energy of light to atmospheric oxygen and in so doing produce singlet oxygen, offered a way to prepare photoactive materials. Porphyrin sensitizers were incorporated into inorganic materials of the clay-type and into fibres of nanofabrics.The sensitizers can be used advantageously,in very low concentrations, since one molecule of a sensitizer can produce many molecules of singlet oxygen by repeated energy transfer. It has been proved that the sensitizer-loaded materials irradiated by visible light (sunlight) display bactericidal effects.



The molecule of the porphyrin sensitizer produces singlet oxygen ($^1O_2$) after absorption of light ($h\nu$). The structure of the fabric containing porphyrin is in the background

Illustrative abstract

Relevant papers:
1. Mosinger J., Jirsák O., Kubát P., Lang K., Mosinger B., *J. Mater. Chem.* **17** (2007) 164.
2. Lang K., Mosinger J., Wagnerová D. M., *Coord. Chem. Rev.* **248** (2004) 321.

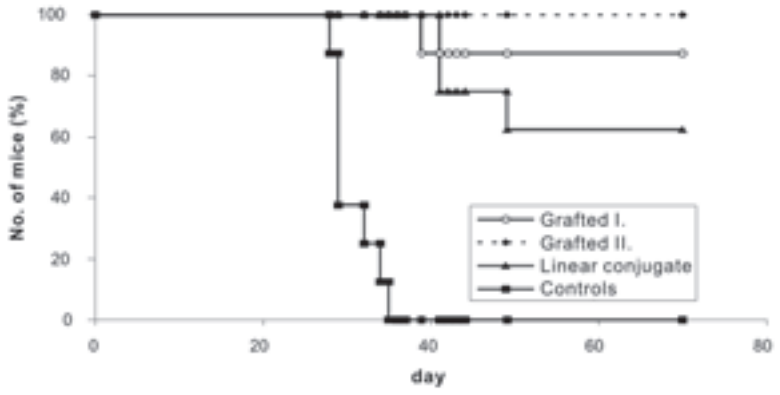
Grafted high-molecular-weight doxorubicin conjugates for treatment of solid tumors

• Institute of Macromolecular Chemistry and Institute of Microbiology

The authors designed and synthesized polymer cancerostatics for treatment of solid tumors. In the polymer drugs, the water-soluble branched high-molecular weight structure provides a prolonged circulation time of the inactive cytostatic in the organism, enhanced deposition of the conjugate in solid tumors due to the EPR (enhanced permeability and retention) effect and specific activation (release) of the cytostatic in the tumor by hydrolysis, the rate of which is controlled by the pH of the medium. Subsequent hydrolytic, enzymatic or reductive degradation of polymer skeleton results in elimination of polymer components from the organism by glomerular filtration in kidneys.

The structure of polymer drug consists of the main HMPA copolymer chain bearing doxorubicin attached by pH-sensitive bonds cleavable by hydrolysis. Additional HMPA copolymer chains with doxorubicin attached by the same hydrolytically labile bonds are grafted onto the main chain. The polymer grafts are attached to the main chain by the bonds cleavable in the target tumor cells enzymatically, hydrolytically or reductively (through disulfide bonds). Molecular weights of the main chain and polymer grafts are selected so the polymers can be eliminated from the organism by renal filtration. When combined in a grafted high-molecular weight structure, they cannot be eliminated; instead, the polymers circulate in bloodstream and deposit in solid tumors. After penetration into a tumor cell by pinocytosis, the active cytostatic is released due to pH change and, later on, the polymer skeleton is degraded to the original fragments, which can be eliminated from the organism.

The authors verified the feasibility of the proposed mechanism of action of polymer drugs with a grafted polymer structure in a medium modelling the conditions in bloodstream and animal cells. An extraordinary antitumor activity of the polymer drug was proved in in vivo experiments in mice bearing a model tumor.



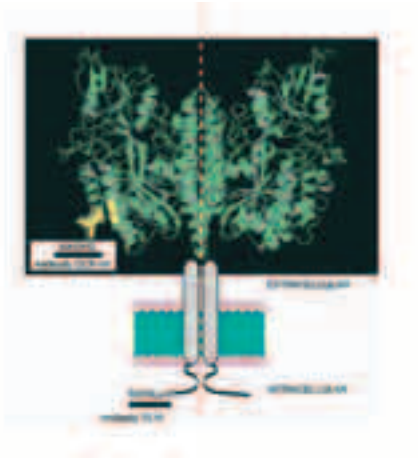
Survival of mice inoculated with mice EL 4 T-cell lymphoma on day 0 and treated with a single dose of grafted polymer conjugate (equivalent of 15 mg DOX/kg) in the therapeutic mode of administration (on day 9). Efficiency of treatment with both new graft polymer conjugates was compared with that of a recently developed generation of polymeric cytostatics (linear conjugate)

Etrych T., Chytil P., Ulbrich K., Mrkvan T., Říhová B.: Grafted high-molecular-weight doxorubicin conjugates with antitumor activity and a method of their manufacture. *PV* **592** (2006)

Illustrative abstract

Recombinant glutamate carboxypeptidase II from human brain • Institute of Organic Chemistry and Biochemistry

Proteases are a group of enzymes capable of cleaving the peptide bond. These molecules play a pivotal role in the regulation of a number of biological processes. One of the important proteases found in various human and animal tissues is glutamate carboxypeptidase II (GCPII). In human brain this enzyme cleaves a neurotransmitter NAAG, thereby liberating amino acid glutamate, which plays an important role in a number of pathological conditions, such as, brain stroke neuronal damage, diabetic neuropathy, Alzheimer's disease, etc. The animal experiments confirmed that GCPII indeed is an important pharmaceutical target for the development of new neuroprotective drugs. In the IOCB we succeeded in preparing recombinant GCPII by expression in insect cells, characterised it enzymologically, developed novel sensitive monoclonal antibodies and, in collaboration with a German team, solved the three-dimensional structure of the enzyme. The structure of this important pharmaceutical target will be used for a rational design of novel neuroprotective drugs based on GCP II inhibition.



Schematic view of the 3D-structure of GCPII dimer showing its position on the plasma membrane and the epitopes of important specific monoclonal antibodies

Mesters, J. R., Bařinka, C., Li, W., Tsukamoto, T., Majer, P., Slusher, B., Konvalinka, J. and Hilgenfeld, R.: Structure of Glutamate Carboxypeptidase II, a Drug Target in Neuronal Damage and Prostate Cancer. *EMBO J.* **25**: 1375–1384 (2006)
Šácha, P., Zámečník, J., Bařinka, C., Hlouchová, K., Vícha, A., Mlčochová, P., Hilgert, I., Eckschlager, T. and Konvalinka, J.: Expression of Glutamate Carboxypeptidase II in Human Brain. *Neuroscience* (in press) doi:10.1016/j.neuroscience.2006.10.022
Hlouchová, K., Bařinka, C., Klusák, V., Šácha, P., Mlčochová, P., Majer, P., Rulíšek, L. and Konvalinka, J.: Biochemical characterisation of human glutamate carboxypeptidase III. *J. Neurochem.* (in press) doi:10.1111/j.1471–4159.2006.04341.x

5 • Biological and Medical Sciences

Research objectives

The section includes seven institutes whose research objectives were as follows:

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

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 organisms • Institute of Molecular Genetics

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

List of studies

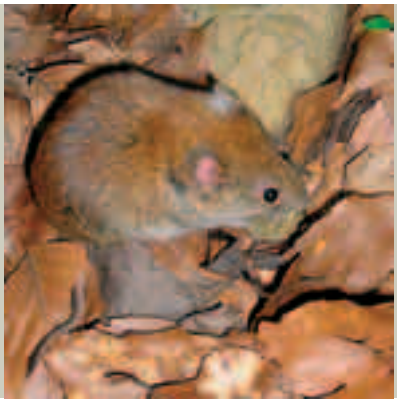
1. DNA signals of past climate change (Institute of Animal Physiology and Genetics)
2. The importance of Aurora B activity and histone H3 phosphorylation in chromosome condensation during meiotic maturation of porcine oocytes (Institute of Animal Physiology and Genetics)
3. Apoptosis in odontogenesis (Institute of Animal Physiology and Genetics)
4. Ribosomal RNA Kink-turn motif as a flexible molecular hinge (Institute of Biophysics)
5. "Multicolor" electrochemical labeling of DNA with osmium tetroxide complexes (Institute of Biophysics)
6. Proliferative effects of polycyclic aromatic hydrocarbons and their role in tumor promotion (Institute of Biophysics)
7. Inverted repeats as molecular switches of genetic activity (Institute of Biophysics)
8. Exocyst in plants (Institute of Experimental Botany)
9. Trichloracetic acid in forest ecosystem (Institute of Experimental Botany)
10. Individual susceptibility and DNA repair in the cascade of genotoxic/carcinogenic events (Institute of Experimental Medicine)
11. Biodegradable polymer macroporous hydrogels for the therapy of spinal cord injury (Institute of Experimental Medicine)
12. Yeast plasma membrane compartmentalization (Institute of Microbiology)
13. Comblike dendrimers containing Tn antigen modulate natural killing to induce the production of Tn specific antibodies (Institute of Microbiology)
14. HIC1 attenuates Wnt signaling by recruitment of TCF-4 and β-catenin to the nuclear bodies (Institute of Molecular Genetics)
15. Na^+/H^+ antiporters of lower eukaryots (Institute of Physiology)
16. The role of protein kinase C-δ isoform in cardioprotection induced by chronic hypoxia (Institute of Physiology)
17. Mechanisms of secretion and excitability of pituitary cells (Institute of Physiology)

Illustrative abstract

DNA signals of past climate change • Institute of Animal Physiology and Genetics

There is controversy and uncertainty on how far north there were glacial refugia for temperate species during the Pleistocene glaciations, and the extent of the contribution of such refugia to present-day populations. We examined these issues using phylogeographic analysis of a European woodland mammal, the bank vole (*Clethrionomys glareolus*). A Bayesian coalescence analysis indicates that a bank vole population survived the height of the last glaciation in the vicinity of the Carpathians, a major central European mountain chain well north of the Mediterranean areas typically regarded as glacial refugia for temperate species. Parameter estimates from the fixed isolation with migration model show that the divergence of the Carpathian population started at least 22,000 years ago, and it was likely followed by only negligible immigration from adjacent regions, suggesting the persistence of bank voles in the Carpathians through the height of the last glaciation. On the contrary, there is clear evidence of a gene flow out of the Carpathians, demonstrating the contribution of the Carpathian population to the colonization of Europe after the Pleistocene. These findings are consistent with data

from animal and plant fossils recovered in the Carpathians, and provide the clearest phylogeographic evidence to date of a northern glacial refugium for temperate species in Europe.



Bank voles are a perfect model species for studying past climate change

Kotlík, P., Deffontaine, V., Mascheretti, S., Zima, J., Michaux, J. R., Searle, J. B. (2006): A nothern glacial refugium for bank voles (Clethrionomys glareolus). *PNAS,* **103**: 14860–14864

Illustrative abstract

Individual susceptibility and DNA repair in the cascade of genotoxic/carcinogenic events
• Institute of Experimental Medicine

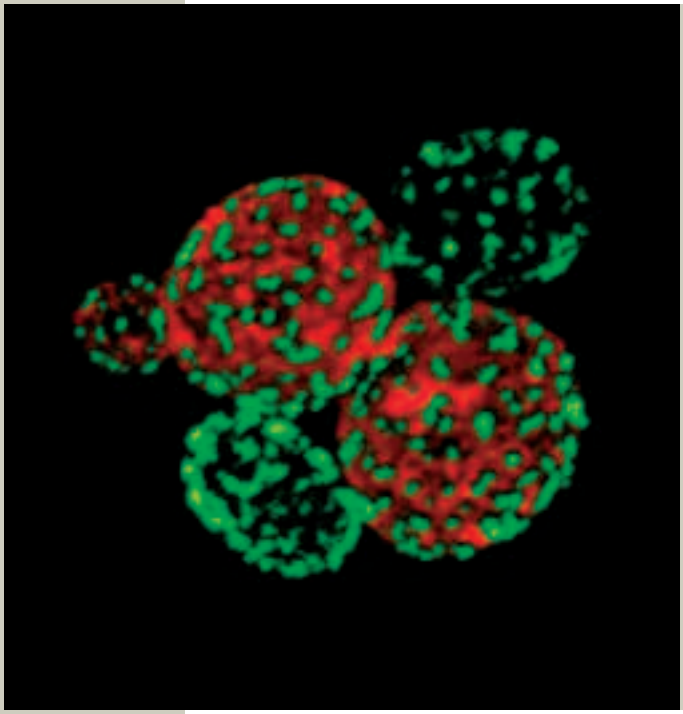
DNA repair processes play a key role in maintaining genomic integrity and preventing mutagenicity and/or carcinogenicity. DNA repair pathways may be divided, as follows: 1) the nucleotide excision repair (NER); 2) the base excision repair (BER); 3) non-homologous end joining (NHEJ) or homologous recombination (HRR) depending on the cell stage; and 4) DNA mismatch repair (MMR). Several DNA repair genes were found to be polymorphic. Polymorphisms in coding and regulatory sequences may result in subtle structural alterations in DNA repair enzymes, but the relationship between the DNA repair genotype and the functional outcome is unknown. We investigated associations between polymorphisms in DNA repair genes and the BER capacity. Individuals with a *XRCC1* Arg399Gln homozygous variant genotype exhibited significantly decreased DNA repair rates. The capacity to repair oxidative DNA damage was decreased in individuals with a *hOGG1* Ser326Cys homozygous variant genotype. Increasing numbers of variant alleles in *XRCC1* Arg399Gln, Arg194Trp and Arg280His and *APE1* Asp148Glu, in combination, resulted in a significant decrease in DNA repair rates, whereas combined variant alleles of *hOGG1* Ser326Cys and *APE1* Asp148Glu resulted in decreased repair of DNA oxidative damage. In mice, DNA repair activity gradually increases during subacute exposure to butadiene after days 7 and 28 of exposure, reaching a maximum on day 1 after the termination of exposure and returning to control levels on day 28 after the exposure. We observed a concentration-dependent decrease in DNA damage and a simultaneous increase in BER capacities. BER capacities seemed to be induced in relation to styrene exposure in humans. Genotoxic and carcinogenic risks need to be assessed in the context of individual susceptibility, including the functional capacity of DNA repair.

Vodička P, Štětina R, Šmerák P, Vodičková L, Naccarati A, Bárta I, Hemminki K. Micronuclei, single-strand breaks in DNA and DNA repair activity in mice exposed to 1,3-butadiene by inhalation. *Mutat Res* **608**:49–57. IF=2.188 (2006)
Vodička P, Štětina R, Poláková V, Tulupová E, Naccarati A, Vodičková L, Kumar R, Hánová M, Pardini B, Slyšková J, Mušák L, De Palma G, Souček P, Hemminki K. Association of DNA repair polymorphisms with DNA repair functional outcomes in healthy human subjects. *Carcinogenesis* Oct 6 [Epub prior to print]. IF=5.108 (2006)
Vodička P, Koskinen M, Naccarati A, Oesch-Bartlomowicz B, Vodičková L, Hemminki K, Oesch F. Styrene metabolism, genotoxicity, and potential carcinogenicity. *Drug Metabolism Reviews,* **38**:1–49. IF=5.153 (2006)

Illustrative abstract

Yeast plasma membrane compartmentalization • Institute of Microbiology

Important results with a key impact on understanding of plasma membrane arrangement in eukaryotic cells have been achieved in cooperation with the Institute of Cell Biology and Plant Physiology at Regensburg University. It was documented that integral plasma membrane proteins are not distributed homogenously, but most of them form clusters which can be observed by means of fluorescence confocal microscopy. Using this method, the existence of at least three compartments in the plasma membrane of yeast has been demonstrated. One of them is inhabited mainly by proton symporters (e.g., Can1p); the other compartment forms a complementary network to the first one and hosts the most abundant plasma membrane protein, H+/ATPase Pma1p. The third compartment is represented by proteins, such as, glucose facilitator, which are homogenously distributed. While the distribution of some plasma membrane proteins can be affected, e.g., by lipid composition or de-energization, the distribution of other proteins is strikingly stable.



Three-dimensional reconstruction of distribution of Can1-GFP (green) and H^+/ATPase-RFP (red) fusion proteins in the plasma membrane of *Saccharomyces cerevisiae* as visualized by confocal microscopy

Grossmann G., Opekarova M., Novakova L., Stolz J., Tanner W.: Lipid raft-based membrane compartmentation of a plant transport protein expressed in Saccharomyces cerevisiae. *Eukaryot.* Cell **5**, 945–953 (2006)
Grossmann G., Opekarova M., Malinsky J., Weig-Meckl I., Tanner W.: Membrane potential governs lateral segregation of plasma membrane proteins and lipids in yeast. *EMBO J.* **26**:1–8 (2007).

Illustrative abstract

HIC1 attenuates Wnt signaling by recruitment of TCF-4 and β-catenin to the nuclear bodies • Institute of Molecular Genetics

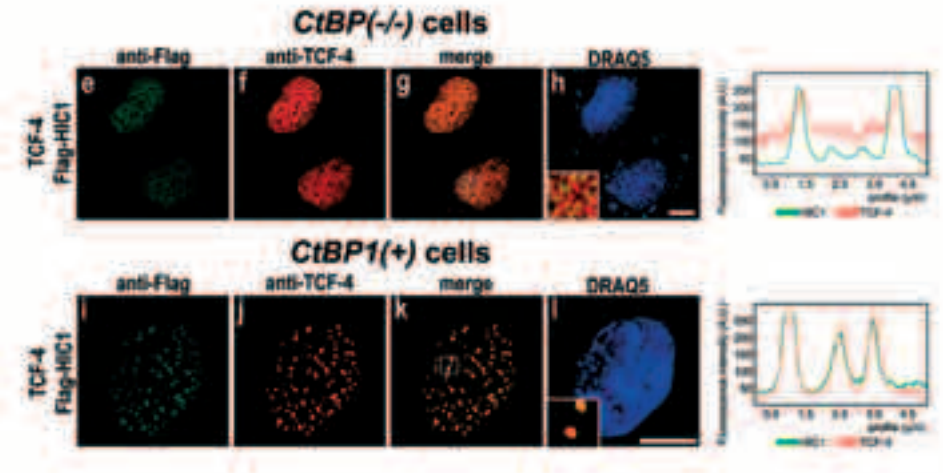
Wnt signaling pathway represents one of crucial molecular mechanisms controlling many cellular and developmental processes, including cell determination, stem cell survival and organogenesis. Moreover, aberrant activation of this pathway is related to deregulated cell growth and cancerogenesis. The central player in the Wnt cascade is β-catenin, a cytoplasmic protein with structural and signaling functions. In the absence of Wnt signals, most of endogenous β-catenin is localized as a component of

adherent junctions, and newly synthesized β-catenin is phosphorylated and targeted for degradation. Binding Wnt ligand to its receptor complex leads to a series of events that ultimately inhibit the degradation of β-catenin.

The result of this inhibition is stabilization of β-catenin, which accumulates in the cell and translocates into the nucleus, where it cooperates with transcription factors of the TCF/LEF family to initiate transcription of Wnt-specific target genes. The transcription activity of TCF/β-catenin complexes can be affected by interaction with several proteins. In this paper we describe protein HIC1 as an important modulator of the Wnt signaling cascade. HIC1 (Hypermethylated In Cancer 1) gene was identified as candidate tumor suppressor gene, frequently epigenetically silenced or deleted in different types of solid tumors. HIC1 encodes a zinc finger transcription factor that belongs to a group of proteins known as the BTB/POZ family. When expressed, HIC1 protein is localized in the nucleus in specific dot-like structures (HIC bodies).

We showed that HIC1 can interact directly with a Wnt signaling pathway effector – transcription factor TCF-4 – both *in vitro* and *in vivo*. HIC1 also relocates TCF-4 to HIC-bodies and the effectiveness of this relocation is partially dependent on the structural role of CtBP transcriptional co-repressors, which were previously described as important inhibitors of Wnt signaling. We further demonstrated that HIC1 represses transcription of several Wnt-specific target genes in different mammalian cell lines and this repression is independent of the inhibitory activity of CtBP proteins. According to chromatin immunoprecipitation data we discovered that the repressive activity of HIC1 is based on relocation of either TCF-4 alone or TCF-4/β-catenin complexes into HIC bodies, which results in the uncoupling of TCF-4 from Wnt-specific promoters.

In conclusion, we suppose that hyperactivity of the Wnt/β-catenin pathway might contribute to the development of tumors in cells where the expression of HIC1 is epigenetically inactivated.



TCF-4 and HIC1 form nuclear protein complexes in mammalian cells

Simultaneous interaction between CtPB, TCF-4 and HIC1 is essential for the efficient nuclear sequestration of TCF-4 into the HIC1 bodies. Confocal microscopy images of CtBP(-/-) (no CtBP expression) and CtBP1(+) (expressing CtBP1) cells transfected with the indicated constructs (left) and stained with anti-Flag and anti-TCF4 antibody. The right panel shows the overlap of fluorescence intensity peaks along profiles as indicated in the merged micrographs. The nuclear sequestration of TCF-4 by HIC1 is less efficient in CtBP(-/-) than in CtBP(+) cells

Valenta, T., Lukas, J., Doubravska, L., Fafilek, B., Korinek, V.: HIC1 attenuates Wnt signaling by recruitment of TCF-4 and beta-catenin to the nuclear bodies. EMBO J. 25(11):2326-37 (2006)

Illustrative abstract

Na^+/H^+ antiporters of lower eukaryots • Institute of Physiology

Systems transporting Na^+ cations against protons by an antiport mechanism exist in all organisms. In eukaryotic cells, they seem to have many important physiological functions. The construction of *S. cerevisiae* mutants lacking different potassium and/or sodium transporters [1] make possible the heterologous expression and functional characterization of a variety of plasma-membrane Na^+/H^+ antiporters from different hemiascomycetes. In some species, only one type of the antiporter mediates the efflux of all alkali metal cations [2,3] whereas other species posess two antiporters with a different affinity for potassium and sodium cations [4,5]. Using site-directed mutagenesis, we have identified amino-acid residues important for transport activity and substrate specificity. Two hydroxyl residues (Ser 140, Thr 151) and highly conserved Pro145 of the 5th transmembrane domain are crucial for substrate recognition and binding [3,6]. Detailed studies of *Sc*Nha1 antiporter's physiological functions revealed that its activity is involved, besides detoxification (export of Na^+ and Li^+ cations), in 1) maintenance of potassium homeostasis; 2) regulation of intracellular pH, cell volume and membrane potential; and 3) in cell response to osmotic shock [7,8].

1. Marešová L., Sychrová H. Physiological characterization of *Saccharomyces cerevisiae kha1*deletion mutants. *Molec. Microbiol.* **55**, 588–600 (2005).
2. Velková K., Sychrová H. The *Debaryomyces hansenii NHA1* gene encodes a plasma membrane alkali-metal-cation antiporter with broad substrate specificity. *Gene* **369**, 27–34 (2006)
3. Kinclová-Zimmermannová O., Zavřel M., Sychrová H. Identification of conserved prolyl residue important for transport activity and the substrate specificity range of yeast plasma membrane Na^+/H^+ antiporters. *J. Biol. Chem.* **280**, 30638–30647 (2005)
4. Papoušková K., Sychrová H, *Yarrowia lipolytica* possesses two plasma membrane alkali metal cation/H^+ antiporters with different functions in cell physiology. *FEBS Lett.* **580**, 1971–1976 (2006)
5. Papoušková K., Sychrová H *Schizosaccharomyces pombe* possesses two plasma membrane alkali metal cation/H^+ antiporters differing in their substrate specificity. *FEMS Yeast Res.* **7**, in press (http://www.blackwell-synergy.com/doi/abs/10.1111/j.1567-1364.2006. 001 78.x) (2007)
6. Kinclová-Zimmermannová O., Zavřel M., Sychrová H. Importance of the seryl and threonyl residues of the fifth transmembrane domain to the substrate specificity of yeast plasma membrane Na^+/H^+ antiporters. *Mol. Membr. Biol.* **23**, 349–361(2006).
7. Kinclová-Zimmermannová O., Gášková D., Sychrová H. The Na^+,K^+/H^+-antiporter Nha1 influences the plasma membrane potential of *Saccharomyces cerevisiae*. *FEMS Yeast Res.* **6**, 792–800 (2006)
8. Kinclová-Zimmermannová O., Sychrová H., Functional study of the Nha1p C-terminus: involvement in cell response to changes in extrenal osmolarity. *Curr. Genetics* **49**, 229–236 (2006)

Research objectives

6 • Bio-Ecological Sciences

The section is comprised of four establishments with the following research objectives:

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

The structure, functioning and development of aquatic ecosystems • Biology Centre

Parasitism and parasite-host relationships at the organismal, cellular and molecular levels • Biology Centre

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

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

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 Průhonice Park • Institute of Botany

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

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

List of studies

1. Why are there so many species of insects in tropical rainforests? (Biology Centre)
2. Antagonistic and synergistic effects of protistan grazing and viral lysis on the production and community composition of bacterioplankton (Biology Centre)
3. A nuclear receptor specifies cell fate (Biology Centre)
4. Emissions of nitrous oxide and methane from pasture soils (Biology Centre)
5. Revision of tapeworms of the order Pseudophyllidea (Cestoda): a phylogenetic analysis inferred from morphological, life-cycle and sequence data (Biology Centre)
6. Significant expansion of *Vicia pannonica* genome size mediated by amplification of a single type of giant retroelement (Biology Centre)
7. Biogeographical approach to plant invasions and processes underlying the naturalization of alien plants (Institute of Botany)
8. The role of arbuscular mycorrhiza in contaminated and degraded soils (Institute of Botany)
9. Population dynamics of plants and its importance for understanding species performance in the landscape (Institute of Botany)
10. Protein flexibility acclimatizes photosynthetic energy conversion to the ambient temperature (Institute of Systems Biology and Ecology)
11. Historical and contemporary selection of major histocompatibility complex genes in cyclic rodents (Institute of Vertebrate Biology)
12. Evolutionary forces affecting birds' breeding strategies (Institute of Vertebrate Biology)
13. Migratory birds and avian influenza A virus H5N1 — its spread in Eurasia and possible introduction to America and continental dispersal (Institute of Vertebrate Biology)

Illustrative abstract

Why are there so many species of insects in tropical rainforests? • Biology Centre

Why there are so many species and what ecological mechanisms permit their coexistence are among the oldest, but still unanswered, questions in biology today. Temperate and tropical forests are so different from each other that their meaningful comparison is difficult. We have developed a new method for standardized comparisons between sets of species characterized by virtually identical phylogenetic relationships (i.e., topography of cladograms based on molecular data). We then used two such sets of 15 tree species, one from a floodplain forest in the Czech Republic and another from rainforests of New Guinea for the analysis of their herbivorous insects. We found that species richness of herbivorous insects per tree species was identical between the temperate and tropical forests. The extraordinary richness in species of tropical insects is thus probably driven by a high diversity of tropical vegetation, rather than finer division of resources among species of herbivores within a particular host plant. Our study was reported in the international press (e.g., The New York Times) and Science commented on it as important progress in the study of insect ecology (Kitching, 2006, Science 313:1055).

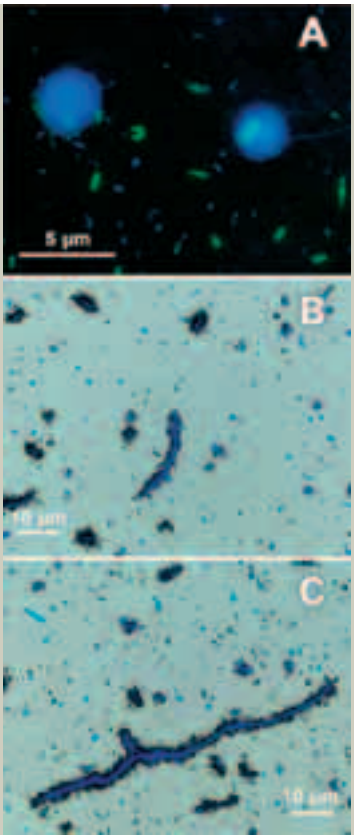
Novotny, V., Drozd, P., Miller, S. E., Kulfan, M., Janda, M., Basset, Y., Weiblen, G. D. (2006) Why are there so many species of herbivorous insects in tropical rainforests? *Science* **313**: 1115–1118. [IF 30.93]

Comparison of caterpillars from temperate and tropical trees with identical phylogenetic relationships

Illustrative abstract

Antagonistic and synergistic effects of protistan grazing and viral lysis on production and community composition of bacterioplankton • Biology Centre

Protistan bacterivory and lysis of bacterial cells by specific viruses, bacteriophages, are two of the most important factors responsible for shaping the dynamics and community composition of bacterioplankton in aquatic ecosystems. Since phages and flagellates consume or attack the same prey — bacterial cells, antagonistic interactions between these two mortality sources may be expected. However, our current research activities have brought surprising new findings. The selective grazing of protists on particular groups of bacteria induced significant shifts in the taxonomic composition of bacterioplankton towards the dominance of only a few phylotypes, either one capable of very fast growth or of filament formation.



(A) Bacterioplankton and heterotrophic flagellates in an epifluorescence microscope — two large blue spots (3—4 µm across) are cells of flagellates, green-stained bacterial cells are those that hybridized with a specific genetic probe both outside and inside of food vacuoles of the flagellates.
(B and C) Microautoradiography combined with epifluorescence microscopy to visualize active bacterial cells. Length and relative activity of filaments (corresponding to the amount of black silver grains adjacent to the filament) of the genus *Flectobacillus* was generally smaller in the treatment with flagellates only (B) compared to the treatment enriched with both flagellates and viruses where longer and more active filaments developed (C).

Since phages do not typically trespass genus boundaries and since phage infection is density-dependent, the grazing-induced bacterioplankton community shift could stimulate activity of the host-specific bacteriophages whose proper hosts overgrow in the system. Thus, instead of the assumed antagonism between these two mortality sources, their partial synergy through the stimulation of certain groups of bacteriophages has been found.

An analysis of a series of *in situ* experiments conducted in the Římov reservoir revealed evidence that under certain circumstances protistan bacterivory and virus lysis indeed can act synergistically. The interplay of both mortality factors caused a rapid increase in the abundance of filament forming bacteria of the genus *Flectobacillus*, which were apparently both grazing- and virus-resistant. By contrast, some bacterial groups vulnerable to virus infection were significantly suppressed and that led to decreased competition for limiting substrates and accelerated growth of the *Flectobacillus* filaments.

Šimek, K., Horňák, K., Jezbera, J., Mašín, M., Nedoma, J., Gasol, J. M. Schauer, M.: Influence of top-down and bottom-up manipulations on the R-BT065 subcluster of β-proteobacteria, an abundant group in bacterioplankton of a freshwater reservoir. *Appl. Environ. Microbiol.* **71**: 2381–2390 (2005)
Jezbera, J., Horňák, K., Šimek, K.: Food selection by bacterivorous protists: insight from the analysis of the food vacuole content by means of Fluorescence In Situ Hybridization. *FEMS Microbiol. Ecol.* **52**: 351–363 (2005)
Horňák, K., Mašín, M., Jezbera, J., Bettarel, Y., Nedoma, J., Sime-Ngando, T., Šimek, K.: Effects of decreased resource availability, protozoan grazing and viral impact on a structure of bacterioplankton assemblage in a canyon-shaped reservoir. *FEMS Microb. Ecol.* **52**: 315-327. (2005)
Jezbera, J., Horňák, K., Šimek K.: Prey selectivity of bacterivorous protists in different size fractions of reservoir water amended with nutrients. *Environ. Microbiol.* **8**: 1330-1339 (2006)
Šimek K., Hornák K., Jezbera J., Nedoma, J., Vrba, J., Straškrábová, V., Macek, M., Dolan, J. R., Hahn M. W.: Maximum growth rates and possible life strategies of different bacterioplankton groups in relation to phosphorus availability in a freshwater reservoir. *Environ. Microbiol.* **8**: 1613–1624 (2006)
Horňák, K., Jezbera, J., Nedoma, J., Gasol, J.M., Šimek, K.: Bacterial leucine incorporation under different levels of resource availability and bacterivory in a freshwater reservoir. *Aquat. Microb. Ecol.* **45**: 277–289 (2006)
Weinbauer, M. G., Horňák K., Jezbera J., Nedoma, J., Dolan, J. R., Šimek K.: Synergistic and antagonistic effects of viral lysis and protistan grazing on bacterial biomass, production and diversity. (*Environ. Microbiol., online publication doi:10.1111/j. 1462-2920.2006.01200.x*) (2007)
Šimek K., Weinbauer, M. G., Horňák, K., Jezbera J., Nedoma, J., Dolan J. R. Grazer and virus-induced mortality of bacterioplankton accelerates development of Flectobacillus populations in a freshwater community. (*Environ. Microbiol., online publication doi:10.1111/j.1462-2920.2006.01201.x*) (2007)

Illustrative abstract

Biogeographical approach to plant invasions and processes underlying the naturalization of alien plants
• Institute of Botany

Integration of hypotheses and theories explaining the ability of plant species to invade and vulnerability of regions/ecosystems to invasion is necessary for achieving progress in the theory of plant invasions; so far, these two facets were mostly considered separately [2, 3]. The biogeographical approach is a convenient tool for exploring the principles of naturalization (i.e., the ability of a species to sustain viable populations in the target area without the help of humans [1]. A global analysis of naturalization patterns shows that temperate mainland areas are invaded more often than tropical mainlands are, but islands in the tropics suffer as much as islands in the temperate zone. Naturalization success decreases with latitude, indicating that for plant species it is easier to become naturalized in warmer climates. So far, studies used the number of naturalized species as a measure of naturalization success in a given region; in our paper [1], we were the first who used a relative measure, i.e., a percentage of the total number of alien plants introduced to the region that became successfully naturalized. This made it possible to reveal patterns that would otherwise remain hidden (Fig. 1)

Together with climate, propagule pressure (the number of propagules that are introduced to the target, i.e., invaded region) and residence time also crucially affect naturalization success. Working on a

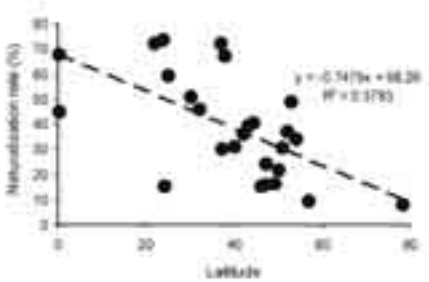


Fig. 1. Based on data from 27 regions of the world, this figure documents that the naturalization rate (a relative measure of naturalization success based on the percentage of naturalized species of all introduced) decreases with latitude. If the number of naturalized species is plotted instead of the naturalization rate, the pattern disappears [1]

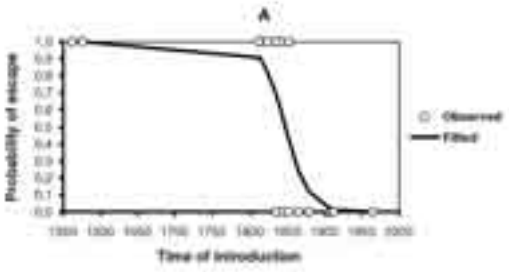


Fig. 2. The time for which the woody species has been planted (residence time) for forestry purposes in the Czech Republic has a decisive influence on the probability of escape from cultivation, which is the first stage of the invasion process. For species that were introduced before 1800, there is a 95% probability of escape [5]

regional scale allows for a more precise evaluation of these factors. The approach adopted in our study was novel in that we worked with a source species pool (the vast majority of studies rely on plants in a target region, recruited from an unknown species pool). Further, by focusing on woody plants we reduced potential bias associated with life forms [4].

Woody plants introduced to the Czech Republic for forestry purposes several centuries ago have a significantly higher probability of escape from cultivation and subsequent naturalization than those introduced later (Fig. 2). The relative importance of residence time (i.e., time for which a species has been planted in CR) is significantly higher than that of the extent of planting (i.e., a proxy for propagule pressure). The paper indicates that forestry is an important historical pathway of alien plant invasions. Another study, using 180 woody species planted in the Czech Republic [5], showed that invasive behavior can be predicted based on species traits, and concluded that a prediction scheme developed in Australia can be successfully used in the temperate zone of Central Europe.

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[5] Křivánek M., Pyšek P., Jarošík V. 2006. Planting history and propagule pressure as predictors of invasions by woody species in a temperate region. *Conserv. Biol.* **20**: 1487–1498.
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Illustrative abstract

Protein flexibility acclimatizes photosynthetic energy conversion to the ambient temperature
• Institute of Systems Biology and Ecology

Physicochemical paradigms predict that rates of imperative reaction steps in photosynthetic reaction centres will increase exponentially with rising temperatures, resulting in different yields of solar energy conversion at the distinct growth temperatures of photosynthetic mesophiles and extremophiles. We have shown a meticulous adjustment of energy conversion rate, resulting in similar maximal yields from mesophiles and thermophiles. The key molecular players in the process consist of a cluster of hitherto unrecognized protein cavities and an adjacent packing motif that jointly impart local flexibility crucial to the reaction centre proteins. Mutations within the packing motif of mesophiles that increase the bulkiness of the amino-acid side chains, and thus reduce the size of the cavities, promote thermophilic behavior. This novel biomechanical mechanism accounts for slowing the reaction above physiological temperatures in contradiction to the classical Arrhenius paradigm. The mechanism provides new guidelines for manipulating the acclimatization of enzymes to a wide range of temperatures.

Oksana Shlyk-erner, Ilan Samish, David Kaftan, Neta Holland, P. S. Maruthi Sai, Hadar Kless & Avigdor Scherz *Nature* **442** (7104), 17. August 2006, pp. 827–830

Illustrative abstract

Historical and contemporary selection of major histocompatibility complex genes in cyclic rodents
• Institute of Vertebrate Biology

Host-pathogen interactions are of particular interest in the understanding of the interplay between population dynamics and natural selection. The genes of the major histocompatibility complex (MHC) of demographically fluctuating species are extremely suitable markers for this purpose because they are involved in the initiation of the immune response against pathogens, and they exhibit high levels of adaptive genetic variation. By using the optimised single strand conformation polymorphism (SSCP) analysis method which involves capillary electrophoresis, cloning, and sequencing, we analysed allelic variation of the MHC Class II DQA gene in voles. For the first time within rodents, we documented the duplication of this gene in three arvicolid rodents with both paralogs being transcriptionally active. Analysis of sequences evidenced that positive historical selection acted very intensively on antigen-binding sites of MHC molecules. By comparing the neutral genetic structure of seven populations (estimated from 14 microsatellites) with that estimated from two MHC genes (DQA1 and DRB), we identified the type and intensity of the contemporary selection acting on MHC genes. In the year of low density, overall differentiation patterns of both MHC genes were more pronounced than at neutral markers suggesting the action of local selection in fragmented populations. With increasing density differences between MHC and neutral markers progressively gone and in the high-abundance year, overall differentiation for the DQA1 gene became even significantly lower than those of neutral markers, suggesting the action of balancing selection. Spatial and temporal fluctuations in parasite pressure are proposed as the most plausible mechanism inducing observed changes in contemporary selection pattern during demographic cycle.

Bryja J., Galan M., Charbonnel N., Cosson J.-F.: Duplication, balancing selection and trans-species evolution explain the high levels of polymorphism of the DQA MHC class II gene in voles (Arvicolinae). *Immunogenetics*, **58**: 191–202 (2006)
Bryja J., Charbonnel N., Berthier K., Galan M., Cosson J.-F.: Density-related changes in selection pattern on major histocompatibility complex genes in fluctuating populations of voles. Submitted to *Molecular Ecology*

7 • Social and Economic Sciences

Research objectives

The section is comprised of five institutes with the following research objectives:

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

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

Sociological analysis of long-term social processes in Czech society in the context of European integrational policies, development of a 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

Development of an infrastructure for science and research. Retrospective historical bibliography: The History of books and libraries in the Czech Lands up to 1800 • Library of the ASCR

List of studies

1. Problems of measuring the underground economy in transition (Economics Institute)
2. Wages in a growing Russia: When is a ten percent rise in the gender pay gap good news? (Economics Institute)
3. Sealed-bid auctions with ambiguity: Theory and experiments (Economics Institute)
4. Computer-based tests: The impact of test design and the problem of equivalency (Institute of Psychology)
5. Methodology of psychological research: Consilience in diversity (Institute of Psychology)
6. Unequal chances in education: Educational inequalities in the Czech Republic (Institute of Sociology)
7. The life cycle. Sociological and demographic perspectives (Institute of Sociology)
8. Multiple voices: negotiating women's spaces after 1989 (Institute of Sociology)
9. Modernization of public administration in Europe and in the Czech Republic (Institute of State and Law)
10. Comments on selected judgments of the Court of Justice of European Communities (Institute of State and Law)
11. Factors influencing the application of EC law by the courts of member states (Institute of State and Law)
12. The Martinicka Bible and its journey from the 15th to the 21st century (Library of the ASCR)

Illustrative abstract

Problems of measuring the underground economy in transition • Economics Institute

Economists and policy makers often try to estimate the size of the informal economy, which is important for measuring the effects of policies directed at increasing the share of the formal sector on total economic activity. An easy and popular method for measuring the size of the underground economy is to use macro data such as money or electricity demand to infer what the legitimate economy needs, and then to attribute the remaining consumption to the underground economy. Such inferences rely on the stability of the parameters of money demand and electricity demand equations, or at very least on the knowledge of how these parameters are changing. We argue that the pace of change of these parameters (such as velocity) is too variable in transition economies for these methods of estimating the size of the underground economy to be applicable. We make our point by using the Czech Republic and other transition country data from the financial and electricity sectors.

Hanousek, J., Palda, F. "Problems of Measuring the Underground Economy in Transition", *Economics of Transition*, **14**, 4: 707–718 (2006). (C)

Illustrative abstract

Methodology of psychological research: Consilience in diversity • Institute of Psychology

Recent psychological research is characterized by the diversity of its methodological approaches. At the same time, any method is considered the only means to gain knowledge. The book illustrates this state of art with a collection of original Czech studies which deal with both general methodological matters and particular methods, with mathematical and statical procedures and linking of quantitative and qualitative methodology. The monograph is based on papers read at a conference in memory of Doc. PhDr. Lída Osecká, CSc., director of PSU CAS in the years 1993–1999.

Blatný, M. (ed.): *Metodologie psychologického výzkumu: konsilience v rozmanitosti.* Praha, Academia. (2006), 138 pp., ISBN 80-200-1450-0

Illustrative abstract

Unequal chances in education: Educational inequalities in the Czech Republic • Institute of Sociology

The Czech Republic is a country with the greatest inequalities in terms of chances to get a higher education. Children from more educated and socially advantaged families systematically receive education of a better quality and higher level than those from poorer and less educated families regardless of the talent and ability. In developed countries addressing the same issue, many studies have been published on the causes of these inequalities, striving to provide a solution to the issue. However, *Unequal chances in education* is the first monograph of its kind published in the Czech Republic after 1989. A team of experts led by Petr Matějů and Jana Straková offer an analytical view of the causes of the enormous social inequalities for young Czechs to obtain higher education in this country.

The monograph is divided into three parts. The first part, *"The context: Educational inequalities through a theoretical and historical lens, international comparison of the development of educational inequalities",* introduces major theories of the causes of educational inequalities in the context of social justice theories with an emphasis on the social-psychological model of social stratification, and presents the results of an analysis of a long-term development of educational mobility, especially during the period of socialism, a comparative view of the Czech educational system, and results of comparative analyses of knowledge and skills of pupils.

The second part, *"The role of the family, school and important social environment in the period of one's formation of study plans: major results from the PISA 2000, PISA 2003 and PISA-L research studies,"* presents analyses of ideas about the role of education in life success and the formation of educational aspirations among adolescents, the influence of the existence of early-entry "gymnasiums" (grammar schools) and the discrepancy between the supply of educational opportunities and the demand for certain types of education in reproducing educational inequalities. Furthermore, it provides an answer to the question of which factors determine parents' and children's decision to choose one of the vocational schools rather than to complete secondary education. In the last part, *"Inequalities in access to higher education",* the authors address the crucial, long-term influence of gender and social coordinates on chances of obtaining higher education, and provide an answer to the question: which factors affect the chances of success in advancing from secondary school to college? They analyze the social profile of first-year college students, costs of study and sources of their funding and opinions of students about potential forms of co-funding.

The chief conclusions consist of the fact that the high level of educational inequalities in the Czech Republic is caused by the selective system of elementary and secondary education which very early on

divides pupils into significantly different educational streams. The education and socio-economic status of parents play a major role in this division. The selectivity of secondary education is influenced by the socio-economic coordinates and downplays the importance of the actual study potential of children. The restricted nature of tertiary education further exacerbates this problem as it reinforces the influence of the type of the secondary school selected and thus the social origin of pupils or their aspirations to continue to study as well as their chances of being accepted to a college. With this, the vicious circle of educational inequality reproduction closes and makes it relatively rigid to any partial changes.

Matějů, P., Straková, J. (eds.): *Nerovné šance na vzdělání. Vzdělanostní nerovnosti v České republice* [Unequal chances in education: Educational inequalities in the Czech Republic]. Prague: Academia. 411 pp. + CD ROM (2006). ISBN 80-200-1400-4.

Illustrative abstract

Modernization of public administration in Europe and in the Czech Republic • Institute of State and Law

The publication is a collection of papers presented at a conference attended by participants from abroad which took place at the Institute of State and Law, Academy of Sciences of the Czech Republic, in November 2005. It also represents the results of the Institute's many years of international co-operation with scientific institutions of Central European region, including the Institute of Legal Sciences of the Polish Academy of Sciences, Institute of Legal Sciences of the Hungarian Academy of Sciences and the Institute of State and Law of the Slovak Academy of Sciences.

The first part of the publication, *On fundamental issues of the reform and modernization of public administration,* deals with the impact of the development of information technology and modern approaches to management in public administration in general on the one hand, and with the present state of and the experience with public administration reform in some European countries on the other. This part of the publication summarizes ongoing state administration reforms which should guarantee effective functioning of public administration, using all communication technologies to eliminate duplicity or multiplicity of official files and to ensure networking of individual information systems enabling reliable, speedy and effective functioning of the whole administrative system.

The second part of the publication deals with the problem of public administration financing from various sources and points out a range of new financing possibilities, such as public and private sectors partnership. The principal contribution of this part is a novel approach to issues connected with the possibilities of development of territorial self-governing units in the framework of individual regions.

Modernizace veřejné správy v Evropě a České republice [Modernization of Public Administration in Europe and in the Czech Republic]. Eds. Louda, Tomáš — Grospič, Jiří — Vostrá, Lenka. Plzeň, *Aleš Čeněk 2006*. 351 pp

Illustrative abstract

The Martinicka Bible and its journey from the 15th to the 21st century • Library of the ASCR

The Library of the ASCR owns a Latin Bible manuscript, called Martinicka Bible, dating to around 1430. It is unique in that it contains the oldest existing illumination of the Czech reformer John Hus as he was burned at the stake in 1415. From September 2005 till January 2006 the manuscript was exhibited in New York at the exhibition "Prague, The Crown of Bohemia 1347—1437".

Between February and May 2006 it was part of the Prague exhibition "Charles IV, Emperor by the Grace of God". Prior to these exhibitions the Martinicka Bible was fully digitalised. The artist and restorer, David Frank, made a manuscript facsimile consisting of eight sheets. Jarmila Frankova designed the leather binding for the facsimile and the body of the book. She also repaired the backbone of the Martinicka Bible which had previously been damaged by insensible restoration.

The Library of the ASCR presented information about the Martinicka Bible at the exhibition, and its place in history in the context of medieval manuscripts from the 15th to the 21st century. Restoration procedures adhered to by David and Jarmila Frank were also explained.

A complete documentation of this exhibition, including informational texts and photographs, is available on CD-ROM.

Martinická Bible at the exhibition *Charles IV, Emperor by the Grace of God*

Martinická Bible: Initial I – Master John Hus being burnt at the stake, and a depiction of Creation

Anežka Baďurová, Dagmar Hartmanová et al., *The Martinicka Bible and its journey from the 15th to the 21st century*. Restoration procedures made by David and Jarmila Frank. The exhibition was held by the Library of the ASCR from 27 March 2006 to 14 April 2006. CD-ROM. Prague, Library of the ASCR. ISBN 80-86675-07-6

8 • Historical Sciences

The section consists of 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 cultural heritage • Institute of Archaeology in Prague

Research objectives

Research into the history of Czech visual arts in the light of joining the European community
• Institute of Art History

Analysis of Czechoslovak/Czech contemporary history and history of science
• Institute for Contemporary History

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

Research 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, and a prospective strategy for working with electronic documents • Masaryk Institute/Archives

The search for identity: Intellectual and political conceptions of modern Czech society between 1848—1948 • Masaryk Institute/Archives

List of studies

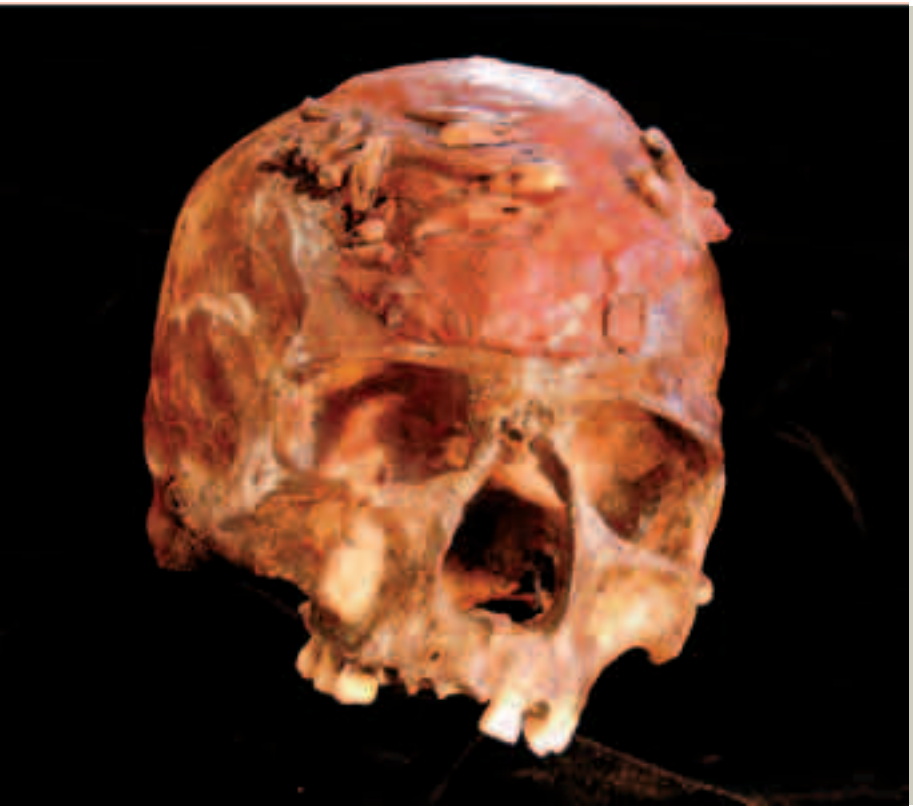
1. Early modern human evolution in Central Europe. The people of Dolní Věstonice and Pavlov (Institute of Archaeology, Brno)
2. The Únětice culture and the Věteřov group in Moravia on the ground of chipped stone material (Institute of Archaeology, Brno)
3. Nechvalín, Prušánky. Four Slavic burial grounds (Institute of Archaeology, Brno)
4. Burials at the Prague Castle and its foregrounds (Institute of Archaeology, Prague)
5. The earliest settlement of South Bohemia (Institute of Archaeology, Prague)
6. The state and prospects of research into Early Medieval settlement agglomerations in Bohemia and Moravia (Institute of Archaeology, Prague)
7. The contributions of "Palaeolithic" and "Neolithic" Y chromosome haplogroups in the Czech population (Institute of Archaeology, Prague)
8. Jan Jiří Heinsch. Painter of Baroque piety (Institute of Art History)
9. Local strategies. International ambitions. Modern art and Central Europe 1918—1968 (Institute of Art History)
10. *Pictura verba cupit*. Essays for Lubomír Konečný (Institute of Art History)
11. The Czech Lands in European history. Volume IV: From 1918 onwards. (Institute for Contemporary History)
12. The powerful? and the helpless? Political élites and dissent during the so-called normalization (Institute for Contemporary History)
13. Poland and Czechoslovakia in 1968 (Institute for Contemporary History)
14. Edvard Beneš. Political biography of the Czech democrat (Institute of History)
15. Between the cross and the nation. Political environment of the Sudeten German Catholicism in the interwar Czechoslovakia (Institute of History)
16. Historical atlas of Czech towns, Vol. 14 (Institute of History)
17. City, war and taxes. Brno in the tax system during the long war with the High Court (1593—1606) (Institute of History)
18. Edvard Beneš. Speeches — articles — interviews 1935—1938 (Masaryk Institute/Archives)
19. Masaryk Miscellany XIII/2004—2006 (Masaryk Institute/Archives)
20. An Invitation to the Masaryk Institute III (Masaryk Institute/Archives)

Illustrative abstract

Early modern human evolution in Central Europe. The people of Dolní Věstonice and Pavlov
• Institute of Archaeology in Brno

This comprehensive publication brings to fruition a long-term Czech-American project, executed in co-operation with Washington University St. Louis and aimed at anthropological evaluation of the oldest

anatomically modern human population of Dolní Věstonice and Pavlov. The study is based on a unique set of skeletal remains of mammoth hunters of the period 25—30 thousand years ago, which were uncovered in the course of long-term research under the Pavlov Hills in South Moravia. Individual chapters written by both Czech and American specialists (J. Svoboda, E. Vlček, E. Trinkaus, S. W. Hillson, T. W. Holliday and others) summarize finding circumstances and relations of individual skeletal findings to the specific situation at the settlement including a complete inventory of graves. It presents a careful and detailed anthropological characterization, e.g., the determination of age and sex, description of individual parts of skeleton, paleo-pathology and also concluding paleo-biological interpretation. The book introduces the mammoth hunters of Dolní Věstonice and Pavlov as a quite homogenous human community with rather robust physique that was accustomed to migrate at long distances together with relatively rich personal furnishings, but the members had a short lifespan. Skeletal remains show conclusively the differences of physique of rather petite women and well-built men, who could not avoid fights with members of other groups of hunters, as seen from healed wounds.



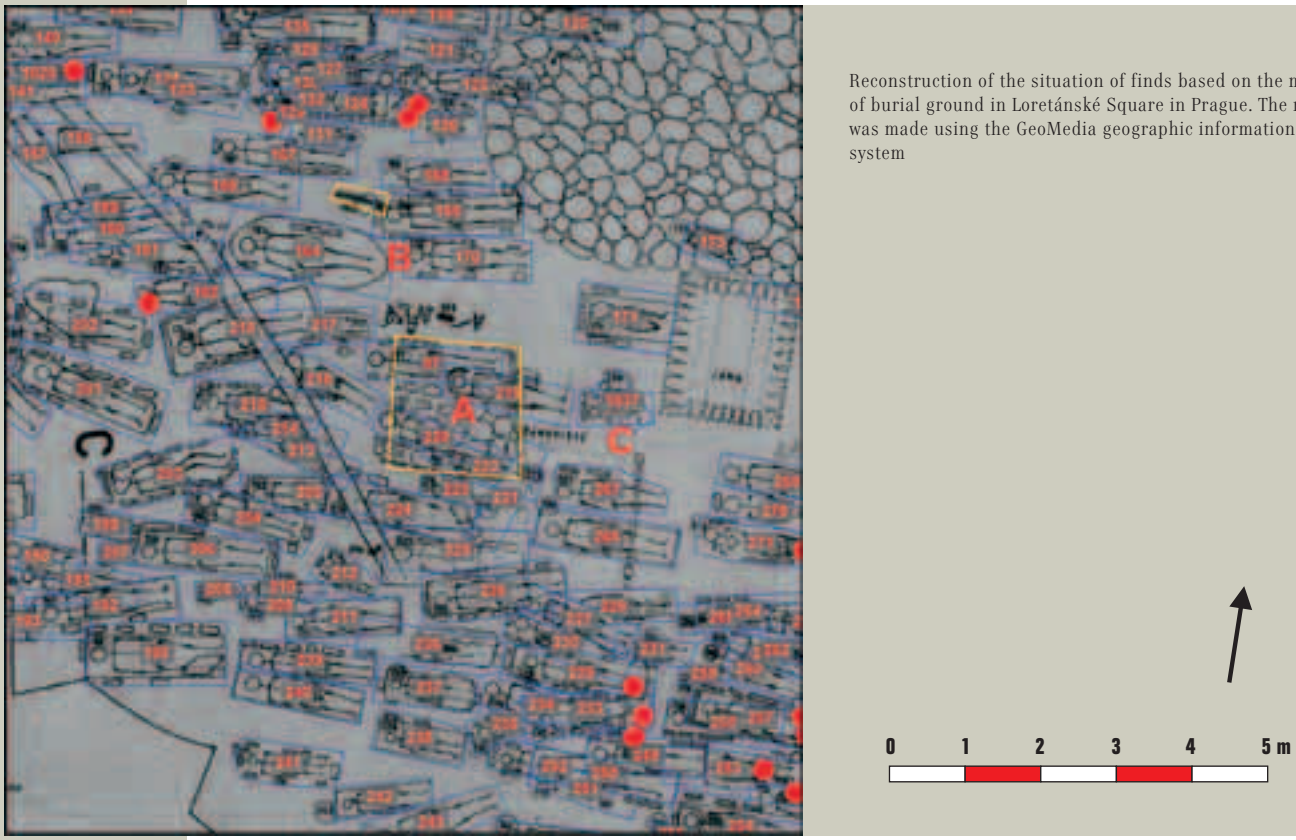
The skull of a man from the triple grave of mammoth hunters in Dolní Věstonice, with preserved remnants of red dye and head decorations made of drilled fox teeth

Trinkaus, E., Svoboda, J., eds.: *Early Modern Human Evolution in Central Europe. The People of Dolní Věstonice and Pavlov. — The Dolní Věstonice Studies 12*, Oxford University Press: 489 pages (2006).

Illustrative abstract

Burials at the Prague Castle and its foregrounds • Institute of Archaeology Prague

The volume presents the Prague Castle not only as a residence of both secular and clerical elite but also as their final resting place between the late 9th century AD and to the present. Attention is paid to the burial rite and equipment of the graves of the elite members as well as other inhabitants of the Castle. This is the result of interdisciplinary teamwork research on metal jewellery and glass beads. The concluding set of papers presents basic information concerning the burial area by the "Jízdárna" (Riding Hall) site.



Reconstruction of the situation of finds based on the map of burial ground in Loretánské Square in Prague. The map was made using the GeoMedia geographic information system

Tomková, K. (ed.): *Pohřbívání na Pražském hradě a jeho předpolích. Díl I.2. Castrum Pragense 7*. Praha 2006.

Illustrative abstract

Jan Jiří Heinsch. Painter of Baroque Piety • Institute of Art History

The proposed monograph and exhibition catalogue on painter J. G. Heinsch (Kladsko 1647–Prague 1712) will appear at an exhibition of his paintings at the Prague Castle. The text includes the artist's biography, an essay commenting on his work from the 18th to 20th century including misuse of his work for the defence of social realism, a chapter on religious images as visual manifestations of his commissioners' faith (Jesuits, Knights of the Red Star) and the didactic function of the images in religious propaganda of Catholic counter-Reformation.Included is a detailed overview of the artist's work, a catalogue of exhibited paintings and his whole oeuvre with a listing of the most important written sources. The text focuses on the artist's work in relation to his patrons, analyses its iconography and links to religious texts and contemporary piety. The book will be an important contribution to our knowledge of the classicist diversion in Czech Baroque art.

Michal Šroněk, *Jan Jiří Heinsch. Malíř barokní zbožnosti,* Gallery Publishers, Management of the Prague Castle, Institute of Art History ASCR, Prague 2006, 192 pp, ISBN 80-86990-03-6

Illustrative abstract

The Czech Lands in European history. Volume IV: From 1918 onwards • Institute for Contemporary History

The fourth volume of the synthetic compilation of the Czech history in the European context focuses mainly on the period of the "short 20th century", but the text continues up to the present time. Thus it deals with numerous current problems that have their origins in modern history. The major

interpretative framework of the book consists of the European history in the sense of principal political, socio-economic and cultural historical trends, as well as an outline of key political ideologies. The book quite naturally reflects the fact that the 20th century European history was more than ever before determined by outside influences such as the global conflagration between the U.S. and the USSR in the Cold War era, but also by events in the United States, the Middle East, etc. Almost half of them were part of the major flow in European developments, that is, primarily in the era of the First Republic (1918–1938) but also during World War II, then passages about Czech history are incorporated into the European context as a typical and detailed example. Yet, in the periods of isolation that culminated in the 1950s and 1970s Czechoslovakia's history is presented as a part of the history of the Eastern bloc. The authors point out the major differences between the development of the Soviet bloc on the one hand and of the countries to the west of the Iron Curtain on the other. The book concludes with chapters about the transformation of East European societies after the fall of Communism and their rapprochement with the European West, as well as reflection of the new challenges that Europe and the Czech Republic for its part face at the beginning of the 21st century.

Cuhra, Jaroslav, Ellinger, Jiří, Gjuričová, Adéla, Smetana, Vít: *České země v evropských dějinách. Díl čtvrtý: 1918–2004*. Praha – Litomyšl, Paseka 2006. 359 pp ISBN 80-7185-794-7

Illustrative abstract

Edvard Beneš. Political biography of the Czech democrat • Institute of History

This is the first of a two-volume project. Its purpose is to give the most comprehensive and detailed mapping and analysis of the political, scholastic and theoretical activities of Edvard Beneš to date. The first chapters of the treatise depict his childhood, youth and political maturing prior to World War I. For the first time it pays attention to his initial strong radical left-wing opinions as they appear in his publications, particularly in several hundred articles in the socialist *Právo lidu* newspaper.

About one quarter of the book deals with Beneš's activities in the first Czechoslovak anti-Austrian resistance during World War I. At first, he established Masaryk's "domestic" organisation, the so-called "Mafia" and later worked as the secretary of the Czechoslovak National Council. In this respect the book looks into his efforts to internationalize the so-called Czech issue, i.e., an effort to enforce division of Austria-Hungary and create a Czechoslovak state. This part of the book closes with the reminder that the Czechoslovak government had been acknowledged even before the actual state was established. It further comments on Beneš's activity at the Paris peace conference where he helped to enforce international recognition of the state's borders.

Edvard Beneš, Political Biography of the Czech Democrat (2006) by Jindřich Dejmek

About half of the book comments on the 17 years when Beneš was in charge of Czech diplomacy. It details the specific foreign policy departments which he managed and their relations with the world powers, i.e., mainly the Western democracies and Germany, and on his activities on the Central and Southeast European scene. Finally his activities in various organs of the United Nations are described. There, Beneš was most able to enforce his concept of collective security in order to safeguard the young republic. The first part of the biography closes with Beneš becoming the second president of the Czechoslovak Republic after years of preparations carried out by T. G. Masaryk.

Jindřich Dejmek, *Edvard Beneš, Political Biography of the Czech Democrat, Part One, Revolutionist and Diplomat (1884–1935),* Prague, Karolinum 2006, 634 pp (ISBN 80-246-1224-0)

Illustrative abstract

Between the Cross and the Nation. Political environment of the Sudeten German Catholicism in interwar Czechoslovakia • Institute of History

This is the first Czech treatise that compiles the history of the Sudeten German Catholicism in the interwar Czechoslovakia. The author discusses the structural, ideological and political development of the German Christian Democratic Party *(Deutsche Christlich-soziale Volkspartei)*. He also comments on the activities of Catholic institutions which presented themselves as non-political institutions, but significantly penetrated into public arena especially in the "30s". The author further pays attention to the efforts to politicize the renaissance of spiritual ideas, which led to the gradual nationalization of the confessional milieu. Attention is also paid to the problems of antidemocratic trends within the Catholic atmosphere in Czechoslovakia and Central Europe and the Catholic response to the emergence of the Nazi totalitarian system in 1933 Germany. The outlook of this ideological trend is presented in the broad context of European Catholicism and its interaction with other Sudeten German parties and ideological camps and Czech Catholic circles.

Between the Cross and the Nation (2006) by Jaroslav Šebek

Jaroslav Šebek, *Between the Cross and the Nation. Political Environment of the Sudeten German Catholicism in the Interwar Czechoslovakia,* Brno, Centre for the Study of Democracy and Culture (CDK) 2006, 336 pages. (ISBN: 80-7325-085-3, EAN: 9788073250850)

Illustrative abstract

Edvard Beneš. Speeches, articles, interviews (1935–1938) • Masaryk Institute/Archives

This publication includes public speeches, articles and interviews by President Beneš from the period of his first presidency (1935–1938) as published in the press. This most comprehensive collection of Mr. Beneš's public texts has been issued for the first time. The edition is one of a series with speeches of President Masaryk *(Cesta demokracie I–IV)*. Some documents were published in the 1930s, but most of them remained in the archives or were dispersed to a number of Czechoslovak or foreign papers and magazines. The collection of President Beneš' speeches consists of documents referring to Beneš's public activities and summarizes his viewpoints on basic problems of Czechoslovakia and European policy in the late 1930s.

Richard Vašek (ed.): *Edvard Beneš. Projevy – články – rozhovory 1935–1938*. Praha, Masarykův ústav – Archiv AV ČR 2006, 728 pp
ISBN: 80-86495-38-8

9 • Humanities and Philology

Research objectives

The section incorporates six institutes with the following research objectives:

Creation of a lexical database of the Czech language from 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 an ethnic picture of Europe • Institute of Ethnology

Transdisciplinary research into selected key areas of philosophy and related disciplines, 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 output in comparative Slavonic linguistics, Palaeoslavonic and Byzantine studies, comparative history of Slavonic literatures and 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

List of studies

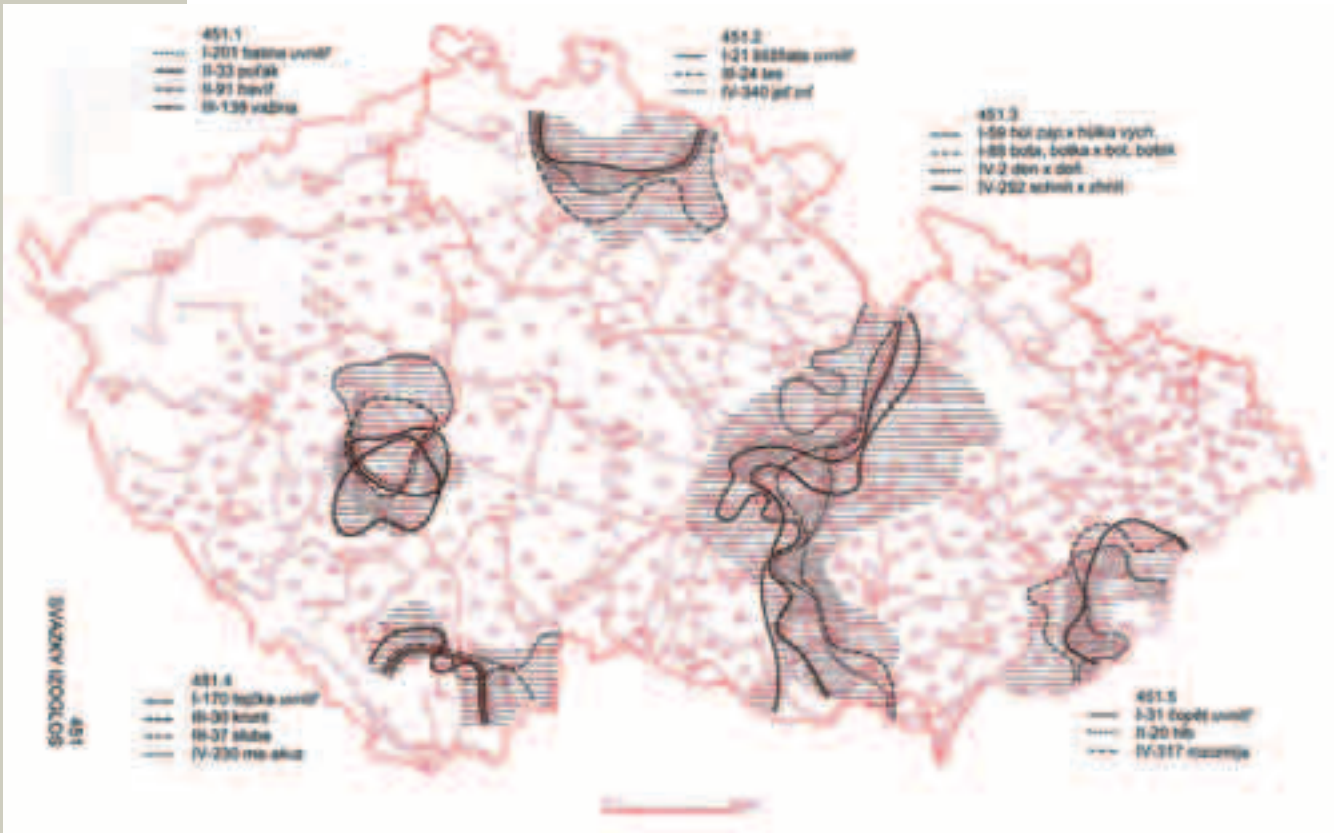
1. Czech Dialect Atlas 5 (The Czech Language Institute)
2. To the origins of words (Introduction to etymology) (The Czech Language Institute)
3. A somewhat different culture? (The Czech Language Institute)
4. In the coordinates of liberty. Czech literature of the 1990s in interpretation (Institute of Czech Literature)
5. History of Czech literature 1945–89, Volume III (1958–69) (Institute of Czech Literature)
6. A sensitive city (Essays on mythopoetics) (Institute of Czech Literature)
7. Culture – Society – Tradition II (Institute of Ethnology)
8. Janáček's records of musical and dance folklore. I. Comments (Institute of Ethnology)

9. Villages and cultural landscapes in the region of Tábor from the 15th to the 19th century (Institute of Ethnology)
10. Interpretation and subjectivity (Institute of Philosophy)
11. Thomas Balthasar Janovka, *Clavis ad thesaurum magnae artis musicae* (Institute of Philosophy)
12. *Die Rezeption der aristotelischen Philosophie der Ehe. Von Robert Grosseteste bis Bartholomäus von Brügge (1246/7—1309)* (Institute of Philosophy)
13. Anarchism. Freedom against power (Institute of Philosophy)
14. Problems of semantics (Institute of Philosophy)
15. *Sancti Gregorii Magni, Romani pontificis, XL Homiliarum in Evangelia in versione bohemo-slavonica* (Institute of Slavonic Studies)
16. "Skit" Praga. 1922—1940 (Institute of Slavonic Studies)
17. Slovenská prozódia a verzifikácia v rukopise Štefana Krčméryho (1935) (Institute of Slavonic Studies)
18. Hijra: Religious emigration in the history of Islamic countries (Oriental Institute)
19. Textbook of the Sanskrit language (Oriental Institute)

Illustrative abstract

Czech Dialect Atlas 5 • The Czech Language Institute

The five volumes of the *Czech Dialect Atlas* (CDA) present the first complete picture of the territorial diversification of our national language through maps and in-depth commentaries. The first three volumes cover variations in vocabulary; the fourth volume is focused on morphology. The fifth, final volume of the CDA is comprised of five parts: phonological, syntactic phenomena, adverbs, cumulative research in cities aimed at newer appellations of life and customs which are bound mostly with the



culture of cities, and appellations dealing with slang. The final part provides maps of isogloss bundles based on isoglosses from all five volumes of the CDA from which a newer and more detailed view of our dialects is presented (see e.g., attached map 451). Among other things, connections are shown between the development of isogloss bundles and the history of language carriers, the variety of old administrative and other boundaries which restrained the dialect carriers from social interaction. Also mentioned are some of the reasons for the occurrence of language boundaries, and the relations between dialectal groups as well as between inhabitants. Thus the atlas is of exceptional value for further linguistic research, especially on language development.

Fig. Map 451 – a detailed overview and survey of dialects
Czech Dialect Atlas 5. Compiled by a team of dialecticians at the Czech Language Institute of the ASCR. Academia, Praha 2005 (published at the end of 2006), 680 pp., 462 maps. 5th volume ISBN-80-200-1339-3; the whole set ISBN-80-200-0013-5

Illustrative abstract

In Coordinates of Liberty. Czech literature of the 1990s in interpretation • Institute of Czech Literature

In the history of modern Czech literature, the 1990s are a period for which there is no analogy. After more than four decades of politically limited development, conditions returned to normal, the separation of Czech literature into three artificially divided streams – official, *samizdat* and exile – ended, literature was emancipated from ideological wardenship and became again an independent sphere of cultural activity. The previous sharp polarity between works of accepted and forbidden authors, between works distributed in the standard way and through specific methods, is interchanged for a wide, even chaotic plurality determined by the market system alone. The quantity of authors, poetics, styles and tendencies create an impenetrable tangle which demands differentiation and hierarchization

Compiled by a collective of authors under the editorship of Jiří Zizler, Petr Hruška (poetry), Lubomír Machala (prose) and Libor Vodička (drama)

Illustrative abstract

Culture – Society – Tradition II • Institute of Ethnology

The work summarizes the knowledge available so far concerning selected areas of study of contact situations, migration groups, ethnic processes and history of ethnology in the Czech Lands. Individual chapters are focused on notable ethnologic activities and results achieved not only by the former and

Cover of a comprehensive study on ethnic processes and the history of ethnology in the Czech Lands

present employees of the Institute of Ethnology of the Academy of Sciences of the Czech Republic but also by their colleagues from other institutions doing research in the same fields. The first chapter of the publication (written by Petr Lozoviuk) is dedicated to the German minority in the Czech Lands and to the history of ethnography written in German in Bohemia. The second chapter (by Naďa Valášková and Zdeněk Uherek) is focused on the new settlers in the borderland. Romany studies and their representation in the Institute of Ethnology are addressed by Renata Weinerová, and communication with Vietnamese immigrants is studied by Stanislav Brouček. The publication is concluded by a chapter on the studies of controlled migrations from expatriate communities in the Ukraine and Kazakhstan that took place in the 1990s. (This chapter was prepared by Zdeněk Uherek and Naďa Valášková.) The foreword to the publication was written by Zdeněk Uherek.

Uherek, Z. (ed): Kultura — společnost — tradice II. [Culture Society Tradition II.] The Institute of Ethnology, ASCR, Prague 2006, 221 pp. English summary.

Illustrative abstract

Interpretation and subjectivity • Institute of Philosophy

The main theme of this book is the relation between external conditionality of intellectual and communicative acts and their subjectivity. The basic question is: In what sense is an individual subject a generator of contents of his attitudes and speech acts, if it is true that the delineation of such contents is intermediated by his physical environment, conceptual repertory of his community, and linguistic conventions. The author enters discussions taking place in contemporary analytical philosophy of mind and philosophy of language, especially the dispute between the internalist and externalist construction of the contents of propositional attitudes (such as beliefs, intentions or desires), and between individualistic and conventionalist conceptions of speech acts meanings. He concentrates on subjective aspects of cogitation and communication, which he finds irreducible, and on ways of interpretation (in the sense of ascribing propositional attitudes and the identification of speech acts meanings) and restraining them. He also deals with the form the dispute takes on in arguments between intentionalists and conventionalists in the sphere of literary interpretation: in this context the book implies a certain concept of a literary creation and of a relation between text and literary work.

P. Koťátko, Interpretace a subjektivita, Filosofia, Praha 2006, 512 pp, ISBN 80-7007-233-4

Illustrative abstract

A Key to the Treasure of the Great Art of Music • Institute of Philosophy

The book, *Clavis ad thesaurum magnae artis musicae* (A Key to the Treasure of the Great Art of Music) was written by the Prague organist Thomas Balthasar Janovka. It is the first critical edition of this fundamental work of the European musical lexicography, namely, the first musical baroque dictionary, published in 1701 by this famous organist at the Tyn Church (in the Old Town of Prague). The text of the edition, the Czech translation and the commentary, present valuable information on the theory of this period (*e.g.*, articles *claves musicae, consonantia, dissonantia, intervallum musicum, tactus musicus,* etc.), aesthetics (*e.g.*, articles *stylus musicus, affectus, figurae musicae*, etc.), instruments and their use (*e.g., fagottum, dulcinum, testudo, galizona, colachon, mandora, fletna, flagolet, organum, violinus, clarinus, tuba, tuba ductilis,* etc.), their parts (e.g., articles *subsilia, pilotides, manuale, pedale, tastatura* etc.) and also valuable information on period interpretation practice (e.g., articles trilla, tabulatura, Einfall, commissura, etc.), music forms (*e.g.*, articles *currens, fuga, menuet, messanza, sonada,* etc.). The critical edition contains the Latin text of *Clavis,* critical notes, note examples, the Czech translation, testimonia, a commentary and indexes. The edition is accompanied by a study in Czech and English concerning the author's life and an analysis of his work.

Matl, J.: *Thomas Balthasar Janovka, Clavis ad thesaurum magnae artis musicae — Tomáš Balthasar Janovka,Klíč k pokladu velikého umění hudebního.* Translated from the Latin original, commented and edited by Jiří Matl. Co-editors Michael Pospíšil and Jiří Sehnal.

Prague, KLP 2006, 387 + CXXIV pp GAČR č. 405/95/1272; GAAVČR č. E9062102. Clavis monumentorum musicorum Regni Bohemiae, Editorial Series I B — I. ISBN 80-85917-93-9

Illustrative abstract

Sancti Gregorii Magni, Romani pontificis, XL Homiliarum in Evangelia in versione bohemo — slavonica • Institute of Slavonic Studies

Old Church Slavonic texts of Czech origin, dating as far back as the 10th and 11th centuries, remained unexplored for a long time. The period of identification, reconstruction and description of the Czech variation of the Old Church Slavonic language has lasted for nearly two hundred years and now has culminated in publication of 40 Gospel Homilies of Gregory I the Great, the original Latin version of which comes from the 6th century.This first edition (editio princeps) of the largest of all the Old Church Slavonic texts of Czech redaction helps to give the complete language description and analysis as well as to appraise its importance for the development of standard Czech language and culture. The publication contains the reproduction of the oldest version of Cyrillic manuscript from the 13th century, the text of its Latin original, critical apparatus comparing variant readings of other select manuscripts and paracritical apparatus to the basic manuscript.

Because of its vast extent (328 folios, with four columns in each) the text has been divided into two volumes, both supplemented with explanations, interpretations, synopses and charts.

Čtyřicet homilií Řehoře Velikého na evangelia v českocírkevněslovanském překladu (Sancti Gregorii Magni, Romani pontificis, XL Homiliarum in Evangelia in versione bohemo — slavonica). Edited by Václav Konzal. (Práce Slovanského ústavu, Nová řada, svazek 20/I). Institute of Slavonic Studies. Euroslavica, Prague 2005, (appeared in 2006), Part I: XIV + 684 pp, ISBN 80-86420-22-1

Illustrative abstract

Hijra: Religious emigration in the history of Islamic countries • Oriental Institute

The monograph examines a phenomenon that is common to the three monotheistic religions — Judaism, Christianity and Islam and presumably to other major religious systems of the world. In the European tradition, the phenomenon is known under the Greco-Latin term "Exodus". The author examines this phenomenon particularly in the context of the modern history of Islam, although it repeatedly occurred all over the history of Islamic civilization. The Islamic way of "Exodus" (in Arabic called *hijra,* or, emigration, originally meaning "cutting ties of kin and tribe") implies a decision of individuals or a community of adherents of common spiritual (political or ideological) values to depart or merely isolate themselves from their original place or milieu, and to settle down in another place. There, as the migrants are convinced, they would find better conditions to build their community/state, to profess and practice their faith, eventually spreading it (usually by force), to achieve a remedy of existing religious (political) conditions.

Mendel, M., *Hidžra. Náboženská emigrace v dějinách islámských zemí* [Hijra: Religious Emigration in the History of Islamic Countries]. Oriental Institute ASCR, Prague 2006, 388 pp. — ISBN 80-85425-58-0. (B)

3

3 Cooperation with Universities and the State of Educating Scientists

In 2006, as in past years, cooperation between the ASCR and universities focused principally on educating students in the doctoral study programmes (DSP) on the basis of joint accreditations. The Ministry of Education, Youth and Sports granted accreditations and created DSP. In 2006, **2072 students of doctoral study programmes** were enrolled in full-time, combined or extramural study at Academy institutes. About the same number of DSP students as in recent years were enrolled. However, slightly fewer new DSP students (**366**) were enrolled and were tutored by institute scientists. Compared to previous years, students awarded PhD. degrees increased (for comparison see Table). A total of **254** foreign students were trained at the ASCR institutes.

Year after year the number of semester lectures, seminars and tutorials offered by ASCR employees at universities increases. Similarly, the number of ASCR employees who teach at universities keeps rising. In 2005, for example, 1872 ASCR employees taught at universities while in 2006 the number grew to **2021**, 410 working part-time. Contrariwise, 575 university professors taught part-time at ASCR institutes.

Coordination of mutual cooperation is demonstrated by the Academy Assembly, Academy councils, supervisory committees and advisory committees of the ASCR Grant Agency (GAAS). The ASCR scientists were involved with university bodies, e.g. in science councils of universities and individual faculties. The ASCR cooperates with the Presidium of the Council of Universities and the Czech Union of Chancellors.

Universities and the ASCR jointly worked on **741** research projects supported by the Czech Science Foundation and the GAAS. Interest in such cooperation continues to grow. But no negotiations regarding new general contracts and agreements on cooperation were made regarding DSP between the ASCR and universities. An overview of the current 21 contracts is available on the ASCR website.

Mutual cooperation is also carried out through joint departments. Presently, 53 such departments exist, with these established in 2006:

Departments established in 2006

Centre of Law and History Studies • ASCR Institute of History and the Faculty of Law of Charles University in Prague

Laboratory of Optical Measuring Methods • ASCR Institute of Thermomechanics and the Technical University in Liberec

Laboratory of Cell Biomechanics • ASCR Institute of Thermomechanics and the Technical University in Liberec

Cooperation within the framework of research establishments and centres of basic research (programme of the Ministry of Education, Youth and Sports) was evident as well.

In physical and Earth sciences, the Astronomical Institute worked with universities and faculties that provide education in astronomy. For technical and software projects which relate to space experiments, the institute developed and tested innovative wide-angle optical devices in cooperation with the Faculty of Nuclear Sciences and Physical Engineering of Czech Technical University in Prague (CTU hereinafter), including compression algorithms for astronomical visual data with the CTU Faculty of Electrical Engineering and materials and technologies for roentgen optics with the Institute of Chemical Technology in Prague (VŠCHT hereinafter). Within the Centre of Particle Physics (LC527) a team of the Institute of Physics, Faculty of Mathematics and Physics of Charles University in Prague (UK hereinafter) and the CTU Faculty of Nuclear Sciences and Physical Engineering participated in processing and a physical analysis of the data on antiprotons and protons collisions in the experiment D0 in particle accelerator Tevatron at the Fermi National Laboratory near Chicago.

Much new information on production and properties of *t* and *b* quarks was obtained. Collaboration between the Institute of Physics and University of Technology in Brno, Faculty of Mechanical Engineering, led to opening of the Centre of Basic Research on "Structures for Nanophotonics and Nanoelectronics (STRUNA)". The newly-built nanomanipulator centre, unique in the Czech Republic, fulfils current requirements for manipulation and measuring of transfer characteristics of phenomena at nanometer level. Research centre LC06041 (the Institute of Nuclear Physics, VŠCHT Prague, J. E. Purkyně University in Ústí nad Labem, the Institute of Macromolecular Chemistry, the Faculty of Electrical Engineering and the Institute of Technical and Experimental Physics (CTU) conducted research on metalized polymers that are a step forward in the production of electronic components (light-emitting diodes, components with negative differential resistance) and bio-sensors. Systems of silver deposit on polymer substrates were examined by nuclear analytical methods in order to study mobility and behaviour of metal particles.

The Institute of Photonics and Electronics along with the Faculty of Nuclear Sciences and Physical Engineering (CTU) verified a new method of pumping of double-clad optical fibres in the arrangement of fibre ring laser. The Institute of Scientific Instruments in cooperation with the Medical Faculty of Masaryk University performed magnetic-resonance and electro-technical measurements of a population of specimens from dental saliva and dental implants based on which recommendations were made to select the most appropriate materials and conditions under which the substances used do not interfere with magnetic resonance examination of the patient.

The Institute of Rock Structure and Mechanics along with CTU in Prague demonstrated a new methodology of *in vivo* tests of connecting a bone and implanted composite samples. The Institute of Geonics along with the VŠB — Technical University in Ostrava worked on a grant project, "Response of Technological Structures and Constructions to Challenging with Technical Seismicity". They determined parameters of the most intense seismicity for modelling its influence on above-ground buildings and calculating responses of type projects based on an extensive database of measurement results.

Based on statistical distribution of extremely high one-day and multiple-day volumes of atmospheric precipitation, the Institute of Atmospheric Physics in cooperation with the Technical University in Liberec evaluated regions of the Czech Republic. Distribution of annual maxima has considerably different characteristics in the region of North Moravia and Silesia, particularly as for the multiple-day volumes; in contrast to other regions this one is characterized by extraordinarily high values of precipitation volumes.

Within a programme called “Information Society” the Institute of Computer Science along with the Technical University in Ostrava, the Faculty of Civil Engineering (CTU) and the Institute of Geonics obtained results usable in modelling traffic safety and prevention of disasters. The Institute along with the Faculty of Mechanical Engineering designed and installed a node of an international experimental network for measuring, regulating and synchronizing; an analogous node was installed at Bowle State University, Maryland, USA.

The Institute of Mathematics along with Charles University, the Institute of Computer Science, University of West Bohemia in Pilsen and Masaryk University in Brno take a significant part in the activities of the Institute of Computer Science which directs its efforts at methods, algorithms, informatics structure and applications to information technologies and offers temporary post-doctoral positions and temporary visits for outstanding scientists. Nephell, a database system for restorers' reports, is the result of collaboration between the Institute of Information Theory and Automation, the Academy of Fine Arts in Prague and the Institute of Analytical Chemistry that associated in a joint department called ALMA (the Academic Laboratory of Material Research on Paintings).

In **life and chemical sciences,** cooperation between the Institute of Organic Chemistry and Biochemistry and the Faculty of Science of Charles University brought a solution to chiral separation of atropoisomer bipyridine-N,N'-dioxides that were subsequently studied as catalysts of enantioselective alkylation of aromatic aldehydes. A study including a combined searching for appropriate substances blocking undesirable production of myelin structures on a beta-sheet secondary structure of peptides was completed with VŠCHT in Prague, and joint research on anticarcinoma and antiviral effects of steroid substances was begun in cooperation with the Faculty of Medicine of Palacký University in Olomouc.

The Institute of Chemical Process Fundamentals working with VŠCHT Prague successfully completed research on ternary equilibrium liquid-liquid in systems N,N-dimethylformamide plus methanol plus cyclical alkane; a role of catalysts based on calcinated compounds CoMn of hydrocalcite type and a role of CO, O_2 and water in decomposition of N_2O was clarified. The Institute worked jointly with the VŠB Technical University in Ostrava and Institute of Chemical Technology in Prague. Researchers of the Institute of Macromolecular Chemistry developed 3D-polymer polylactide-based cell carriers; tests to colonize them with mesenchymal cells of bone marrow were started with the 1st Faculty of Medicine of Charles University and potentials of using them in regeneration of bone tissue were investigated and the results were included in a joint patent application.

Collaboration of the Institute of Microbiology, the Institute of Organic Chemistry and Biochemistry, the Faculty of Science, Charles University, and Palacký University in Olomouc resulted in discovery of a specific and very strong inhibitor of natural killer-cells, a molecule is synthesized artificially using comb-branched dendrimer containing end saccharide group. This breakthrough may suppress NKT cells in some asthmatic and allergic states. Within the Bioferm project, which is a part of the EU 6th Framework Programme, a solution of the effects of ultrasonic field intensity on kinetics of growth in selected aerobic and anaerobic microorganisms was found in cooperation with CTU in Prague. Positive results led to a reduced cultivation period and a project of technology modification in wine production; the results have been applied by the company Melloni Vini in Sardinia.

The Institute of Molecular Genetics working with the South Bohemia University Faculty of Biology in České Budějovice described interactions between Wnt signalling pathway and nuclear receptor NHR-25 which decides on cell fate in the somatic gonad in nematodes. In the Clinical Laboratory of Tumour Biology (the joint department of the Institute of Molecular Genetics and 1st Faculty of Medicine of Charles University) a new line of EM-G3 isolated from primary invasive ductal breast carcinoma was characterised in terms of molecular biology. It was determined to be progenitor of carcinoma cells that can partially differentiate in vivo. The Centre of Molecular and Cell Immunology developed an original

method of preparing pure protein Wnt3a which enhances growth in some important types of cells.

Collaboration between the Institute of Experimental Medicine and the Faculty of Medicine, Charles University in Hradec Králové brought forth a finding that statins (substances reducing cholesterol level in blood) can have a positive effect in the course of hearing loss with age in an animal model.

The Biology Centre and the Faculty of Science of Masaryk University jointly evaluated the ecological status and management of rivers and streams in the Czech Republic on the basis of a comprehensive system PERLA including 300 referential localities with abiotic and biotic data using the newly developed software HOBENT. The model is based on mathematical principles of the RIVPACKS programme and is locality-specific yet non-specific in terms of stressors. It facilitates predicting the target population of benthic invertebrates at any locality, and the predicted population is compared with the actual status.

Cooperation between the Institute of Botany, Research Institute of Organic Syntheses, Rybitví and VŠCHT, Prague resulted in 58 new phtalocyanins being synthesized and tested by eco-toxicological tests; some of them are selectively toxic to anabaena. Included is a group of eight non-toxic phtalocyanins suitable for ecologically safe shielding of ponds. A joint patent application was submitted, to inhibit the growth of algae, anabaena and bacteria. The Institute of Vertebrate Biology, ASCR, and Charles University's Faculty of Science continue their cooperation in the new Centre of Biodiversity. Involved as well are: the ASCR Institutes of Systems Biology and Ecology, of Botany, and of Animal Physiology and Genetics, the Biology Centre, University of South Bohemia in České Budějovice, and Masaryk University.

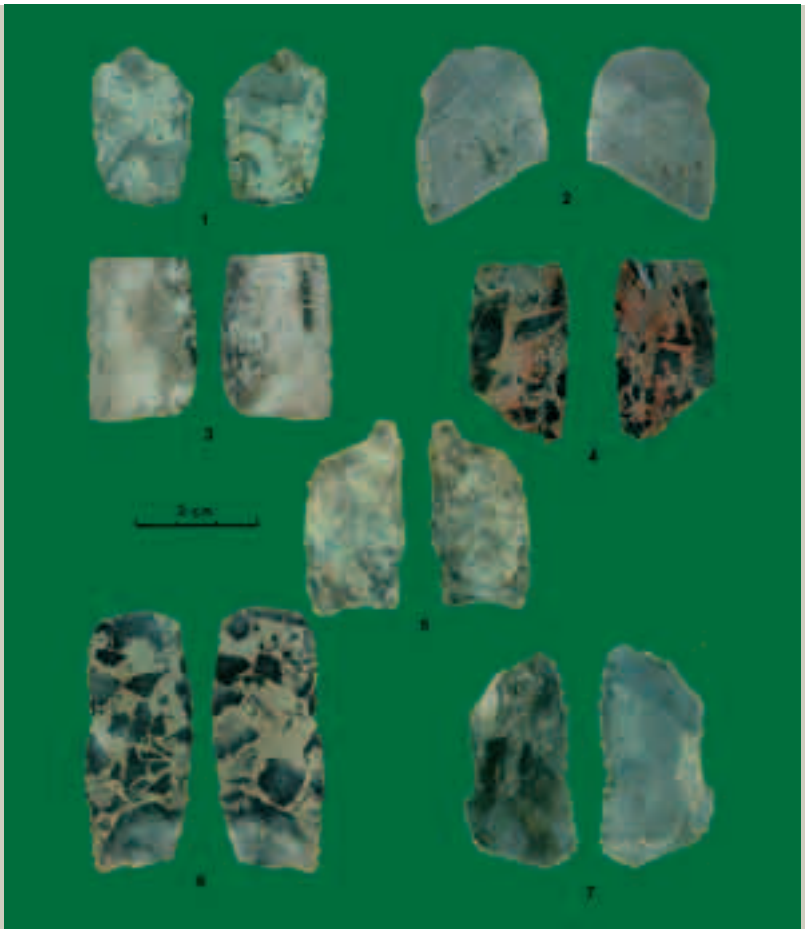
Humanities and the social sciences

In **humanities and the social sciences,** a doctoral study programme CERGE-EI is a continuing cooperative endeavour of the Economics Institute, ASCR, and Charles University. The Institute of Sociology participated in six projects investigating the development of Czech society, with Charles University's Faculty of Social Sciences, its 3rd Faculty of Medicine, the Economics Institute, the University of Economics, Prague and Masaryk University. A "European Consortium for Sociological Research Summer School: Quality and Inequality in Education" was sponsored jointly by the Academy and Charles University's Faculty of Arts and Philosophy. The results of the project "Burnout Syndrome and Risk Factors of Cardiovascular Diseases", assembled by the Institute of Psychology and Charles University's Faculty of Arts and Philosophy, were presented at numerous scientific conferences.

The project "Reform and Modernization of Local Public Administration in Europe and the Czech Republic" was a joint project of the Institute of State and Law, the Faculty of Law in Pilsen and the University of Economics, Prague. A joint project of the Institutes of Archaeology, of Computer Science and the University of Economics, Prague resulted in a monograph on quantitative properties of settlement ceramics. A collection of abstracts from an international conference on castellology Castrum Bene 9 was published jointly with J.E.Purkyně University in Ústí nad Labem. The Institute of Archaeology in Brno completed "Předmostí" jointly with Charles University's Faculty of Science, with a summary monograph in manuscript. One of the basic purposes of the projects "Late Neolith in Moravia" and "A List of Burial Grounds of the Bell-Beaker Culture" was a monograph on split stone tools of that remarkable culture. Participating in the research was the Institute of Geological Sciences, Faculty of Sciences of Masaryk University in Brno.

The Institute for Contemporary History participated in establishing Department of Contemporary History at Masaryk University. The department expects to begin offering bachelor programmes in 2008 and also to be a service centre for other educational programmes of Masaryk University. The Institute of Philosophy with the Institute of Philosophy and Religionistics of Charles University's Faculty of Arts and Philosophy, held in Prague an international conference "George Berkeley: Vision, Mind, Matter". The Slavonic Institute accomplished a joint grant project with Charles University's Faculty of Arts and Philosophy, "The Comprehensive Croatian-Czech Dictionary". The Czech Language Institute along with

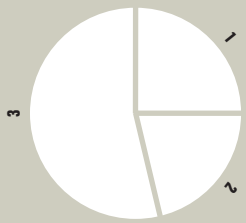
the Institute of the Czech National Corpus at Charles University's Faculty of Arts and Philosophy compiled a lexical database of the Czech language of the early 21st century, digitising its database, and also digitising some of the "Dictionary of Local Names in Moravia and Silesia", with Masaryk University's Faculty of Informatics. The Institute of Czech Literature with Charles University's Faculty of Education held a literary-science conference for young bohemicists and slovakicists "Poetics of Programme – Programme of Poetics", attended by local and foreign students.



A set of seven stone chopping tools from an elevated settlement of the Únětice culture in the region of Zelená Hora near Vyškov, that were probably utilized for wood processing in the course of settlement construction

In 2006, as in previous years, the ASCR offered **Courses of Research Fundamentals** for students of doctoral study programmes. Attending them the DSP students learn principles of presenting and publishing results of scientific work, principles of science financing, issues of intellectual property in science, information sources for research, ethics and other aspects of research work. Eight training courses were held in 2006, with two in Brno and six in Prague. The courses were attended by 225 students, as shown in the graph.

The graph implies that students' interest in life sciences still prevails, especially in bio-medical branches, even though similar courses for these students are currently organised by other institutes as well.



Courses of Research Fundamentals (in %)

1 humanities and social sciences 25,0
2 physical and Earth sciences 20,0
3 life and chemical sciences 55,0

Overview of the most important examples of cooperation with universities in 2006

	2002	2003	2004	2005	2006
DSP students trained at Institutes	1 574	1 786	1 939	2 079	2 072
Undergraduates trained at Institutes	988	959	1 097	1 143	1 238
Students newly enrolled in doctoral study programmes	388	420	421	391	366
Number of DSP graduates trained at Institutes	174	161	204	220	259
Undergraduates at Institutes	683	691	691	763	787
Numbers of semester lectures, seminars, tutorials given by ASCR staff members at universities	2 196	2 316	2 292	2 666	2 824
Teaching by ASCR staff members at universities (in hours)	55 402	56 392	60 329	66 006	68 429

4

4 Cooperation with the Business Sphere and Other Institutions

Transferring results from research to practice is one of the priorities of the ASCR, and therefore the Academy of Sciences supports applying this knowledge as an important task. The Academy targets reinforcing current contacts and making new ones between its institutes and the commercial sphere. Among contacts established in 2006 was the Engineering Academy of the Czech Republic.

Some ASCR institutes and business partners worked together on dozens of grant projects of the Czech Science Foundation, and more than one third of innovative projects in the programmes "Support for Projects of Targeted Research" and "Information Society" were cooperative efforts with industrial partners. Cooperation with partners from the business and application sphere proved fruitful for most programme projects within the "Nanotechnology for Society" programme. This cooperation contributed significantly to the process of technology and knowledge transfer. The results were practised in industrial enterprises, agriculture, protection of the environment and cultural property, healthcare and survey of the current state of the Czech society.

ASCR President Václav Pačes and deputy governor of Pardubice Region Roman Linek sign the framework contract on cooperation between the Pardubice Region and ASCR

Transfer of **new technologies and support of innovations** are priority areas supported by the Ministry of Industry and Trade of the Czech Republic, especially within the TANDEM programme. The "Operating Programme of Business for Innovation of EU Structural Funds" for 2007—2013 will support these activities in the immediate future. The ASCR institutes participated in projects of the Ministry of Education, Youth and Sports and the Ministry of Health of the Czech Republic. Application of research results is documented in the following examples of achievements and projects:

Transfer of new technologies and support of innovations

Development of technology-demanding pixel detectors for ATLAS experiment in CERN, Geneva, Switzerland • **Institute of Physics — ON Semiconductor, Ltd., Rožnov pod Radhoštěm**

Development of fabric vessel substitutes • **Institute of Physics — Výzkumný ústav pletařský, a. s., Brno**

Mathematical modelling of earth gas consumption by small-scale and medium-scale customers
• **Institute of Computer Science — Czech Gas Union — ERÚ — Plynoprojekt, a. s.**

Neutron-diffraction study of residual voltage distribution around steel welds
• **Nuclear Physics Institute — Nuclear Research Institute at Řež, plc**

Development of a tool for distribution and connecting of logical blocks in field-programmable gate arrays of Atmel Comp. • **Institute of Information Theory and Automation — Atmel, USA**

Determination of characteristics of heat resistant chrome martensitic steel of new generation for use at extremely high temperatures and non-stationary mechanical straining
• **Institute of Physics of Materials — ÚJP Praha, a. s.**

Establishment of a thermodynamic database for modelling characteristics and phase diagrams of alloys suitable for modern steel
• **Institute of Physics of Materials — Max-Planck Institut für Eisenforschung, GmbH, Düsseldorf, Germany**

Evaluating applicability of commercially available Hall sensors for measuring magnetic fields in ITER Tokamak in terms of their radiation and heat resistance
• **Institute of Plasma Physics — Nuclear Research Institute, Řež, plc**

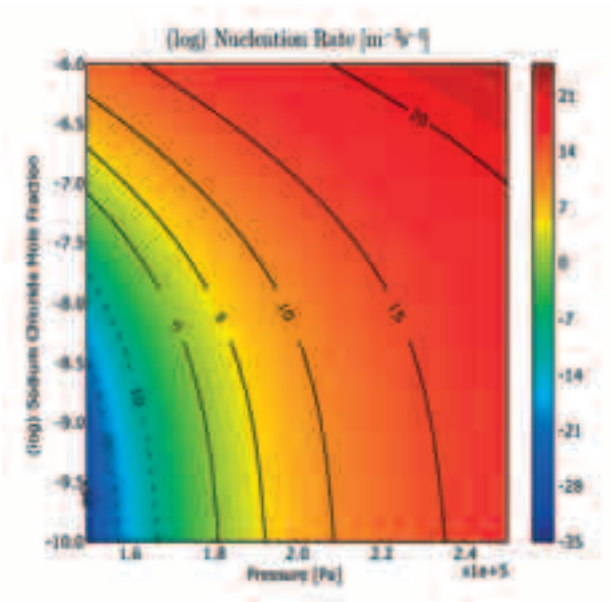
Aerodynamic research on small business and transport airplanes
• **Institute of Hydrodynamics — Aeronautical Research and Test Institute, Inc., Letňany**

Development of functional samples of instruments using non-diffraction beams and mechanical effects of light • **Institute of Scientific Instruments — Meopta Přerov, a. s.**

Enhancing the original spectroscopy method of surface plasmomas developed at the Institute of Photonics and Electronics and its prospective use in the construction of minisensors
• **Institute of Photonics and Electronics — PHENOGENOMICS, Inc., USA**

Measuring of root and tip sections of rotor blade of the last stage of large-output steam turbine in a high-speed aerodynamic tunnel • **Institute of Thermomechanics — Škoda Power, Ltd., Plzeň**

Development of designing methods for new highway bridges and verification of usable properties criteria and life span of existing bridges with regard to the stochastic character of materials, loading and response • **Institute of Theoretical and Applied Mechanics — Stavby mostů Praha, a. s.**



Binary nucleation of water and sodium chloride

A steam turbine blade damaged by early condensation
(source: Škoda Power)

(below) The influence of the concentration of sodium chloride on the nucleation rate in the water — sodium chloride mixture at 373 K

Development of car crash absorber placed on the gear box
- **Institute of Theoretical and Applied Mechanics — Škoda auto, a. s.**

Profile audio-magnetotelluric measurements as a part of complex geophysical prospecting
- **Geophysical Institute — Geonika, Ltd.**

Methods and tools for evaluating the effects of engineering barriers on distant interactions in the environment of underground disposal sites
- **Institute of Geology — ProGeo, Ltd. — ISATech, Ltd. — Geotechnika, a. s.**

Objective numerical analysis of the boundary of cold outflow from a convective storm downdraft
- **Institute of Atmospheric Physics — Czech Hydrometeorological Institute**

Creating prognostic maps of exposure to land slumps in particular regions in the Czech Republic
• **Institute of Rock Structure and Mechanics — Ministry of the Environment of the Czech Republic**

Cooperation of ASCR institutes and subjects from the business and application sphere involves effort to **apply the results of research in chemistry, biology, pharmacy and healthcare.** ASCR institutes teams are among researchers and co-researchers of many grant projects of the Ministry of Industry and Trade, Ministry of Agriculture and Ministry of Health of the Czech Republic. Many projects were supported by the Czech Science Foundation. Examples of remarkable projects follow:

Application of the results of research in chemistry, biology, pharmacy and healthcare

Nanoforms of multilayered piezoelectrics in production of high-temperature ultrasonic transducers
• **Institute of Inorganic Chemistry — Starmans Electronics, Ltd. — Piezoceram, Molecular Cybernetics, Ltd.**

Development of high-active, particularly selective catalyst for Baeyer-Villiger oxidation of cyclic ketones to lactones which is based on cheap and easily available tin-modified silica
• **J. Heyrovský Institute of Physical Chemistry — Research Institute of Inorganic Chemistry, Inc.**

Technology of re-processing waste alums to fertilizers — Diamo, Stráž pod Ralskem

Development of a new detector of explosives (Explonix) with a detection limit under 20 pictograms
• **Institute of Analytical Chemistry — RS Dynamic, Prague**

New bio-degradable high-molecular conjugates of doxorubicin with hydrolytic-controlled activation of cytostatic agents • **Institute of Macromolecular Chemistry — Zentiva, a. s.**

Preparation of new brassinosteroids for testing in field conditions on various crops
• **Institute of Organic Chemistry and Biochemistry — AGRA Group**

A new Joint Research Centre • **Institute of Organic Chemistry and Biochemistry — Gilead Science, USA**

Antonín Holý of the Institute of Organic Chemistry and Biochemistry and John F. Milligan, executive vice president of the Gilead Company (USA) at a press conference after signing a contract on cooperation between the Institute of Organic Chemistry and Biochemistry and Gilead

A new complex of platinum (Pt 4) with adamantylamine — LA-12 inhibiting proliferation of a resistant human line of ovarian carcinoma SK-OV-III • **Institute of Biophysics — Pliva-Lachema, a. s., Brno**

Development of oxycellulose-based material for biomedical use
• **Institute of Physiology — Synthesia Pardubice, a. s. — Research Institute of Organic Syntheses, Inc.**

Constructing an express system for new penicillin acylase which is used for the synthesis of the Amoxicillin antibiotic • **Institute of Microbiology — Fermenta Biotech, Ltd., India**

Development of substances in anti-carcinoma pharmaceuticals based on CDK inhibitors
• **Institute of Experimental Botany — Cyclacel, Ltd., Great Britain — C3 Bio, GmbH, Germany**

Preparation of seven monoclonal antibodies of high commercial potential
• **Institute of Molecular Genetics — University of Magdeburg, Germany — EXBIO Praha, a. s.**

Optimizing the development potency of bovine embryos developed *in vitro*
• **Institute of Animal Physiology and Genetics — BOVET, a. s. — VÚŽV Uhříněves**

Completing the development of detection and semi-quantitative determination of Lyme borreliosis spirochaeta using a real-time PCR method in human tissue • **Biology Centre — Dynex, Ltd., Prague**

Development and realization of a serological platelets incubator allowing maintenance of homogenous and independently adjustable temperature, light and CO_2 saturation • **Institute of Botany — Labio, a. s.**

Researchers produced several hundred **expertises, appraisals and analyses** or provided **consultations** for subjects from the public sector including agencies of the state and territorial administrations and administrative bodies of the European Union and World Bank. Institutes working in humanities and social sciences participated in these activities. For example, the Institute of State and Law compiled 121 professional statements and provided a number of specialized consultations. The Archaeological Institute in Brno produced 439 written technical treatises, particularly determining conditions of protection of archaeological localities and archaeological cultural monuments. Scientists at the Archaeological Institute in Prague wrote 2797 reviews of construction activities, historical sites and area management, and made 415 field interventions and actions. The Economics Institute participated in a World Bank research under "Global Development Network" coordinated by CERGE-EI, a joint effort of the ASCR and Charles University.

In addition to the aforementioned projects and methods for application of research results, teams or individual researchers from ASCR institutes undertook a study of technical standards, methods, measurements, laboratory tests and diagnostic methods.

ASCR institutes currently own and hold a total of 75 **patents** valid in the Czech Republic and 61 patents valid abroad, primarily in EU member states, the USA, Canada and Japan; other applications are currently processed by the Industrial Property Office of the Czech Republic. In 2006, 15 new **invention applications** were filed in the Czech Republic and four abroad. Results of research activities are also evident in 132 **licence contracts,** 18 of which were concluded in 2006. The Institutes of Experimental Botany, of Macromolecular Chemistry and of Organic Chemistry and Biochemistry were the most active of all in this respect.

International Cooperation

5

Cooperation within EU structures

The ASCR focused a great deal of attention during 2006 on the **7th European Union Framework Programme.** Putting together and approving the new programme was a long, demanding process and was hampered by requirements for considerable increases in the overall budget. The ASCR responded as follows to the prompting of the European Commission either through public consultation or comments regarding plans or specific documents submitted: it was positive in its statements regarding pilot documents for the new programme, for example regarding **proposals for specific programmes, rules of participation, a model grant contract, a Charter for Scientific Research Workers, and a Code as Regards Hiring Scientific Research Employees.** The principal thoughts behind the Charter and the Code were incorporated in the Concept of Advancing Research and Development at the ASCR, the new Statutes of the ASCR, the Code of Ethics, and Career Rules. ASCR representatives also made their opinions known on subordinate problems, such as, the participation of the European Investment Bank in the debt system of financing and the new operating concept of the European Research Council and its method of financing "frontier research".

The new framework programme places great emphasis on the integration process and on supporting multinational networks and cooperation, for example ERA-NET. Fluent mobility for science and research workers is the base on which this process may be based. For this reason the ASCR broadened the activity of the **Czech Mobility Centre,** e.g., cooperation with regional cooperating points at selected universities and colleges in the Czech Republic, presentation of the Centre on the Czech and European portals was improved, a number of training sessions and seminars were held regarding the issue of hiring foreign scientists in the Czech Republic and the EU Charter and Code, etc., an information brochure intended for foreign scientists was published in English, and comments on setting up a European Institute of Technology and its system of operation were processed.

The ASCR offered its representatives for a team of experts to assess projects under the **7th Framework Programme,** for the **programme committees of this programme** (the ASCR is represented on 11 of the 19 committees), and for **European Research Council expert panels** and the **expert panels** of the new priority programme of the 7th Framework Programme (Security). An internal network of contacts among employees at institutes was set up thus ensuring the effective transfer of up-to-date information, to provide effective help and consultation to project implementers.

Forum of Academies of Sciences of the Visegrad Four countries

The ASCR hosted a regular **meeting of the Forum of Academies of Sciences of the Visegrad Four countries.** Participants commented on the European Financial Perspective

and reducing appreciably funding planned for research and development during the period 2007–2013, the expediency of setting up a European Institute of Technology, the functions and operating of the European Research Council, and other European issues. The participants accepted a joint Declaration by the Forum of the Visegrad group of Academies of Sciences.

The ASCR worked with the European Academy of Sciences and Arts to organise the seventh meeting of representatives of academies of sciences from Central and Eastern Europe, whose aim it was to coordinate an exchange of opinions regarding the 7th Framework Programme. Among their accomplishments the participants adopted a joint declaration on the European Institute of Technology and decided to submit a joint coordination project to the INCO division (International Cooperation Activities) as part of the 7th Framework Programme. Primarily they stressed support for closer and specific cooperation among individual research establishments.

EU structural funds

In terms of EU **structural funds,** the ASCR participated in the preparation of the operative programmes entitled "Research and Development for Innovation" and "Education for Competitiveness: Enterprise and Innovation" and participated in comment procedure for the "Prague – Adaptability" and "Prague – Competitiveness" operative programmes, aimed at obtaining support from the European Social Fund and the European Fund for Regional Development between 2007 and 2013. The ASCR invested maximum effort to create the best conditions for the broadest participation in these projects at its institutes.

The overall participation of ASCR institutes in European Union framework programmes remained at practically the same level as in 2005, i.e., around 209 projects. By contrast, the volume of funds rose from € 4.2 million to € 5.9 million.At the same time, research teams at the institutes have become involved in financially more-demanding projects. Whereas the average amount for one project was € 552 112 in 2005, it was € 790 430 in 2006. The institutes' role also increased as project coordinators. Institutes working on the largest numbers of projects were the Institute of Physics (28), Institute of Experimental Medicine (13), Institute of Atmospheric Physics (9), and the Institute of Physiology and Institute of Microbiology (8 each). Among the most expensive projects were *Gene Therapy: An Integrated Approach to Treating Neoplastic Illness* (Institute of Macromolecular Chemistry), *European Rat Tools for Functional Genomics* (Institute of Physiology), and *Human Resources I* and *Human Resources II* (Institute of Systems Biology and Ecology).

Main instruments of the 6th Framework Programme

Type of instrument	Total number of projects 2005	2006
IP (Integrated Projects)	33	40
Other types of project	28	40
STREP (Specific Targeted REsearch Projects)	23	38
NoE (Network of Excellence)	12	16
Marie Curie	11	21
INTAS (INTernational ASsociation for the Promotion of Cooperation with Scientists from the New Independent States of the Former Soviet Union)	7	48
SSA (Specific Support Actions)	9	15
CA (Coordinated Actions)	3	6
EURATOM (EURopean ATOMic Energy Community)		4
I3 (Integrated Infrastructure Initiative)		4

ASCR cooperation with other international governmental organisations

Cooperation between the ASCR and **CERN** (Conseil Européen pour la Recherche Nucléaire) included basic research into particle physics, the development of new technology and materials, the use of a sensor and particle beams in medicine, and building the Grid computer network, the most up-to-date information and computer network in the world. Czech researchers contributed 101 papers and 88 contributions to international conferences and professional meetings during collaboration on experiments. Staff at the Institute of Physics developed a unique method of analysing data on elastic proton, scattering protons for the LHC super-accelerator at CERN. Vakuum Praha, Ltd. supplies the technologically-demanding sensors that form part of the accelerator tubes. Cooperation with CERN also helped augment the qualifications of young Czech researchers and also the level of education of teachers and students at secondary schools and the general public, and was publicised through news media.

Working contacts continued between some of the Academy´s institutes, in particular the Nuclear Physics Institute, Institute of Macromolecular Chemistry, Geophysical Institute and the Institute of Physics, and the **Joint Institute for Nuclear Research** in Dubna, particularly in experimental, theoretical, and mathematical physics, ion physics, and the chemistry of transuranium, cooperation in radiobiology and medical physics, in the application of methods of neutron physics, in solid state physics, in geophysics, in research into polymers, and in other fields. Cooperation continued in the improvement and development of sensors and other experimental equipment. ASCR institutes participated in 26 targeted projects (of a total of 44), 28 articles were published, and 39 papers were presented at international conferences.

The **ESF** (European Science Foundation) is a prestigious organisation which offers considerable financial support to trans-European science programmes and projects. The members of this organisation for the Czech Republic are the ASCR and the Czech Science Foundation. ASCR staff served on steering committees of this organisation and on other boards. Two research programmes were coordinated by ASCR staff.

Miroslava Kopicová, minister of Education, Youth and Sports of the Czech Republic and Thomas Wilson, deputy director general of the European South Observatory signing the agreement on the Czech Republic's accession to the European South Observatory

Representatives of the ASCR are also active on the **Czech Commission for UNESCO,** with former President of the ASCR Helena Illnerová having been elected to the head of this advisory board of the Czech government. Certain institutes also organised postgraduate courses, for example the Institute of Macromolecular Chemistry, and the Institute of Botany in cooperation with the Institute of Systems Biology and Ecology. The national committee of **MAB UNESCO** (Man and the Biosphere) is also active and deals with the issue of biosphere reserves. A meeting of the working party for the Czech National Committee for the Biosphere Reserves was held in Lednice na Moravě in the spring of 2006. The Czech MAB Committee organised a number of excursions for students at Czech universities.

Representatives of the ASCR discussed the acceptance of the Czech Republic as a member of **ESO** (European South Observatory) with the representatives of this institution and of the Czech government, resulting in an agreement being signed in December.

ASCR cooperation with international non-governmental science institutions

ALLEA (All European Academies) comprises 53 European academies of sciences. This organisation cooperates closely with other European and world organisations and participates in organising global events, such as the World Science Forum. The ASCR is represented on its Standing Committee on Science and Ethics and in professional working parties.

The **EASAC** (European Academies Advisory Council) consists of representatives of 24 national academies of sciences from most EU member states. The organisation prepares expert studies and provides objective information from science and research for European institutions (for example, the European Parliament). Representatives of the ASCR took part in expert groups in the environment, infectious diseases, and power engineering.

The **ICSU** (International Council of Scientific Unions) is a non-governmental organisation that brings together 111 national science institutions and 29 science unions that are the umbrella organisations of national science committees. The ASCR represents the Czech Republic. It is also the guarantor of 35 national science committees and is in contact with them via the Council for International Affairs. It deals as well with situations which outgrow the competence of the committees and contributes to some of their activities.

The **IAP** (InterAcademy Panel) and IAMP (InterAcademy Medical Panel) unite academies of sciences from countries throughout the world. ASCR representatives took part in general meetings of both organisations.

The **UAI** (Union Académique Internationale) joins 58 national academies from around the world. It coordinates and, in some cases, provides financial support for cooperation on international projects from the sphere of the humanities. ASCR institutes participate in six projects: *Moravia Magna, Clavis Monumentorum Litterarum Bohemiae, Lexicon Iconographicum Mythologiae Classicae/Thesaurus Cultus et Rituum Antiquorum, Corpus Vasorum Antiquorum, Dictionnaire du Latin Médiéval,* and *Aristoteles Latinus*. A project to create a Greek Old Slavic dictionary is at the preparatory stage. ASCR representatives participated in evaluating other projects.

The **Czech Historical Institute in Rome,** a joint department of the ASCR and the Faculty of Arts and Philosophy at Charles University in Prague, concentrates on systematic source research on Bohemian material in Roman (and particularly Vatican) archives and libraries, as well as other archives and libraries in Italy. Its results are mainly published in issues of *Monumenta Vaticana res gestas*

Bohemicas illustrantia and *Epistulae et acta nuntiorum apostolicorum apud imperatorem*. At the same time a catalogue of Bohemian manuscripts in the collections of the Vatican Library is being created. The institute provides regular information on the results of its work in the periodical *Bollettino dell' Istituto Storico Ceco di Roma*.

International cooperation under bilateral agreements

Bilateral contacts between academies play an indispensable role in international scientific cooperation at the ASCR. The Academy currently has 59 agreements with partners in 44 countries, including one recently signed with a partner in Peru. These agreements build new contacts, ensure participation in international science meetings, and focus on cooperation as part of bilateral projects. Concluded agreements are updated on an ongoing basis and adapted to comply with new trends in international cooperation.

More than 710 people went abroad for a total of 7898 days under these bilateral agreements. Meanwhile, some 571 foreign scientists were on study visits to this country for a total of 5151 days. The ASCR established contacts at the government level with no partner relationship, such as Greece and Norway where cooperation in research is covered by an inter-governmental cultural agreement.

Scientists also develop international cooperation based on direct contacts made by individual institutes through their own inter-institutional agreements. There were 288 such agreements in 2006. This enables the institutes and their research teams engage in additional international programmes and projects, in particular within the European Union (see an overview of the most significant projects and statistical table in the appendices to this chapter).

Other activities as part of international relations

The ASCR participated in the actions of the **International Human Rights Network of Academies and Scholarly Societies.** This network investigates cases of injustice committed on people of science and to protest against them. The ASCR has intervened in a number of serious cases, for example the imprisonment of a group of Ethiopian scientists who are charged with preparing a violent revolution, and the illegitimate imprisonment and conviction of Bulgarian nurses accused in Libya of spreading HIV and HCV viruses. This protest was supported by a professional molecular epidemiological study which proves that the HIV and HCV strains had reached the hospital from West Africa before the convicted nurses arrived.

6th EU Framework Programme

Examples of international projects at ASCR institutes in 2006

Ensemble-based Predictions of Climate Change and its Impacts • coordinator: Meteorological Office, Exeter, UK; participants: Institute of Atmospheric Physics and 73 other research units in 20 countries

Multimedia Understanding through Semantics, Computation and Learning • coordinator: European Research Consortium for Informatics and Mathematics, France; participants: Institute of Information Theory and Automation and 42 other similar units in 15 countries

Integrated Infrastructure Initiative for Neutron Scattering and Muon Spectrometry • coordinator: Rutherford Appleton Laboratory, Chilton Didcot, UK; participants: Nuclear Physics Institute and 21 laboratories in 13 other European countries

Providing Milk Supply Chain with a Rapid, Portable and Cost Effective Biosensor for Multi-Pathogen Detection in Milk • coordinator: N. Clavell, Spain, participants: Institute of Photonics and Electronics and 20 similar research sections in 11 European countries

Proactive Management of the Impact of Cultural Tourism upon Urban Resources and Economies • coordinator: The University of Liège, Belgium, participants: Institute of Information Theory and Automation and 10 other research institutions in 8 European countries

Brain, Respiration and Cardiac Causalities in Anaesthesia • coordinator: University of Lancaster, UK; participants: Institute of Computer Science and partners in five European countries

Advanced Techniques for Optical Manipulation Using Novel 3D Light Synthesis • coordinator: University of St. Andrews, UK; participants: Institute of Scientific Instruments and 5 laboratories abroad

Induced Microseismics Applications from Global Earthquake Studies • coordinator: Schlumberger Cambridge Research, UK; participants: Geophysical Institute and 5 research establishments in 4 countries

Integrated Multiscale Process Units with Locally Structured Elements • coordinator: CNRS Nancy, France; participants: Institute of Chemical Process Fundamentals, 4 industrial companies and 16 laboratories in 5 EU countries

Emerging Diseases in a Changing European Environment • coordinator: CIRAD Montpellier, France; participants: Institute of Vertebrate Biology and 47 research institutions in Europe, Asia, and Africa

Gene Therapy: an Integrated Approach for Neoplastic Treatment • coordinator: University of York, UK; participants: Institute of Macromolecular Chemistry and 5 research sections abroad

Functional Analysis of Accessory Factors in RNA Editing — Project Integrated Consortium • coordinator: University of Utrecht, Holland; participants: Biology Centre and 42 partners in 29 countries

3D Genome Structure and Function • coordinator: University of Amsterdam, the Netherlands; participants: Institute of Biophysics and 7 laboratories in the Netherlands, Germany and France

Quality Assurance and Improvement of Microscale Meteorological Models "Physical Modelling of Transport Processes in Micrometeorological Flows" • coordinator: Institute of Meteorology at Hamburg University, Germany; participants: Institute of Thermomechanics and 31 partners in 19 countries

The Role of the Upper Troposphere and Lower Stratosphere in Global Change "Atmospheric Chemistry Influence on the Upper Troposphere — Simulation in the Wind Tunnel" • coordinator: Institut für Umweltphysik, University of Bremen, Germany; participants: Institute of Thermomechanics, a total of 24 research establishments in 18 countries

3-D Monitoring of Active Tectonic Structures • coordinator: Consiglio Nazionale delle Ricerce, Istituto di Geoscienze e Georisorse, Italy; participants: Institute of Rock Structure and Mechanics and laboratories in another 13 countries

COST

EU — Marie Curie

Oral Facial Development and Regeneration • coordinator: University of Lyon, France; participants: Institute of Animal Physiology and Genetics and institutes in 22 European countries

Diamond Research on Interfaces for Versatile Electronics (RTN) • coordinator: University of Uppsala, Sweden; participants: Institute of Physics and 11 European laboratories

Consumption, Household Welfare, and Dynamics of Property Prices (International Reintegration Programme) • participants: Economics Institute in cooperation with Charles University and other research institutions in more than 15 European countries

EU — STREP

Nanocrystalline Heterosupermolecular Materials for Optoelectronic Applications • coordinator: University of Valencia, Spain; participants: J. Heyrovský Institute of Physical Chemistry and 8 partners in four European countries

From Stem Cell Technology to Functional Restoration after Spinal Cord Injury • coordinator: Institute of Neuroscience, Montpellier, France; participants: Institute of Experimental Medicine and 7 institutes in 5 European countries

Optimized Delivery Systems for Vaccines Targeted to Dendritic Cells • coordinator: Pasteur Institute in Paris, France; participants: Institute of Microbiology and 4 European Institutes

Targeted Gene Interaction in Plants: Vectors, Mechanisms and Applications for Protein Production • coordinator: Weizmann Science Institute, Rehovot, Israel; participants: Institute of Experimental Botany and 7 institutions in 3 European countries

Other

Speleothems and other Cave Sediments from Siberia: An Archive from the Boreal Climate Zone with the Potential for Climate Reconstruction on an Annual to Decadal Basis • coordinator: GeoForschungsZentrum Potsdam, Germany; participants: Institute of Geology and 6 other research units in 3 European countries

Integrated European Laser Laboratories • coordinator: Forschungsverbund Berlin, Germany, participants: Institute of Physics and 15 European laboratories

Spectral-spatial Scaling from Leaf to Canopy Level Using Spectro-directional Approaches in Support of the GMES Sentinel 2: "Superspectral" Mission • coordinator: European Space Agency; participants: Institute of Systems Biology and Ecology and 2 research units in France and Holland

Integrated Project to Evaluate the Impacts of Global Change on European Freshwater Ecosystems • coordinator: University College London, UK, participants: Biology Centre and 35 research establishments in 17 European countries and Canada

Novel Inhibitors of the Replication of Poxviruses • coordinator: Catholic University of Leuven, Belgium; participants: Institute of Organic Chemistry and Biochemistry, Gilead Science, USA and Gilead Science Research Centre in Prague

Consomic Strains between C57/BL/6 and PWD • coordinator: Jackson Laboratory, USA; participants: Institute of Molecular Genetics and 9 joint USA participants

Network of Excellence ALTERNET: "A Long-Term Biodiversity, Ecosystem and Awareness Research Network" • coordinator: Centre for Ecology and Hydrology in Lancaster, UK; participants: Biology Centre and 23 research institutions in 17 European countries

The Health Benefits of Exercise: An Identification of Genes and Signalling Pathways Involved in the Effect of Exercise on Insulin Resistance, Obesity and Metabolic Syndrome • coordinator: University of Dundee, UK, participants: Institute of Physiology and 23 laboratories in 13 European countries

International Social Survey Programme • participants: Institute of Sociology and partners in 41 countries

Transformation. The Development of a Common Culture in the Northern Provinces of the Roman Empire from Britain to the Black Sea • participants: Institute of Archaeology in Brno and research sections in 14 European countries

Representations of the Past: National Histories in Europe • participants: Institute of History and 22 partners in 14 European countries

Baroque Wall Painting in Central European Context • participants: Institute of Art History in cooperation with Masaryk University, the Austrian Academy of Sciences, and the Slovenian Academy of Science and Art

History after a Fall. The Indeterminacy of the Short Twentieth Century • participants: Institute for Contemporary History in cooperation with the University of Central Europe in Budapest and 3 partners in Poland and Romania

Supporting Potential and Existing Research Intensive SMEs • participants: Institute of Philosophy and partners in 10 European countries

Der Beitrag des slawischen Funktionalismus zur internationalen Narratologie • participants: Institute of Czech Literature together with the University of Hamburg

European Language Atlas – Atlas linguarum Europae • participants: The Czech Language Institute and partners in 51 European countries

Representative international conferences organised by ASCR institutes

Conferences

26th General Assembly of the International Astronomical Union • joint organiser: Astronomical Institute; 2412 participants, 2297 from abroad

4th International Symposium on Laser, Scintillator and Non Linear Optical Materials • organiser: Institute of Physics; 106 participants, 16 from the Czech Republic

44th European High Pressure Research Group – International Conference • organiser: Institute of Physics; 215 participants, 22 from the Czech Republic

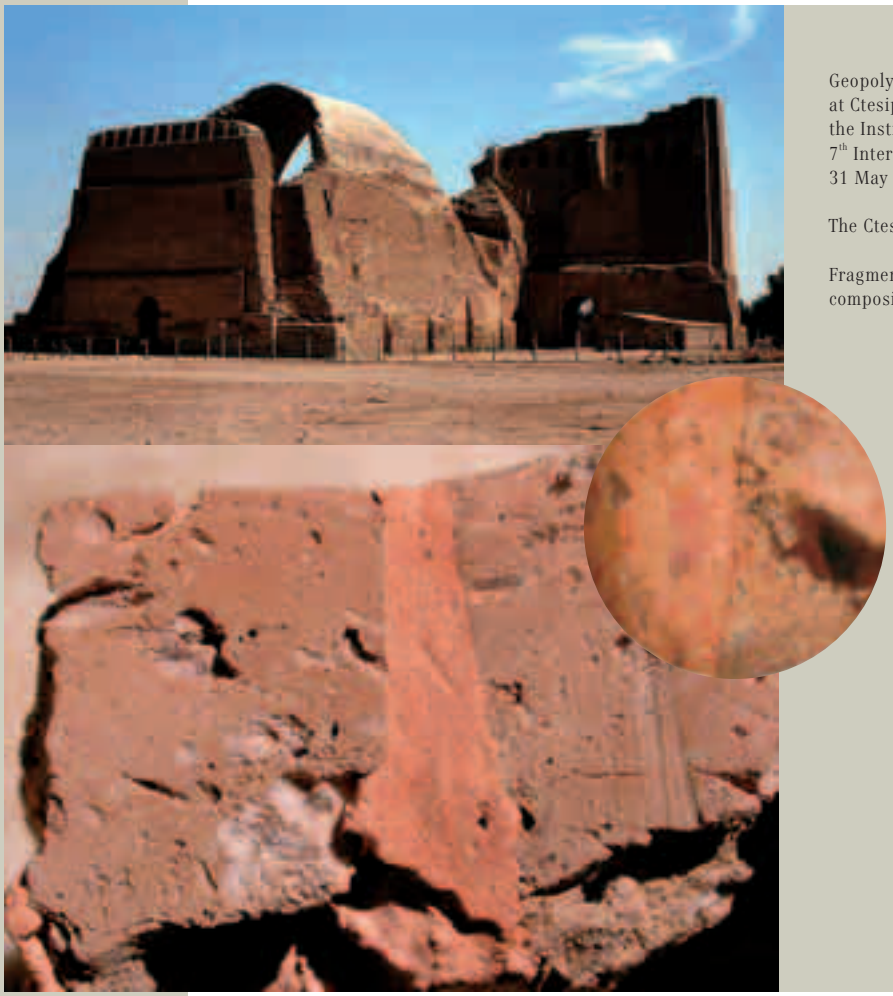
10th Prague Topological Symposium • organiser: Institute of Mathematics; 212 participants, 180 from abroad

The Conference on Current Trends in Theory and Practice of Computer Science SOFSEM 2006 • organiser: Institute of Computer Science; 109 participants, 77 from abroad

Prague Stochastics 2006, a joint gathering of the **7th Prague Symposium on Asymptotic Statistics** and the **15th Prague Conference on Information Theory, Statistical Decision Functions and Random Processes** • organisers: Institute of Information Theory and Automation and the Faculty of Mathematics and Physics at Charles University; 169 participants, 130 from abroad

22nd Symposium on the Physics and Technology of Plasma • organisers: Institute of Plasma Physics and the Faculty of Electrical Engineering at the Czech Technical University; 284 participants from 25 countries

7th European Commission Conference "Sauveur": Safeguarded Cultural Heritage. Understanding and Viability for an Enlarged Europe • organiser: Institute of Theoretical and Applied Mechanics; 286 participants from 37 countries



Geopolymers for reconstruction of the historical royal palace at Ctesiphon (Al Mada´in in Arabic) in Iraq. Presented by the Institute of Rock Structure and Mechanics at the 7th International Conference SAUVEUR in Prague, 31 May — 3 June 2006

The Ctesiphon palace at the present time

Fragments of an original brick bound by a geopolymer composite

10th Symposium on Studies of the Earth's Deep Interior • organiser: Geophysical Institute; 158 participants, 150 from abroad

7th European Paleobotany-Palynology Conference • organisers: Institute of Geology, Institute of Archaeology in Prague, Faculty of Science at Charles University, National Museum in Prague, Museum of West Bohemia in Pilsen; 343 participants, 309 from abroad

19th International Conference on High Definition Molecule Spectroscopy • joint organiser: J. Heyrovský Institute of Physical Chemistry; 260 participants, 227 from abroad

17th International CHISA Congress 2006 • joint organiser: Institute of Chemical Process Fundamentals; 957 participants, 763 from abroad

Seventh Liblice Conference on the Statistical Mechanics of Liquids • organisers: Institute of Chemical Process Fundamentals, Université Paris-Sud, Imperial College London, North Carolina State University,Raleigh; 144 participants, 120 from abroad

17th International Mass Spectrometry Conference • main organiser: Institute of Microbiology; 1900 participants, 1810 from abroad

10th International Symposium on the Genetics of Industrial Microorganisms • main organiser: Institute of Microbiology; 1000 participants, 790 from abroad

36th Annual Meeting of the European Environmental Mutagen Society: "From Genes to Molecular Epidemiology" • organiser: Institute of Experimental Medicine; 450 participants, 420 from abroad

6th International Conference "Scientific and Clinical Applications of Magnetic Carriers" • organiser: Institute of Systems Biology and Ecology; 326 participants, 315 from abroad

23rd Congress of the Science and Arts Society • joint organiser: Biology Centre; 500 participants, over 300 from abroad

EALE Conference 2006 (European Association of Labour Economists) • joint organiser: Economics Institute (CERGE-EI); 400 participants, mostly from the EU and USA

School and Health for the 21st Century • joint organiser: Institute of Psychology; 272 participants, 51 from abroad

Eva Šlaufová, science secretary of the Institute of Slavonic Studies, interviewed by the Russian State Television at the opening of "Institute of Slavonic Studies yesterday and now" exhibition in the library of Russkoe zarubezhie in Moscow, March 2006

Science Policies Meet Reality: Gender, Women and Youth in Science in Central and Eastern Europe • joint organiser: Institute of Sociology; 150 participants, mainly from Europe

Grundprobleme der frühgeschichtlichen Entwicklung im mittleren Donauraum. Mitteleuropa zur Zeit Marbods • joint organiser: Institute of Archaeology in Brno; 48 participants, 36 from abroad

Sacri canones servandi sunt • organiser: Institute of History; 115 participants, 14 from abroad

Mors immortalis — 5th Meeting on the Issue of Sepulchral Monuments • joint organiser: Institute of Art History; 68 participants, 8 from abroad

Philosophy and Social Science • organiser: Institute of Philosophy; 95 participants, 62 from abroad

The Life and Work of Wolfgang Amadeus Mozart in Czech Studies • organiser: Institute of Ethnology; 20 participants, 14 from abroad

Slavianski institut v Prage — vchera i segodnia • organiser: Institute of Slavonic Studies; 89 participants, 80 from abroad

Overview of international cooperation at ASCR institutes

	1	2	2a	3	3a	3b	3c	4	5	6	7	8	8a
Section 1	38	2 356	1 188	1 152	784	227	411	23	164	102	151	61	45
Section 2	27	836	780	670	528	69	262	10	57	99	77	31	26
Section 3	16	488	423	380	267	43	188	7	46	65	35	31	18
Total	81	3 680	2 391	2 202	1 579	339	861	40	267	266	263	123	89
Section 4	34	1 221	1 154	753	313	92	602	4	92	85	109	84	48
Section 5	40	1 461	1 391	1 157	464	193	669	29	140	96	180	91	50
Section 6	18	678	586	499	243	79	293	17	108	64	43	47	30
Total	92	3 360	3 131	2 409	1 020	364	1 564	50	340	245	332	222	128
Section 7	30	242	233	298	257	114	16	9	11	57	90	24	15
Section 8	29	267	272	252	244	192	13	4	33	58	64	19	4
Section 9	39	345	270	275	287	172	5	14	84	52	128	13	7
Total	98	854	775	825	788	478	34	27	128	167	282	56	26
Total other	0	0	0	0	0	0	0	0	0	0	0	0	0
ASCR Total	**275**	**7 894**	**6 297**	**5 436**	**3 387**	**1 181**	**2 459**	**117**	**735**	**678**	**877**	**401**	**243**

1 — Number of conferences attended by scientists from other countries (organised or jointly organised by a department)
2 — Number of journeys abroad undertaken by staff members of institutes
2a — number of these without bilateral agreements
3 — number of staff at institutes actively participating in international conferences
3a — Number of papers read at these conferences
3b — number of invited papers
3c — number of posters
4 — Number of ASCR employees teaching at universities abroad
5 — Number of ASCR employees serving on editorial boards of international journals
6 — Number of memberships in bodies of governmental and non-governmental international science organisations (societies, committees)
7 — Number of lectures given by foreign scientists at institutes
8 — Number of grants and projects financed from abroad
8a — number of these from EU programmes

Public Tenders in Research and Development

6

Specified financial resources allocated from the budget chapter of the ASCR were used to support programme and grant projects. These resources are specifically distributed based on the results of public tenders in research and development as announced by the Academy or the Grant Agency of the ASCR. Funds disbursed in 2006 totalled 605 million CZK, of which 359 million CZK was for support of programme projects and 246 million CZK to support grant projects. The basic difference between programme and grant projects is that the content of programme projects must meet the objectives of the programme specified during the announcement process itself, whereas grant projects support the individual activities of the researchers.

Programmes announced by the ASCR

A total of 58 projects under the **Scheme of Targeted Research and Development Support** were completed by 31st December 2005. The Council for the Scheme of Targeted Research and Development Support assessed the quality of results achieved. The Academy Council of the ASCR approved the final assessment as follows: 24 projects were completed with excellent results, 30 were successfully completed, and 4 projects were unsuccessful. The completion of these projects marked the completion and evaluation of the entire programme, in which 443.8 million CZK of specific resources had been invested since 2000. A total of 132 projects were part of the Scheme of Targeted Research and Development Support; a number of high quality results in basic and applied research were achieved, including patented research. A number were of international standard.

Implementation continued of projects in **The Information Society** (a thematic programme) and **Targeted Research Projects Support** (a sub-programme of the sectional programme entitled "Integrated Research") classified under National Research Programme I. The specific support provided of 76 continuing projects in the Information Society programme was 185.8 million CZK in 2006. A total of 53 projects continued as part of Targeted Research Projects Support with 74.8 million CZK.

A new programme entitled **Nanotechnologies for Society** got underway on July 1st. This programme, which was notified by the European Commission in December 2005, was announced to run from 1st July 2006 to 31st December 2012. Work began on 15 projects based on the results of a public tender (selected from 39 proposals a 38.5% success rate for bidders). Support provided in 2006 was 98.7 million CZK, the average being

90.4%. A public tender was announced on 31st May with another 14 projects initiated on January 1st 2007 based on the public tender (20 proposals submitted – success rate of bidders of 70 percent).

A total of 246 million CZK was allocated for the Academy's Grant Agency (GAAS) from the ASCR budget, including resources to purchase equipment funded from investment costs. The overall sum was divided into support for new and continuing grant projects. A further 392 thousand CZK supported selected medical research projects. This project was supported by PRO.MED.CS a.s.

Support for grant projects

Work on 102 research grant projects began on January 1st based on public tenders, with 62 341 thousand CZK assigned to these. The sum of 32 158 thousand CZK was made available to 73 junior researchers. In addition, 1144 thousand CZK supported 9 supplementary publication grant projects.

Assessment of completed and continuing grant projects

The Departmental Councils of the GAAS assessed the quality of results of grant projects completed by December 31st 2005 and the progress of grant projects continuing in 2006. The completed reports provided by the implementers of these projects were supplemented with prints of the most significant work created during project. A total of 97 standard research projects covering 2 and 5 years were completed by the end of 2005. An average of 7.7 publications per project was issued in the course of project work, the majority being published in prestigious, reviewed journals. A total of 69 junior research grant projects were completed during one to three years. The number of results published was more than 3.4 per project, which can be regarded as adequate given the length of time spent on implementation and the youth of team members. The Departmental Councils appraised the progress of 235 standard and 91 junior research grant projects, on which a total of 150 372 thousand CZK was invested in 2006 (32 432 thousand CZK of this on junior projects).

The progress and results of public tenders in the year 2006

The Grant Agency of the ASCR organised the XVII round of the tender for granting support to new projects. A total of 414 proposals were received for the tender for standard research grant projects. A separate category of inter-disciplinary projects was earmarked for the first time under the grant programme and 15 proposals were accepted. These projects mainly provide an opportunity for joint teams from the staffs of basic research laboratories in different fields. It also promotes cooperation between ASCR institutes, universities, and other research establishments. The teams on inter-disciplinary projects have from 4 to 5 years to complete their projects. A total of 266 proposals were received as part of the tender for junior research grant projects. Meanwhile, a total of 5970 requests for reports by intellectual evaluators were sent out in order to assess 695 proposals for both types of research grant projects received. A total of 1107 reports were received from intellectual evaluators in the Czech Republic and 1246 reports from abroad, i.e., around 3.4 reports for each project proposal. The management at GAAS decided to grant support to 157 standard projects (38% of the proposals received), 4 inter-disciplinary projects (27% of the proposals received), and 101 junior research grant programmes (38% of the proposals received). The increasing interest in obtaining support from the GAAS for both types of research grant projects, which was already considerable during the XVth round, continued in 2006. However, owing to the fact that the funds set aside for the GAAS for 2007 were also increased, we can consider the achievement of public tenders to be satisfactory. (Details on the success of individual fields and on the financial resources allocated is summarised in the tables that follow.)

A total of 20 proposals were received for supplementary publication grant projects. Two appraisals from Czech-based intellectual evaluators were obtained for all proposals. The funds were also sufficient given the number of proposals submitted. The management at the GAAS decided to provide support to 8 grant

projects (40% of the proposals received) to a total amount of 1502 thousand CZK as recommended by the Departmental Councils.

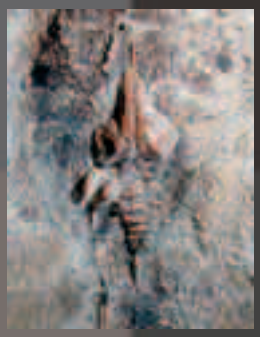
Newly-launched standard research grant projects

Discipline		Number of proposals	Number of projects funded	Percentage of projects funded	Special grants in thousands of CZK
1	Mathematics and physics, computer science	59	15	25.4	13 559
2	Technical sciences and cybernetics	27	10	37,0	6 640
3	Earth and space sciences	46	17	36.9	11 100
4	Chemical sciences	61	26	42.6	21 936
5	Medical sciences and molecular biology	62	23	37.1	22 753
6	Bio-ecological sciences	75	25	33.3	21 136
7	Social sciences and economics	29	14	48.3	4 875
8	Historical sciences	33	11	33.3	4 418
9	Humanities and philology	22	16	72.7	7 245
Total		**414**	**157**	**37.9**	**113 66**
x	Inter-disciplinary projects	15	4	26.7	5 398

Newly-launched junior research grant projects

Discipline		Number of proposals	Number of projects funded	Percentage of projects funded	Special grants in thousands of CZK
1	Mathematics and physics, computer science	27	13	48,1	3 893
2	Technical sciences and cybernetics	14	4	28.6	2 604
3	Earth and space sciences	25	11	44.0	4 038
4	Chemical sciences	33	12	36.4	5 359
5	Medical sciences and molecular biology	26	11	42.3	5 036
6	Bio-ecological sciences	77	22	28.6	13 649
7	Social sciences and economics	25	10	40.0	1 924
8	Historical sciences	17	7	41.2	2 107
9	Humanities and philology	22	11	50.0	2 735
Total		**266**	**101**	**38.0**	**41 345**

The Academy Assembly of the ASCR approved a statute on 14th December designed to improve the work of the GAAS. It became effective 1st January 2007.



Science Communication

7

ASCR institutes continued to present their scientific results to the general public in 2006. Communication activity mainly drew on the cooperation of scientists with the media and their active approach to all events which promoted science.

The Sixth **Science and Technology Week** and **Open Door Days** took place 6—12 November during European Science Week. Partners with the ASCR included the American Science Information Centre, British Council in the Czech Republic, Institute of Criminology in Prague, Museum of the Czech Police, National Museum of Agriculture, Municipal Library in Prague, and universities, among others. Media partners included *Lidové noviny* and *Učitelské noviny* (newspapers), Czech Radio, *Respekt* (magazine), and *Science World* and *Veda.cz* (Internet portals). Science and Technology Week was reported by more than 60 media and some lectures were broadcast live on the Internet.

Open Door Days during the Science and Technology Week 2006. Institute of Scientific Instruments in Brno

Principal themes of the Science and Technology Week were biotechnology, nanotechnology, and the European cultural heritage. These topics dominated the lectures and also inspired exhibitions and a round-table discussion. The best received and most visited exhibition was *Transgenesis — Biotechnology in Contemporary Art*.

Science and Technology Week 2006 featured 64 lectures and 20 other events for 6300 attendees. ASCR institutes attracted 8500 visitors while others visited universities. The total attending Science and Technology Week and Open Door Days was 17 000 compared to 12 000 the previous year.

European Mind Week (13th—19th March) featured nine lectures attended mainly by secondary school pupils.

The ASCR and several other establishments participated in the second annual European **Scientists' Night** event, where many science institutions and scientists were presenting their scientific activities, interests and hobbies to the public. The ASCR received a financial contribution for the whole event from the 6th Framework Programme for Science and Research to coordinate the event and also sponsored public debates between leading Czech scientists. The Institute of Sociology and the Astronomical Institute prepared other events.

The Academy also took part in the **Science in the Streets** event, sponsored by the Czech Intellect project. Fifteen institutes presented interactive exhibitions on Prague streets 23rd—24th June, with 13 institutes taking to the streets of Pilsen 22nd—23rd September. The public responded with interest and the scientists in attendance considered this promotion of science successful and indeed necessary.

A glass blower showing his skill in front of a stall with a microwave glassmaker's oven designed at the Institute of Chemical Process Fundamentals. Science in the Streets, Pilsen 2006

Lectures publicize the institutes and are significant. For example, the Astronomical Institute included lectures for the general public during the two-week conference of the 26th General Assembly of the International Astronomical Union in August.

Cooperation continued with **Czech Television** and **Czech Radio.** ASCR staff took part in a television series entitled *Česká hlava* (Czech Intellect), *Planeta Věda* (Planet Science), and *Popularis*, whilst the Czech Language Institute prepares a regular weekly programme entitled *O češtině* (About Czech). Other institutes, such as the Institute of Physiology, Institute of Molecular Genetics, Institute of Organic Chemistry and Biochemistry, and Institute for Contemporary History also have established good working relations with Czech Television. Similarly, ASCR personnel participated in creating various radio programmes, in particular on Czech Radio 2 (the *Meteor* programme) and Leonardo (*Historie a současnost Akademie věd* (The History and Present of the Academy of Sciences) as prepared by the Masaryk Institute/ Archives, a documentary made by the ASCR about Antonín Holý, or the five-part series *Odhalené souvislosti* (Uncovered Connections).

A number of institutes worked with the Ministry of Education, Youth, and Sports and with individual secondary schools in organising **competitions and contests.** For example, the Institute of Physics prepared a Europe-wide event entitled *European Master Classes in High Energy Physics* for secondary-school students and their teachers. It also organised a week-long visit to its departments for students of the grammar school in Prostějov. Meanwhile, the Institute of Mathematics and the Czech Language Institute jointly organised secondary-school competitions, and also lectures for teachers.

The Institute of Systems Biology and Ecology, the Academy and university centre at Nové Hrady sponsored **summer schools for students** entitled Schola ludus and also prepared the second year of an international course for university students.

Jiří Sádlo of the Institute of Botany teaching a chemistry course at Nové Hrady. Open Science project, 2006

The Press Department of the Academy's Centre of Administration and Operations organised a total of 25 press conferences and issued 85 press releases. A round table on the *Origins of Life on Earth — Evolution or Creation?* in the cycle entitled Science and Faith attracted students and journalists. Ten-part cycles of lectures for the general public and secondary-school students entitled Akademická Praha (Academic Prague) and *Nebojte se vědy* (Don't Be Afraid of Science) lectures attracted 150 students.

The monthly **Academic Bulletin** described activities at the ASCR and offered reports and articles on current events and history.

A total of 15 exhibitions were staged at the Head Office of the ASCR. Three of these were part of the Science and Technology Week 2006, four were organised in cooperation with ASCR institutes, and eight were art-related. Very well received was an exhibition on the *Martinická Bible*, organised in cooperation with the ASCR Library, and a presentation by the Norwegian painter Magne Sandoy. Individual institutes also cooperated on exhibitions, for example, the Institute of Archaeology in Prague (the *Mammoth Hunters* exhibition in the National Museum, a permanent exhibition within Prague Castle entitled *The History of Prague Castle*), etc.

The ASCR also prepared its own educational projects, in particular **Open Science.** Three week-long courses and a one week-long seminar were organised to improve the standard of educating teachers at secondary schools in science and technical subjects. Meanwhile, 150 placements at 24 institutes were created in support of talented secondary-school students, and a student conference was held at which 38 students presented the results of their work.

The ASCR continually monitors the response to its activities in the media. During 2006 over 7500 informative pieces were published, for an average of over 600 articles a month.

8

8 Summary of the Use of Financial Resources

In 2005, following a four-year period during which the relative level of support for research and development from the state budget as expressed as a percentage of gross domestic product stagnated, a very slight improvement was reported. This trend continued into 2006, when the overall support for research and development from the state budget rose to 0.56 percent of GDP. While this change in the trend is welcome, this tempo of growth of support for research and development means that the Czech Republic is failing to fulfil the aims of the Lisbon Strategy of the European Commission and the National Research and Development Policy, despite the increase for R&D in GDP.

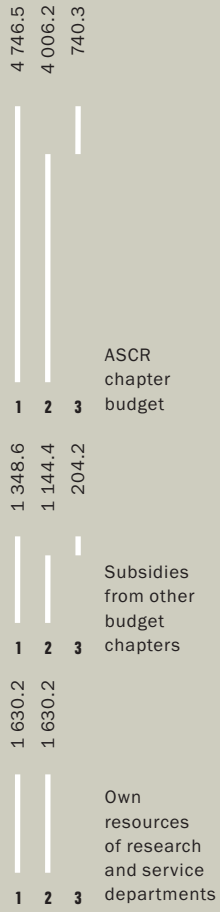
Expenditure in the budget chapter of the Academy of Sciences of the Czech Republic only rose by 6.1% in contrast to the previous year, which is one-third lower than for the overall expenditure from the state budget for research and development. In addition, institutional funds contributed to the growth of expenditure of the chapter to a lesser extent, which was not too favourable a situation for the research objectives of institutes that mainly entered their second year of implementation. This widened the difference between the amount of institutional support and allowable expenses, even though the financial demands were already adjusted to the unfavourable development forecast (on the basis of the medium-term outlook approved by the Council for Research and Development) in proposals for research objectives.

The ASCR operated with a total of 7832 million CZK during 2006, 4853.2 million of which came from its own budget chapter. The institutional funds provided for research objectives and for ensuring the research infrastructure amounted to 87.3% of the budget resources. The total volume of specific resources obtained in public tenders for research and development rose by more than one-third compared to 2005. A total of 1343 million CZK was transferred to ASCR institutes from other budget chapters without budget measures pursuant to Act No. 130/2002 Coll. In contrast to previous years, the predominant part, 859.7 million CZK, came from other providers; for example, a total of 483.3 million CZK (or 35.3 percent) from the Czech Science Foundation.

ASCR non-investment funds were generated as follows: 59.3 percent resources from its own state budget chapter, 16.8 percent transfers from the other state budget chapters, and 23.9 percent from own revenues and extra-budgetary funds. The share of the final two elements here rose considerably compared to the previous year. The investment funds of the ASCR were generated as follows: 79.8 percent resources from its own state budget chapter and 20.2 percent transfers from the other state budget chapters.

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
2006 0.56



The structure of ASCR's financial resources in 2005 (in million CZK)

1 Total
2 Non-investment funds
3 Investment funds

The structure of financial resources (in million CZK)		Non-investment Funds	Investment Funds
Approved chapter budget		4 032.3	676.8
Amended ASCR chapter budget		4 006.2	740.3
of this,	subsidies to allowance organisations	3 699.2	679.4
	to ASCR Head Office	307.0	60.9
Subsidies from other budget chapters		5.6	
of this,	Ministry of Culture projects	0.7	
	Ministry of Health projects	0.5	
	Ministry of Education, Youth and Sports projects	1.3	
	Ministry of Labour and Social Affairs projects	3.1	
Sources of the ASCR chapter reserve fund		39.2	67.5
Subsidies from other budget chapters (pursuant to Act No. 130/2002 Coll.)		1 138.8	204.2
of this,	Czech Science Foundation	472.0	11.3
	Other departments	666.8	192.9
Own resources of research and service departments		1 630.2	
of this,	Main activity orders	108.6	
	Sales of publications	149.2	
	Sales of goods and services	153.9	
	Licences	604.4	
	Conference fees	67.8	
	Foreign grants and donations	271.6	
	Rent	48.7	
	Own fund resources	110.2	
	Other	115.8	
Total resources		**6 820.0**	**1 012.0**

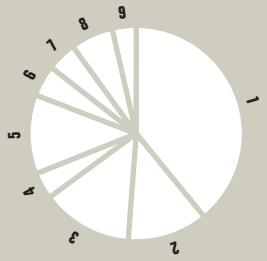
Structure of the costs of research and service departments	in %	in million CZK
Employees' salaries and other payment for work done	39.71	2 438.2
Mandatory insurance paid by the employer	13.63	836.7
Purchase of material	13.83	849.0
Purchase of energy, water, and fuels	2.94	180.3
Purchase of services	11.18	686.2
Repairs and maintenance	4.38	269.2
Total travel expenses	3.28	201.9
Depreciation of fixed assets	6.70	411.6
Total other costs	4.35	267.2
Institutes, service departments of ASCR used in total	**100.00**	**6 140.3**

The structure of costs is stable and has practically not changed for a number of years. The total costs of institutes and service departments rose by 12.2 percent against 2005. Employee pay increase (11.7 percent) was a little slower, but purchases of services (20.7 percent), travel expenses (17.26 percent), and other expenses (19.3 percent) were raised more, in particular due to exchange rate losses.

The creation and use of investment resources

Sources of investment resources are created primarily through institutional and specific subsidies from the state budget and 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)		**1 478.4**	
of this,	Depreciation	411.6	
	Transfer from improved trading income	32.2	
	Recipients; joint recipients (pursuant to Act No 130/2002 Coll.)	204.2	
	Foreign grants and donations	22.6	
	Subsidies from the state budget		732.0
	Institutional specific	75.8	
These resources were used to fund:			
	Buildings	594.9	
	Acquisition of land	26.0	
	Acquisition of instruments and equipment	800.7	
	Maintenance and repairs	71.3	
	Other	64.9	
Total used on the acquisition of fixed assets			1 557.8
Fixed asset renewal fund reduced by			79.4
Sum returned to the state budget			0.0

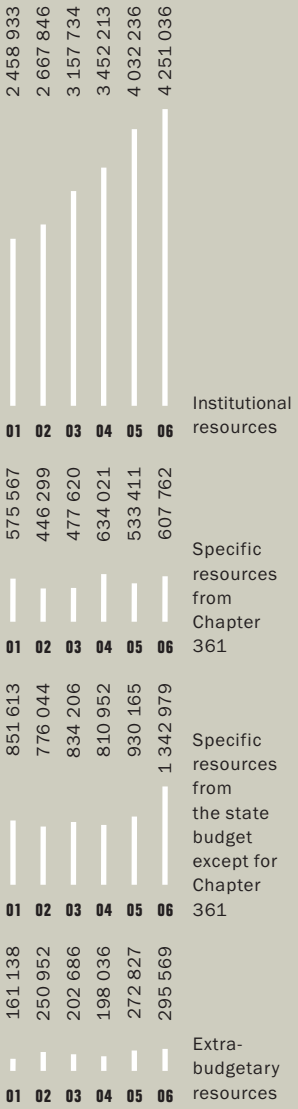


The structure of costs of the institutes and service departments in %

1 Employees' salaries and other payments for work done 39.71
2 Mandatory insurance paid by the employer 13.63
3 The purchase of material 13.83
4 The purchase of energy, water and fuel 2.94
5 The purchase of services 11.18
6 Repairs and maintenance 4.38
7 Travel expenses 3.28
8 Depreciation of fixed assets 6.70
9 Other costs 4.35

The ASCR was careful that the amount of investment resources in its budget allowed for the gradual elimination of arrears which occurred due to insufficient funds from the previous 15 years in terms of the maintenance and renewal of scientific instruments, modernisation of laboratories, and the maintenance and reconstruction of buildings used, all within the limits of the restricted possibilities of the expense budget of its chapter. A supplement to investment funds in 2006 involved subsidies for depreciation.

The investment resources of ASCR institutes increased by 34.4 percent from one year to the next. These were used in large part for the acquisition of apparatuses and equipment. As well, financing for construction increased considerably, mainly because of a significant sum for the continuation of the most important construction operation, Infragen, in the complex in Prague-Krč. Among the other construction operations in 2006 were the completion of a multipurpose building for the Biology Centre in České Budějovice, construction of a laboratory building for the Institute of Physiology in Prague, ongoing reconstruction of the chateau at Liblice, construction of a lecture theatre for the Institute of Plasma Physics, reconstruction of the ground floor of the court wing of the Institute of Mathematics in Prague, and the carpentry shop in the Institute of Scientific Instruments was rebuilt into Library, in Brno.



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

Analysis of employment and drawing wage funds

The numbers of employees and average monthly earnings for individual categories of employees are stated in the following table:

Category	Average adjusted Number of employees	Average monthly earnings in CZK
Science worker (with certificate)	2 378	38 645
Specialist R&D worker with university education	1 630	25 208
Specialist worker with university education	368	23 643
Specialist worker with secondary education, technical college	1026	18 186
Specialist R&D worker with secondary education, technical college	122	20 320
Technical and financial employee	939	24 786
Manual worker	639	14 106
Operator	346	12 620
Total ASCR	**7 448**	**26 784**

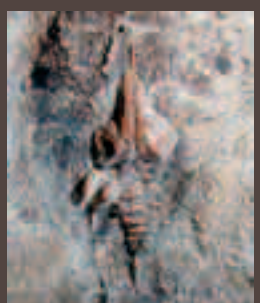
The total average monthly wage at the ASCR was 26 784 CZK, which represents a year-on-year growth of 8.66 percent against 2005.

The ASCR paid 74.4 percent of the payroll from institutional funds restricted by a wage limit.

Institute evaluation

The Academy of Sciences regularly inspects institutes and other recipients of subsidies from the chapter budget. Shortcomings are eliminated during inspection and the effectiveness of measures taken is followed up on.

The ASCR inspection department audits accounting of projects from the 6th EU Framework Programme as approved by the EU. Funds checked in 2006 totalled 103 121 thousand CZK. Thirty audit certificates were awarded.



Appendices

Summary of Information Posted on ASCR Websites

A 1

Basic characteristics of the ASCR • http://www.cas.cz/zinfo.php
History of the ASCR • http://www.cas.cz/historie.php
Annual Report of the ASCR • http://www.cas.cz/vyr_zpr.php

Act on the ASCR • http://www.cas.cz/zakon_avcr.php
Statutes of the ASCR • http://www.cas.cz/stanovy_avcr.php
Conceptual plan for the advancement of research and development at the ASCR (updated for 2004—2008) • http://www.cas.cz/koncepce_vav.php
Code of ethics for research workers at the ASCR • http://www.cas.cz/eticky_kodex.php

Structure of the ASCR • http://www.cas.cz/struktura.php
Advisory and auxiliary bodies of the ASCR • http://www.cas.cz/ostatni.php?m=3&ID=88
Academy Assembly • http://www.cas.cz/akademicky_snem.php
Grant Agency of the ASCR • http://www.gaav.cz/

Awards presented by the ASCR • http://www.cas.cz/ostatni.php?m=4-10&ID=4-10-01-00
Medals presented by the ASCR • http://www.cas.cz/ostatni.php?m=4-10&ID=4-10-02-00
The Otto Wichterle Award • http://www.cas.cz/ostatni.php?m=4-10&ID=4-10-03-00
The J. E. Purkyně Fellowship • http://www.cas.cz/ostatni.php?m=4-10&ID=4-10-04-00

Research objectives of the ASCR • http://www.cas.cz/vav.php
Research centres in which ASCR institutes participate • http://www.cas.cz/ostatni.php?m=4&ID=4-02-00-00
Research and development programmes announced by the ASCR • http://www.cas.cz/programy_vav.php
Catalogue of publication activities at ASCR institutes • http://library.sk/aRL/main.php?language=czech&ictx=cav
Magazines published at the ASCR • http://www.cas.cz/ostatni.php?m=4&ID=4-02-00-00

List of experts from ASCR institutes • http://www.cas.cz/experti.php
List of ASCR institutes qualified for expert work • http://www.cas.cz/pracoviste_pro_znaleckou_cinnost.php
Doctoral study programmes implemented in cooperation with universities at ASCR institutes • http://www.cas.cz/ostatni.php?m=5&ID=5-01-00-00

A 2 Number of Institutes and Employees at the ASCR by Section

	Number of institutes in 2006	Average adjusted number of employees in 2005				Average adjusted number of employees in 2006			
		total		of this figure research and development with university education		total		of this figure research and development with university education	
		number	%	number	%	number	%	number	%
1. Mathematics, physics, and computer science section	6	1,272.0	17.6	688.9	18.3	1,322.8	17.8	735.1	18.3
2. Applied physics section	7	794.9	11.0	410.2	10.9	831.5	11.2	436.4	10.9
3. Earth sciences section	5	478.0	6.6	254.9	6.8	477.3	6.4	260.7	6.5
4. Chemical sciences section	6	1,040.1	14.4	641.4	17.0	1,062.2	14.3	684.6	17.1
5. Biological and medical sciences section	7	1,564.2	21.7	853.5	22.6	1,490.9	20.0	832.9	20.8
6. Biological and ecological sciences section	4	539.4	7.5	276.9	7.3	781.7	10.5	392.0	9.8
7. Social sciences and economics section	4	235.2	3.2	133.9	3.6	227.9	3.0	130.1	3.2
8. Historical sciences section	6	369.2	5.1	197.0	5.2	393.1	5.3	211.0	5.3
9. Humanities and philology section	6	439.5	6.1	304.2	8.1	449.2	6.0	322.2	8.0
Service departments (including the Head Office of the ASCR)	3	489.5	6.8	6.3	0.2	411.2	5.5	3.5	0.1
ASCR Total	**54**	**7,222.1**	**100.0**	**3,767.2**	**100.0**	**7,447.6**	**100.0**	**4,008.4**	**100.0**

Publication Results in ASCR

A 3

All-inclusive publication results at the ASCR

Type of publication	Publication results			
	Year of issue 2005		Year of issue 2006*)	
	Czech	foreign languages	Czech	foreign languages
Books	203	57	175	44
Essays in books	1036	306	435	220
Articles in science magazines	1214	2937	1090	2692
Proceedings of conferences	39	38	45	48
Papers in Proceedings	791	1575	703	1305
Translations		25		26
Reviews		373		265
Special articles in the daily press		232		222
Research reports		299		221

*) The information for 2006 is incomplete since publications with a publication date in the given year are also published the following year.
N.B.: the aggregate data for the ASCR is not a sum of the information per field of science given the fact that staff from more than one institute can participate in a single piece of work. Such work is included for each institute and in the summation once only.

Publication results in fields of science

	Sections 1–3				Sections 4–6				Sections 7–9			
	Year of issue 2005		Year of issue 2006*		Year of issue 2005		Year of issue 2006*		Year of issue 2005		Year of issue 2006*	
	Czech	foreign l.	Czech	foreign l.	Czech	foreign l.	Czech	foreign l.	Czech	foreign l.	Czech	foreign l.
Books	32	15	18	13	11	8	3	5	168	34	156	26
Essays in books	57	44	30	51	41	99	29	54	943	164	379	117
Articles in science magazines	287	1 261	231	1 116	233	1 540	209	1 505	697	165	659	102
Proceedings at conferences	14	14	20	25	5	16	8	9	20	7	17	12
Papers in Proceedings	361	982	324	848	196	501	172	353	234	98	206	108
Translations		0		4		0		0		25		22
Reviews		5		3		3		12		365		251
Special articles in the daily press		19		39		54		43		161		140
Research reports		132		104		18		12		150		105

*) The information for 2006 is incomplete since publications with a publication date in the given year are also published the following year.

THE ACADEMY
OF SCIENCES
OF THE CZECH
REPUBLIC

A giant tadpole
of the extinct frog genus
Palaeobatrachus from
the former crater lake of
the Lower Miocene site
of Randecker Maar
in Germany

detail

Section of Mathematics, Physics and Informatics 1

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

Section of Applied Physics 2

Institute of Hydrodynamics
Institute of Photonics and Electronics
Institute of Physics of Materials
Institute of Plasma Physics
Institute of Scientific Instruments
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 Experimental Botany
Institute od Experimental Medicine
Institute of Microbiology
Institute of Molecular Genetics
Institute of Physiology

Section of Bio-Ecological Sciences 6

Biology Centre
Institute of Botany
Institute of Systems Biology and Ecology
Institute of Vertebrate Biology

Section of Social and Economic Sciences 7

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

Section of Historical Sciences 8

Institute of Archaeology (Brno)
Institute of Archaeology (Praha)
Institute of Art History
Institute for Contemporary History
Institute of History
Masaryk Institute / Archives of the ASCR

Section of Humanities and Philology 9

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

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