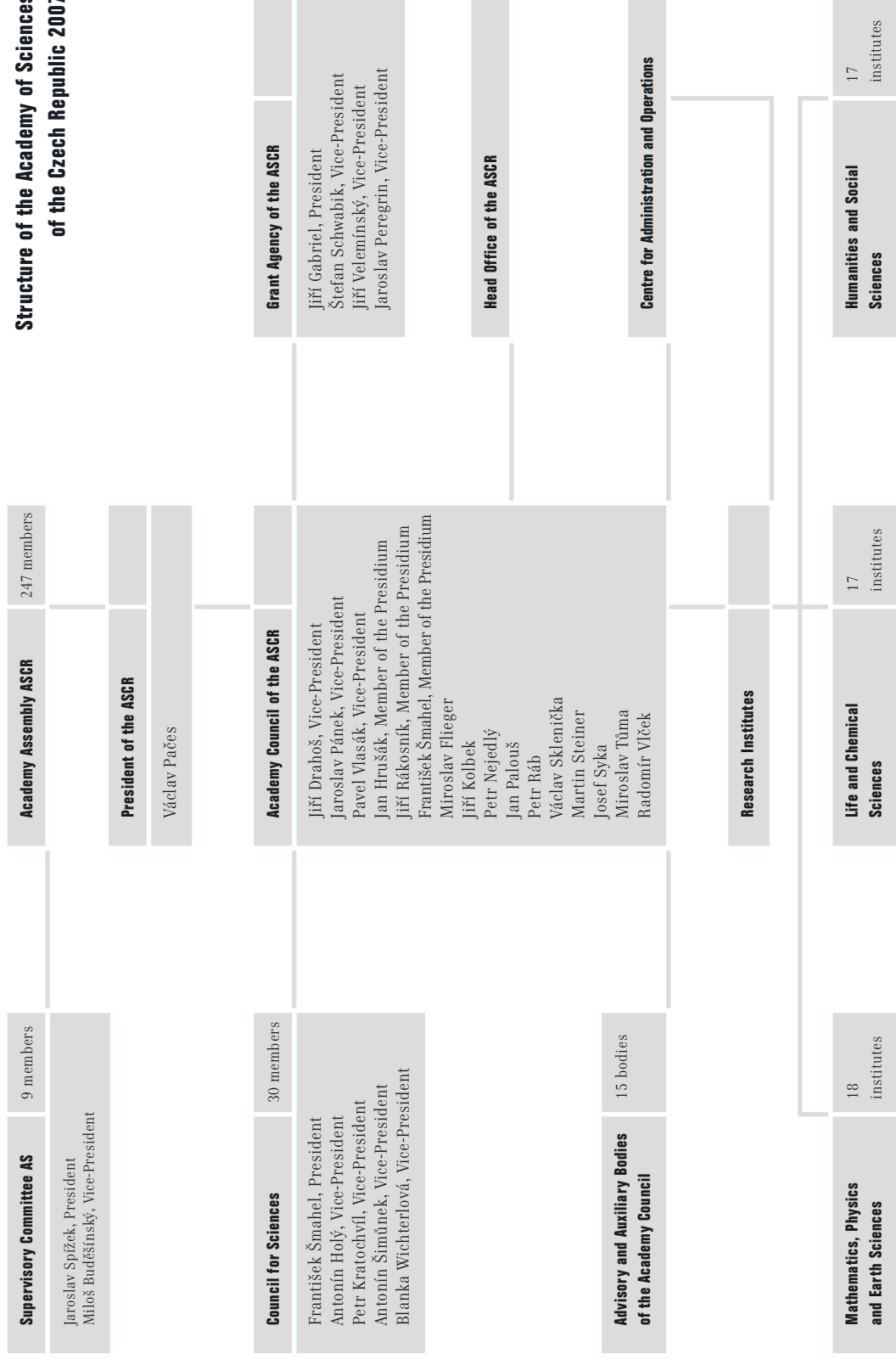


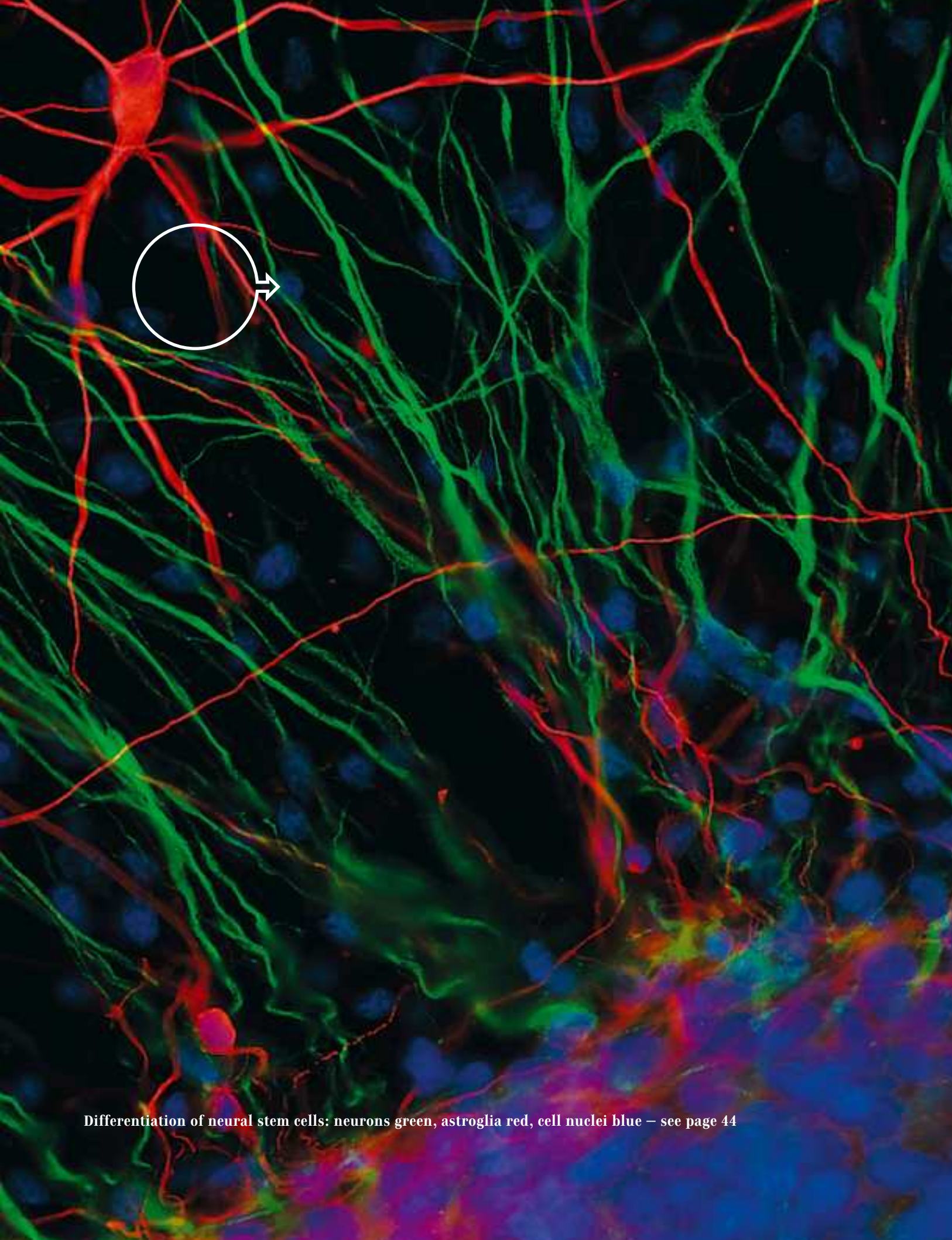
2007



ACADEMY OF SCIENCES OF THE CZECH REPUBLIC — ANNUAL REPORT

**Structure of the Academy of Sciences
of the Czech Republic 2007**

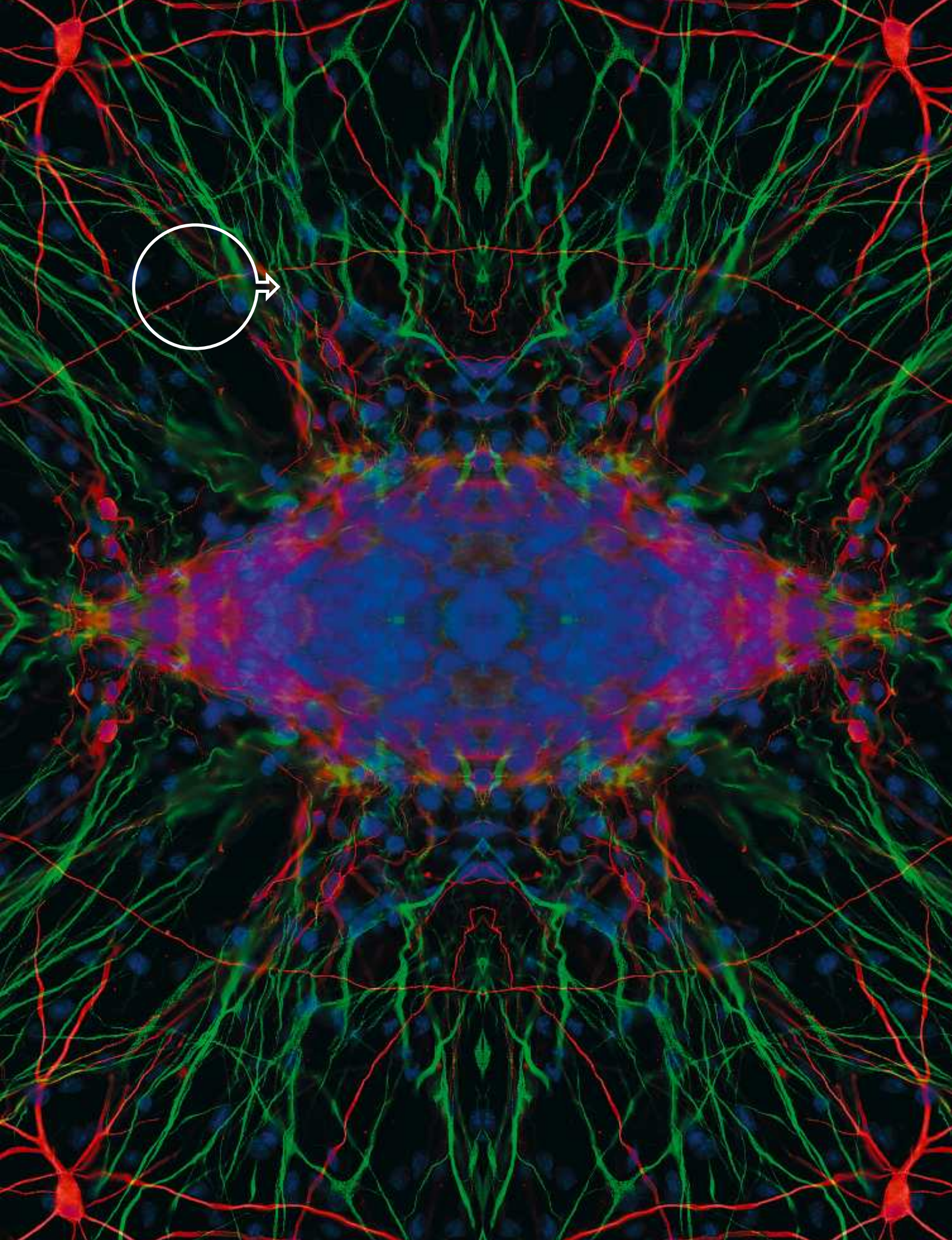




Differentiation of neural stem cells: neurons green, astroglia red, cell nuclei blue – see page 44



THE ACADEMY
OF SCIENCES
OF THE CZECH
REPUBLIC



Foreword by the President



Dear Readers, You have in your hands the Annual Report of the Academy of Sciences of the Czech Republic in which you will find information about our achievements during the year 2007. It was a year in which the institutes of the Academy of Sciences worked under a new legal and economic format as public research institutions. This is signified by “v. v. i.” (the Czech acronym for “public research institution”) after their names. This first year brought new opportunities in the work and focus of the institutes, along with a number of ambiguities in the interpretation of laws that define the framework for our work. We knew this would be the case and are taking steps to eliminate these problems.

Our scientific standard in 2007 once again improved on that of previous years when measured by international scientometric criteria. This is most important since the Academy of Sciences remains an institution whose primary *raison d'être* is basic research. Nonetheless, we are still not among the leading science institutions on a European and consequently on a global scale. And this has to continue to be our aim. To achieve this, the management of institutes needs to be far more exacting in their assessment of research teams and individuals and for them to take on new, prospective, young colleagues. Certain institutes are “ageing”. Others have had an increase in the number of employees, but the scale of their work has not improved.

Institutes will be assessed on an ongoing basis throughout 2008 and although this will have no direct influence on their funding, it will alert the management of institutes as to what they have to concentrate on to ensure that their departments pass the test when assessed again in 2011.

The Czech government ratified a reform of research, development and innovation in March 2008. This is something which affects us greatly. It is important to inexorably insist on a fair and transparent nationwide method of evaluation and on the fair distribution of finances for science based on the results of this evaluation. Only in this way can the Czech Republic gradually rank itself among the elite of European academies.

The situation should be helped by European Union structural funds, which the Czech Republic can draw on until 2013. Even here, however, it is necessary to insist on the fair distribution of funds, which should be used to strengthen certain regions and support high quality research. We agree with EU policy that investment should primarily be made in major infrastructures of trans-European significance. In this way the Czech Republic should be able to integrate itself more intentionally in the European Research Area.

I am convinced that the Academy of Sciences of the Czech Republic is an institution which has all the prerequisites necessary to become a genuine “window” for Czech science in Europe and beyond and into the foreseeable future.

Václav Pačes



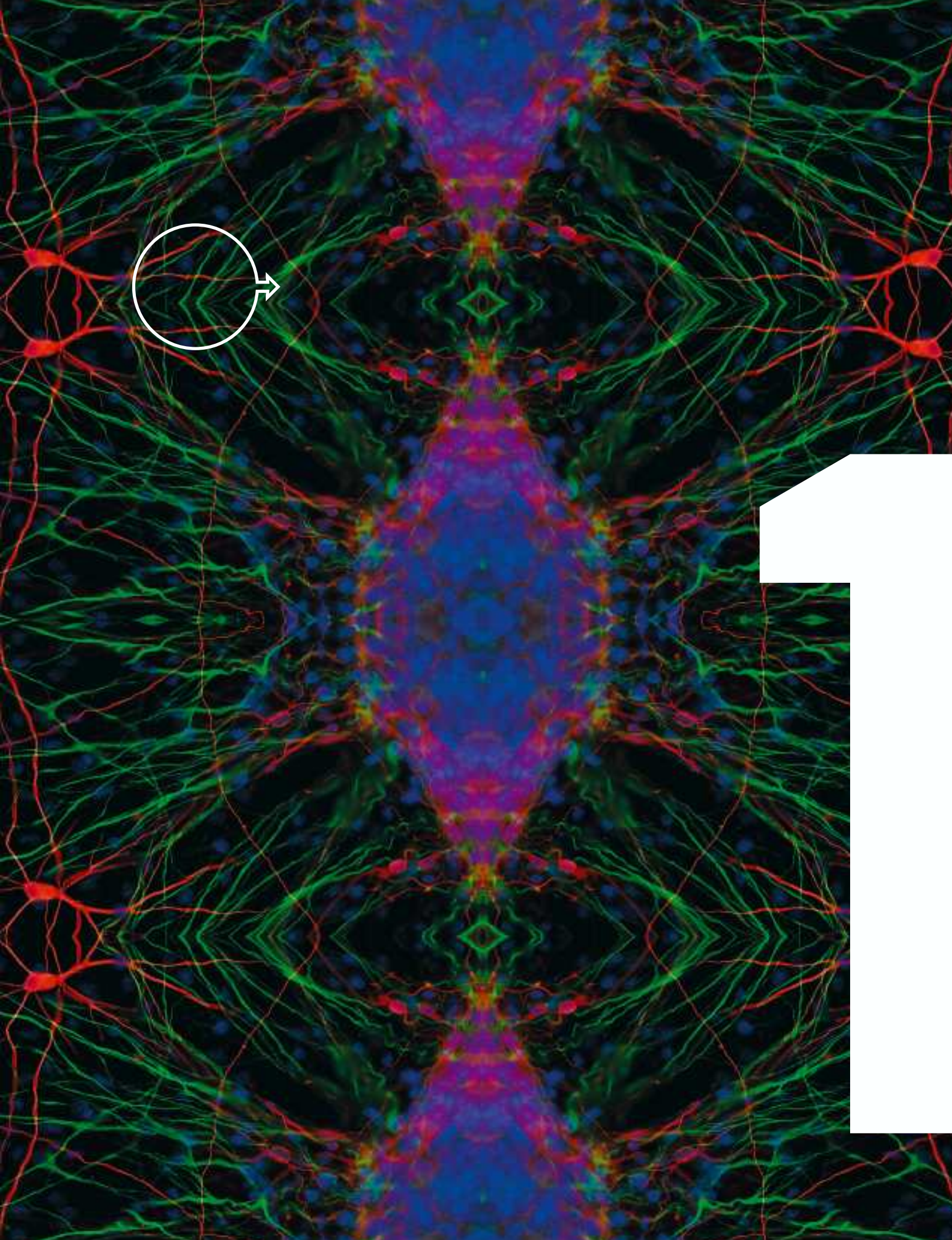
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Introduction

1



The year 2007 brought significant changes to the inner structure of the Academy of Sciences of the Czech Republic (hereinafter the ASCR) and its institutes. From January 1st 2007, **the institutes of the ASCR were transformed from contributory organizations to public research institutions** and began working under new legal, economic and organizational conditions. This transformation was a major organizational and administrative effort. According to the Act on Public Research Institutions and in accordance with the

Statutes of the ASCR, new bodies of the institutes, their Boards, Directors and Supervisory Boards were constituted, and all the necessary internal regulations for the control of the scientific, organizational and economic activities were also executed and accepted. New foundation deeds of all institutes of the ASCR were registered. In the past, the institutes of the ASCR were allowed only to manage assets, which are worth almost seventeen billion CZK and were later transferred to the ownership of the institutes of the ASCR. In accordance with Act No. 341/2005 Coll., on Public Research Institutions, the ASCR as the founder, transferred property to the ownership of its institutes, necessary for the provision of purposes, for which the institutes were newly established. In certain more complicated cases, this process will yet continue in the following year.

The transformation of the institutes of the ASCR to the public research institutions has **altered the position of the ASCR**, namely of its Assembly, the President, the Academy Council, the Council for Sciences



XXXIst session
of the Academy
Assembly,
December 2007

photo by P. Velek,
archiv KAV

and the *Offices* as the administrative machinery in relation to the institutes of the ASCR. Even in this new organization, the ASCR and its authorities have remained as the organizational bodies of the state and the *Office* as the inner organizational entity (Supplement 1). The key role of the ASCR, as the founder of the public research institutions, remains strictly defined by law. The Academic Assembly discussed and accepted the final report on the process and results of the transformation of the ASCR institutes into public research institutions at its XXXI Meeting in December 2007.

Accordingly, even in 2007 the ASCR was a body of 52 scientific institutes all democratically organized and administered by scientists, including the *Centre for Administration and Operations of the ASCR* – the Service Unit, which has the form of a public research institution (Supplements 1 and 3). Close professional cooperation has continued among all the bodies of the ASCR, at the level of divisions, and on the regional basis. The helpfulness of such cooperation for example has clearly proved the constantly developing activities of the Association of South Moravian Institutes of the ASCR in Brno.

The ASCR has shown that it is not a stagnant structure, by establishing a new institute – *the Institute of Biotechnology* – which in its activities joins molecular-biologically oriented research with a transfer of results; its establishment was intensively planned during 2007 and its foundation was authorized toward the end of the year.

In 2007 the ASCR achieved two outstanding results in the maintenance of its facilities: *The Institute of Molecular Genetics* continued its operation in newly built property in Krč.



New building of the Institute of Molecular Genetics, inaugurated on April 19, 2007

photo by archiv ÚMG

A convention centre was opened in Liblice in the autumn, where eleven events had been organized by the end of the year.



The Academic Conference Centre in Liblice opened by M. Kopicová, vice-president of the Council for Research and Development, and V. Pačes, president of the ASCR

photo by Dorothea Bylica, archiv SSČ

Conference room of the Conference Centre in Liblice

photo by P. Králík, archiv SSČ



During 2007 discussions and negotiations were in progress, on general organization, financing and the conception of the future development of science and academic education in the Czech Republic. The Academy Council applied a number of remarks on the proposal of the “Analysis of the state of research, development and innovations in the Czech Republic and their comparison to foreign countries in 2007”. The Council also submitted remarks on methods of evaluation of research and the development for 2007, provided under sponsorship of the Research and Development Council, and remarks on considerations about the preparation of the research, development and innovation system reform. The Academy Assembly also expressed its opinion on these current issues at its XXXI Meeting on 18th December 2007. The Assembly upheld the Standpoint of the Directors and the Presidents of the Councils of the Institutes of the ASCR on this subject and directed the President of the ASCR and the Academy Council to defend during consequent proceedings the democratic principles of the organization of the ASCR and its institutes. They also directed them to retain an above – departmental sphere of authority of the Research and Development Council and to promote the implementation of objective and equal evaluative procedures for all the parties concerned.

Both the Academy Council and the individual institutes of the ASCR dealt with the results of evaluation of the research activities performed by the Research and Development Council, according to the procedure accepted for 2006. However, it is necessary to realize what specifications are put into relations when monitoring the effectiveness of the research in the ASCR in comparison with other scientific institutions in the Czech Republic. For example, over the last five years (2002–2006) the ASCR has received approximately 24 to 25 percent from the total financial resources of the state’s budget for research and development, but that had to cover all its expenses (unlike the public universities and other institutions). For this quarter of the resources the institutes of the ASCR produced, among other results, full 37.5 percent of internationally recognized accomplishments of Czech science, published in impacted magazines, and achieved almost 50 percent of citations of all Czech scientific works, according to the Science Citation Index.

For a total summary of publication results of the ASCR in 2007, see Supplement 5. Numbers of publications in particular years (according to the Web of Science) are shown in the following survey. It can be expected that the final number of publications for 2007 will be even higher.

Year	2003	2004	2005	2006	2007
Czech Republic	5940	6755	7065	8026	8013
ASCR	2190	2392	2459	2719	2574

The institutes of the ASCR continued to resolve their research intentions, with extra four new intentions from 2007, namely, “Establishing the Institute of Biotechnology ASCR”, “Genome and epigenome: 1D and 3D Structure, Dynamics, Interaction with Proteins and Functions”, “New biotechnologies, nanomaterials and stem cells for use in regenerative medicine” and “The implementation of research and development infrastructure in the ASCR, a prerequisite of qualitative progress of the ASCR disciplines”. A summary of the most important results is included in Chapter 2. The institutes of the ASCR were also to a large extent involved in domestic as well as international research and development programmes and also cooperated with a number of foreign institutes. Results of these works are described in more detail in Chapters 3, 4 and 5.

In 2007 preparations were in progress of **continuous evaluation of the research intentions** to be executed in 2008. The goal of this evaluation will be objective assessment of the development of scientific and

The conception
of the future
development
of science

Numbers
of publications
in particular
years

Significant honours

professional performance of individual institutes of the ASCR within the period of 2005–2007 and the effectiveness of the expended public funds. In this connection, the Academy Council has prepared methodical directions for the Evaluation Committees and executed partial changes in their constitution.

Outstanding achievements of scientists from the institutes of the ASCR in 2007 were **awarded a number of significant honours**. On the occasion of the national holiday on 28th October 2007, the President of the Czech Republic presented the national Award “For State Merit in Science” to Prof. RNDr. Miroslav FIEDLER, DrSc., *Institute of Computer Science and Institute of Mathematics*. Four research workers from institutes of the ASCR became the laureates of the 6th Annual competition Česká hlava (“Czech Intellect 2007”). The main National Award of the Government of the Czech Republic was given to Prof. RNDr. Antonín HOLÝ, DrSc., *Institute of Organic Chemistry and Biochemistry*. The INVENCE award was given to Ing. Miroslav BLEHA, CSc., *Institute of Macromolecular Chemistry*, the DOCTORANDUS award to Mgr. Aleš BENDA, Ph.D., *J. Heyrovsky Institute of Physical Chemistry* and the MEDIA award for popularization of science to RNDr. Václav CÍLKA, CSc., *Institute of Geology*. The Awards of the Minister of Education, Youth and Sports for research in 2007 were given to Ing. Miroslav KÁRÁSEK, DrSc., *Institute of Photonics and Electronics* and RNDr. Jiří JARUŠEK, DrSc., and doc. RNDr. Miroslav KRBEC, DSc., *Institute of Mathematics*. The Medal of the Ministry of Education, Youth and Sports of the first degree was given to RNDr. Jan PETRÁŠEK, PhD, *Institute of Experimental Botany*. The award of the Minister of Health was given to MUDr. Josef HOUŠTĚK, DrSc., *Institute of Physiology*. The awards of the President of the Grant Agency of the Czech Republic for solution of projects were given to Prof. Ing. Jan FLUSSER, DrSc., *Institute of Information Theory and Automation* and Prof. RNDr. Vojtěch NOVOTNÝ, CSc., *Biology Centre*, Prof. RNDr. Ivan RAŠKA, DrSc., *Institute of Physiology* and Ing. Stanislava ŠIMBEROVÁ, CSc., *Astronomical Institute*. The Award of the Learned Society of the Czech Republic for the scientific work was presented to Prof. RNDr. Miroslav ENGLIŠ, DrSc., *Institute of Mathematics* and Mgr. Naďa ŠPAČKOVÁ, Ph.D., *Institute of Biophysics*.

The international prizes include mainly the “European Young Investigators Award”, presented to physicist RNDr. Martin SCHNABL at his return to the *Institute of Physics*. The Forum of the Visegrad Four presented the “Young Research Award” in the field of physical science and astronomy to RNDr. Radan SLAVÍK, Ph.D., *Institute of Photonics and Electronics*. Ing. Miroslava DUŠKOVÁ, Ph.D., from the *Institute of Macromolecular Chemistry* was presented the “DuPont Young Faculty Award 2007”. Significant scientific honour is the membership in prestigious international scientific societies. Prof. RNDr. František Sehnal, DrSc., became a member of The Entomological Society of America, Prof. PhDr. František Šmahel, DrSc., is a member of the Medieval Academy of America and Prof. RNDr. Jan Palouš, DrSc., became a member of the Royal Society of Edinburgh. The Polish President appointed Prof. RNDr. Pavel Bosák, DrSc., as an external member of the Polish Academy of Arts and Sciences in Krakow. The French Ministry of National Education awarded doc. PhDr. Jiří Pechar from the Institute of Philosophy The Merit of the Academic Palms.

The ASCR has a number of categories of awards for the native as well as foreign excellent scientists. It is necessary to highlight the “Praemium Academiae 2007” prize, among these **ASCR own awards** given in 2007, which was awarded for the first time and presents an outstanding support for the scientific research of its awardees. The summary of awarded merits is mentioned in Supplement 6.

Sixteen workers from particular institutes of the ASCR received a **Letter of thanks** for their work to the ASCR from the hands of the President of the ASCR. This award was intended for workers not included in the category of the scientific and research workers, and was presented for the first time in this form in 2007.

By the decision of the Council for Sciences, 9 titles of **“Doctor of Science”** in total were conferred in 2007.

ASCR own awards

Letter of thanks

Doctor of Science



Researchers who were presented the O. Wichterle Award in 2007

photo by Dorothea Bylica, archiv SSC



"Letter of thanks"

photo by archiv KAV



Cooperation
with
universities

Educational
role

Cooperation with universities during the solution of scientific problems was as always very good (Chapter 3). Following the contracts between the institutes of the ASCR and the universities, an additional three new collective institutes have arisen. The institutes of the ASCR also established new cooperation in connection with the preparation of projects sponsored from the EU Structural Funds. The President of the ASCR together with the Chancellor of the ČVUT in Prague signed the declaration of joint intention relating to establishing the Institute of Applied Sciences. Four institutes of the ASCR combined with Charles University and prepared the establishment of an interest association of legal entities under the name BIOCEV, z. s. p. o.

The basis of the **educational role** of the ASCR is its traditional presence in the guidance of doctoral students. In 2007 a General Contract concerning cooperation on the implementation of the doctoral study programme came into effect between the Academy of Sciences of the Czech Republic and Charles University. In addition, a partnership agreement was signed for accomplishing the doctoral study programme in the field of biomedicine, and a General Contract on cooperation between the Academy of Sciences of the Czech Republic and the South Bohemian University in České Budějovice. However, in comparison with the last period we noticed a certain transformation. Despite a progressive increase in the number of educated doctoral students, the institutes of the ASCR focused rather on involvement of post-doctoral students in solving their projects. This can be seen as the result of the unequal position of the ASCR in the area of tertiary education. In the future we can also expect lower involvement of the ASCR workers in lecture activities at universities, because lecturing is not a recognized outcome of research and the ASCR does not receive any resources for this pedagogical and teaching work from the budget of the Ministry of Education, Youth and Sports of the Czech Republic. Traditionally the institutes of the ASCR have devoted great attention to high school students.



Laboratory for laser chemistry in flying nanoreactors.

Experimental results measured in the laboratory need to be discussed with students. Next to post-docs, graduate and undergraduate students are high school students who are starting to take part in laboratory work

photo by archiv ÚFCH JH

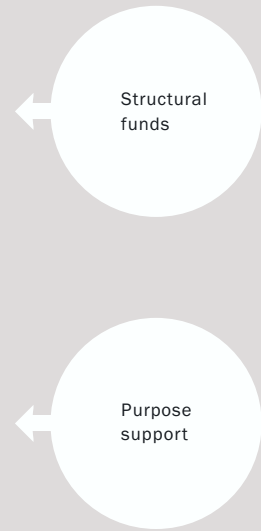
The ASCR and its institutes have continued to cooperate **with the entrepreneurial sphere, manufacturing corporations and the state administration**. The legal and economic form of public research institutions now enables a larger extent of cooperation of the institutes of the ASCR with manufacturing enterprises. Apart from continuous contracting cooperation with the Pardubice region and the Association of Municipalities Orlicko, a contract on the cooperation with Brno was prepared, mainly for the preparation of projects funded from the EU Structural Funds. Also cooperation with the Czech Knowledge Transfer Office of the Academy of Engineering of the Czech Republic has developed in the area of the intellectual property protection and the patent policy. For more detailed information on these activities, see Chapter 4.

The ASCR attaches cardinal importance to its **external relations** in Europe as well as on a worldwide basis. **In terms of relations with the European Union** and integration of science to the European research territory, it

was important to succeed in eliminating certain legislative obstacles which complicated the participation of the institutes of the ASCR in European projects. The involvement of institutes of the ASCR in the 7th framework programme can be evaluated quite positively. For detailed information see Chapter 5.

The Academy Council and the Council for Sciences paid considerable attention to future development in the area of the **structural funds** for the programming period 2007–2013. The institutes of the ASCR have also developed considerable initiative in preparing the projects for the programmes funded from the Structural Funds, mainly for the Innovation, Research and Development Operational Programme. It is only to the detriment of Czech science and the whole society that the programmes failed to be announced in time. The representatives of the ASCR actively participated in negotiations and events of the “European Research Council”. They have also focused on preparations of the chairmanship of the Czech Republic in the European Union in 2009. One representative of the ASCR was nominated to the working group for research infrastructures.

In the area of the **purpose support** of the research, the Statute of the Grant Agency of the ASCR and its procedure and election regulations were newly authorized for simplification of procedures during the constitution of the Departmental Councils and adjustment of the form of their elections. On the basis of this document, an election committee of the Grant Agency of the ASCR was appointed and supplementary elections to the Departmental Councils were executed. The ASCR was the provider of three programs. When evaluating the programmes – in accordance with their specialization – the main attention was focused on application outputs. Therefore the Councils of the programmes will observe and evaluate the contributions of the contracts on the utilization of the results and application outputs of particular projects very intensively in the future. For more detailed information on tendering procedures in the area of research and development, see Chapter 6.



Structural funds

Purpose support



Colourful chemistry in the hands of J. Šebestík of the Institute of Organic Chemistry and Biochemistry during the Science and Technology Week 2007

photo by P. Velek, archiv KAV

Science-
popularizing
activity

Cultural
mission

In the sector of **editing work**, attention was paid mainly to the quality increase of the published periodicals. In 2007, the ASCR financially sponsored the edition of 43 books. A total of 27 of these were issued by the Academia Publishers and 16 of them were published by the institutes of the ASCR. For total summary of all published books, see Supplement 7.

The **science-popularizing activity** has focused more directly on high school students (see more about popularization in Chapter 7). An exceedingly successful activity in this area was this year's **7th Week of Science and Technology** in November 2007, where the leading idea was the light. It was also satisfying to obtain more co-organizers and sponsors, and particularly the media response to this undertaking, with Czech Television as the general partner. We can also positively evaluate the **"Open Science"** project, which was completed in 2007, but found its continuation in another project **"Open Science to Regions"**. Last but not least, various events under the patronage of the President of the ASCR contributed to a larger promotion of the ASCR in its entirety. A good example is the national competition of high school students AMAVET, etc.

The **cultural mission** of the ASCR is expressed in the contract for cooperation with the Czech Philharmonic Orchestra and in a recently concluded contract for cooperation with the National Theatre, demonstrating a manifestation of active co-operation of these significant national institutions.



An agreement on co-operation with the National Theatre was signed by the chief representatives of both institutions, Václav Pačes and Ondřej Černý

photo by P. Králík, archiv SSC

A significant educational and general cultural function is provided by the **Learned Society of the Czech Republic** and the scientific institutes associated in the **Council of Scientific Societies of the Czech Republic**. For more information on their activities, see Supplements 8 and 9.

Detailed information on **the financial policy and management** of the state resources of the ASCR is included in Chapter 8 and Supplement 4. For the area of the institutional support in 2007, the ASCR accepted a concept and schedule of verification of the solution process of research intentions of the institutes of the ASCR. In the **purpose financing**, the Academy Council discussed reports of the programme councils and authorized allocation of specific grants towards solving the continuing projects.

But in 2007 it was also necessary to deal with the disastrous effects of fire at the Brno branch of the Institute of Archaeology in Mikulčice, which unfortunately brought tragic consequences with it. The first

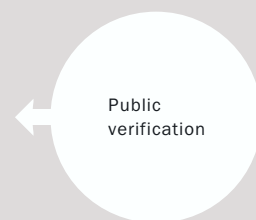
protection of the destroyed research base was provided with the support by the Ministry of Culture of the Czech Republic; however valuables which cannot be replaced were lost.

The ASCR **implemented economic information systems**, which use modern technologies for more efficient management of activities of its institutes.

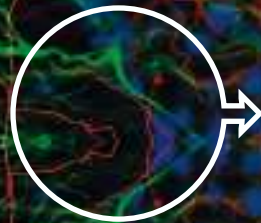
Pursuant to government decree No. 1199/2006, the ASCR underwent an internal anti-corruption audit, which mainly focused on the internal control system of the institutes, on definition of competence and responsibility of the people participating in the financial and property operations, security and protection of properties and other measures related to the prevention of corruptness and the fight against any corrupt behaviour. The results of the audit were also passed on to the Ministry of Finance of the Czech Republic. On the basis of the audit results, the President of the ASCR also issued a new order about the verification activities in the ASCR for the management of public resources.

In terms of **public verification**, the Academy Council discussed the results of the management verification and remedial measures of the detected failings in 16 institutes of the ASCR and also approved summary information on subsequent verification in 12 institutes of the ASCR. The Council also discussed the results of the verification in 4 scientific societies that the financial resources provided to the societies were properly assigned and used in a regular manner.

The Institutes and the general public were informed in accordance with the law about the negotiations and resolutions of the Academy Council, as the executive body of the ASCR, via the internet pages. General information on the problems under consideration and adopted resolutions were also published in the *Academic bulletin*.



2



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 limits results were gathered are mentioned first. These are followed by an overview of the most notable studies accompanied by selected illustrative abstracts.

1 • Section of Mathematics, Physics and Computer Science

The Section united six departments, of which three had a physical character and three were from the mathematics and informatics fields, and their research focus was characterized by the following exploratory aims:

Astronomy and Astrophysics • Astronomical Institute

Particle physics beyond the Standard Model • Institute of Physics

Specific effects in condensed systems with reduced dimension and broken symmetry
• Institute of Physics

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


Wave and Corpuscular Light Propagation, Optical Materials and Technology
• Institute of Physics

Intense Radiation Sources and Radiation-Matter Interaction • Institute of Physics

Research and Development of General Mathematical Knowledge and its Application to Other Branches of Science and Practice • Institute of Mathematics

Computer Science for the Information Society: Models, Algorithms, Application
• Institute of Computer Science

Nuclear Physics and Related Fields in the Basic, Applied and Interdisciplinary Research
• Nuclear Physics Institute



Research objectives

List of studies

Advanced Mathematical Methods in Retrieval, Processing and Applications of Knowledge and Information in Complex and Non-deterministic Systems

- Institute of Information Theory and Automation
- 1. The spectrum and polarization of active galaxies • Astronomical Institute
- 2. Binary asteroid population: Angular momentum content • Astronomical Institute
- 3. Impact polarization in solar flares • Astronomical Institute
- 4. Correlation of the Highest-Energy Cosmic Rays with Nearby Extragalactic Objects • Institute of Physics
- 5. Lattice Dynamics in Magnetoelectric Materials and their Magnetoelectric Effect • Institute of Physics
- 6. Magnetism in the Magnetoelectric Hexaferrite System (Ba_{1-x}Sr_x)₂Zn₂Fe₁₂O₂₂ • Institute of Physics
- 7. Quantum cloning • Institute of Physics
- 8. Generation and Investigation of Warm Dense Matter by using unique focused x-ray laser beam • Institute of Physics
- 9. Dilute Moment n-type Ferromagnetic Semiconductor Li(Zn, Mn)As • Institute of Physics
- 10. Atomic force microscopy based single-atom chemical identification • Institute of Physics
- 11. K-bar Nuclear Bound States • Nuclear Physics Institute
- 12. Found Significant Excess of Dielectron Yields over Theoretical Expectations Below Mass of rho and omega Vector Mesons • Nuclear Physics Institute
- 13. Study of Anomalous Behaviour of LiTaO₃ during the Preparation of Optical Waveguide using ion Beam Analytical Methods – Comparison with LiNbO₃ • Nuclear Physics Institute
- 14. Strong Solutions to Stochastic Wave Equations with Values in Riemannian Manifolds • Institute of Mathematics
- 15. Preconditioner Updates for Solving Sequences of Large and Sparse Nonsymmetric Linear Systems • Institute of Computer Science
- 16. Autopoietic Automata: Complexity Issues in Offspring-Producing Evolving Process • Institute of Computer Science
- 17. Causality Detection Based on Information-Theoretic Approaches in Time Series Analysis • Institute of Computer Science
- 18. Model for Photosynthesis and Photoinhibition and its Identification based via Harmonic Excitation • Institute of Information Theory and Automation
- 19. Support of objective ranking of research and development projects • Institute of Information Theory and Automation
- 20. Extreme Compression and Authentic Visual Modeling of Material Surfaces • Institute of Information Theory and Automation

Illustrative abstract

The spectrum and polarization of active galaxies • Astronomical Institute

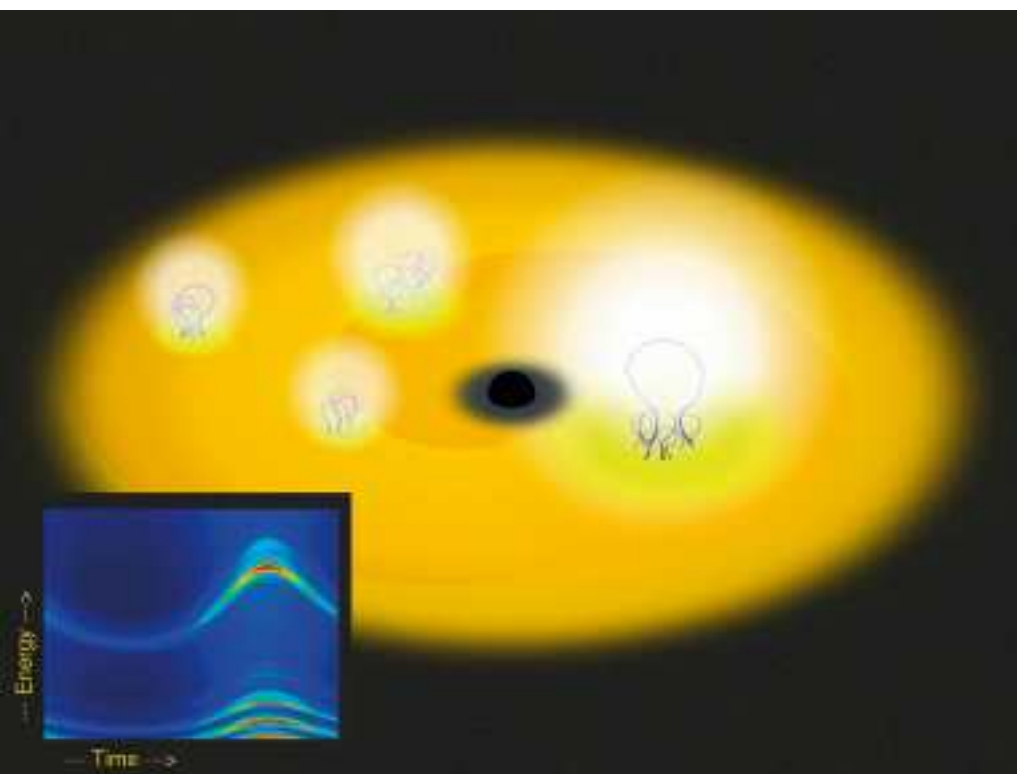
Active galaxies are a very interesting category of astronomical objects. They emit extremely strong, non-thermal radiation, which varies on all observable time-scales. The powerful emission is caused by accretion of matter onto massive black holes (see figure). Spectroscopic and spectro-polarimetric studies allow astronomers to determine the geometrical structures around the black hole and to constrain their orientation in space.

A group of authors lead by R. W. Goosmann from the Astronomical Institute of the Academy of Sciences investigates, in collaboration with foreign colleagues, the spectral and polarimetric properties of active galactic nuclei in a series of papers published during the last two years. From these contributions we have selected three cornerstone papers, which appeared in the European astronomical journal, *Astronomy & Astrophysics*.

Goosmann and his collaborators continue to develop a method, which can use the maximum of information in a weak light signal coming from active galaxies. They study mutual time delays of the

incoming photons, their dependency on the photon energy, and they search for signatures of reprocessing for individual light components in the x-ray and ultraviolet domain. They also investigate the effects of polarization, which is induced by reflection and scattering off toroidal, conical, and disk-like structures surrounding the central massive black hole. These approaches allow astronomers to indirectly examine the black hole properties and to constrain the geometry of the active nucleus. A specific example, to which Goosmann *et al.*, applied their method, is the Seyfert galaxy MCG-6-30-15. It represents a mysterious cosmic object being under investigation by many research teams, especially in x-ray astronomy.

The work of Goosmann *et al.*, is supported by several programs of the Academy of Sciences and carried out in broad collaboration with researchers from the Copernicus Astronomical Center in Poland, the Observatoire Paris-Meudon and the laboratory Astroparticule et Cosmologie in France, as well as the University of Texas in the U. S.



The innermost region of an active galaxy (artistic view). A massive black hole is surrounded by a rotating accretion disk. The disk transports gas and dust toward the black hole gradually heats up, and produces radiation. Magnetic field structures in the disk give rise to powerful eruptions, similar to solar eruptions, and create powerful lamps. They produce bright spots on the disk surface emitting reprocessed radiation with strong emission lines. In the time-dependent spectrum the energy of these lines varies with the spot's motion around the black hole (inset)

photo by archiv ASÚ

Goosmann, R. W., Mouchet, M., Czerny, B., Dovčiak, M., Karas, V., Róžańska, A., Dumont, A.-M.: Iron lines from transient and persisting hot spots on AGN accretion disks. *Astronomy and Astrophysics* **475**, 1: 155-168 (2007)
Goosmann, R. W., Czerny, B., Karas, V., Ponti, G.: Modeling time delays in the X-ray spectrum of the Seyfert galaxy MCG-6-30-15. *Astronomy and Astrophysics* **466**, 3: 865-873 (2007)
Goosmann, R. W., Gaskell, C. M.: Modeling optical and UV polarization of AGNs. I. Imprints of individual scattering regions. *Astronomy and Astrophysics* **465**, 1: 129-145 (2007)

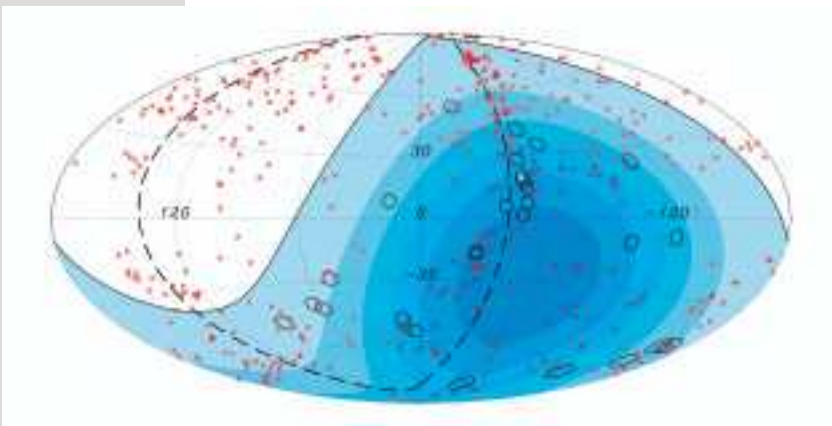
Correlation of the Highest-Energy Cosmic Rays with Nearby Extragalactic Objects • Institute of Physics

The Pierre Auger Observatory announced significant findings about the nature of the most energetic particles in the universe. Cosmic rays revealed by the observatory reach energies up to one hundred million times larger than we can prepare in our earth-based accelerators. Such particles with record-

← Illustrative abstract

breaking energies are extremely interesting, but also extremely rare: during 50 years of their observation only few tens of such particles were detected. The Pierre Auger Observatory now made a first step towards identification of enigmatic sources of such particles. It was proved that the most energetic particles do not arrive to the Earth from different directions with the same frequency, but some directions are preferred. The best statistical agreement is currently with the set of all known active galactic nuclei with distances less than 300 million light years from the Earth. The discovery of this mentioned anisotropy of cosmic rays then leads to the conclusion that we have to look for sources of these particles between usual astrophysical objects.

A vast majority of the so-called exotic physics scenarios needs isotropic distribution of particle arrival directions, which is now excluded with high probability. The authors from the Institute of Physics have been members of this project from its very beginning in 1998. They contributed significantly to the construction of the observatory by production of 12 out of 24 mirrors of fluorescence telescopes, one of two types of detectors used for observation of a shower development in the atmosphere. They also worked on more precise measurements of fluorescence yield that will allow significant reduction of systematic uncertainty of shower energy reconstructions. The reduction of systematic uncertainties similarly follows also another Czech activity, *viz.*, monitoring of actual atmospheric parameters using the robotic telescope FRAM that was developed at the Institute of Physics. Czech scientists also participate in data-taking activities in Argentina where they contribute to detector calibration and to physical analysis of obtained data.



Anisotropy of the Highest-Energy Cosmic Rays

photo by archiv FZÚ

Pierre Auger Collaboration (M. Boháčová, T. Kárová, P. Nečesal, M. Prouza, J. Řídký, R. Šmída a P. Trávníček): Correlation of the Highest-Energy Cosmic Rays with Nearby Extragalactic Objects. *Science* **318**, 58: 938–943 (2007)

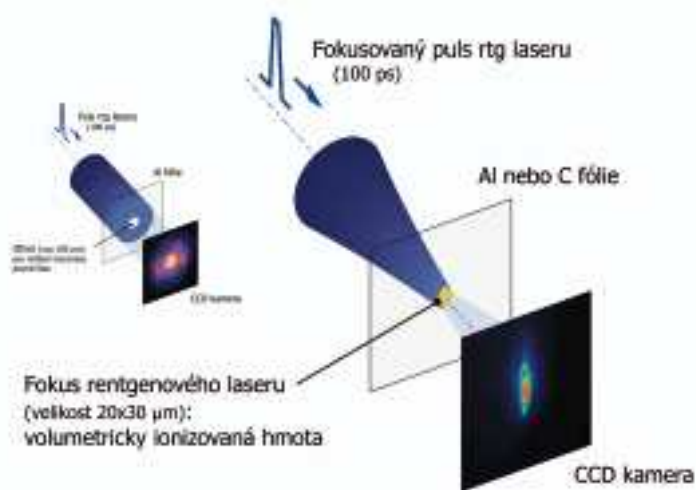
Illustrative
abstract

Generation and Investigation of Warm Dense Matter by using unique focused x-ray laser beam

• Institute of Physics

The focused beam of a soft x-ray laser was employed at PALS Research Centre to undertake a unique experiment aimed at the generation and study of ionized matter with the density of a solid state, belonging to the category of Warm Dense Matter (WDM). This experiment, the first ever carried out, was made possible due to availability at PALS of the most energetic soft x-ray laser of its class (energy of photons about 60 eV). The WDM is an “exotic” type of matter with properties between the solid state and plasma. It is super-dense, relatively cold ($n > 10^{22} \text{ cm}^{-3}$, $T < 50 \text{ eV}$) with a high degree of ionization. Knowledge of properties of the WDM, especially of radiation transport, is essential in the astrophysics of large energy densities, physics of collapsing stars, and physics of the interior of giant planets.

A generation of WDM in the laboratory is extremely difficult since the usual laboratory techniques of producing “classical” plasmas are inapplicable. In the PALS laboratory pulses of intense soft x-ray radiation (10^{12} Wcm^{-2}) were employed to volumetrically ionize matter of thin foils, benefiting from penetration of the soft x-ray beam through the foil material (volumetric heating). Basic differences concerning transport of the soft x-ray radiation through volumetrically heated Aluminum and Carbon were found and the experimental results, interpreted together with our colleagues from the Lawrence Livermore National Laboratory in the U. S., serve now as test data for numerical modeling of the WDM.



Generation and detection of Warm Dense Matter (WDM). Warm Dense Matter was generated in a focus of the soft x-ray laser on a thin aluminium and carbon foil. Transmission of the soft x-ray radiation is detected using a CCD camera; transmission of solid, non-ionized, matter is carried out by passing the soft x-ray laser through a locally perforated foil

photo by archiv FZU

Rus, B., *et al.*: Development and applications of multimillijoule soft X-ray lasers. *Journal of Modern Optics*, **54** Issue 16, 2571 (2007)

Kbar nuclear bound states • Nuclear Physics Institute

We studied anti-K nuclear bound states in a few-body system anti-KNN as well as in heavier nuclei, up to $^{208}\text{Pb}+n\text{K}$. We performed the first genuinely three-body anti-KNN- π SigmaN coupled-channel calculation and found a quasibound state Kpp, bound in the range $\sim 55\text{-}70\text{ MeV}$ and with a width of $\sim 90\text{-}110\text{ MeV}$. Our results differ significantly from previous estimates and are at odds with experiments that claimed evidence for the Kpp bound state. We studied in detail dynamical processes and relevant kinematical conditions that determine the decay width of K nuclear states in heavier nuclei. These self-consistent calculations also yield considerable widths of such states. Moreover, our multi-anti-K nuclear calculations indicate that the Kbar separation energy saturates upon increasing the number of Kbar mesons embedded in the nuclear medium. The nuclear densities increase only moderately and are close to saturation, with no indication of any kaon-condensation precursor phenomena.

Shevchenko, N.V., Gal, A., Mareš, J., *Phys. Rev. Lett.* **98**: 082301 (2007)

Shevchenko, N.V., Gal, A., Mareš, J., Revai, J., *Phys. Rev. C* **76**: 044004 (2007)

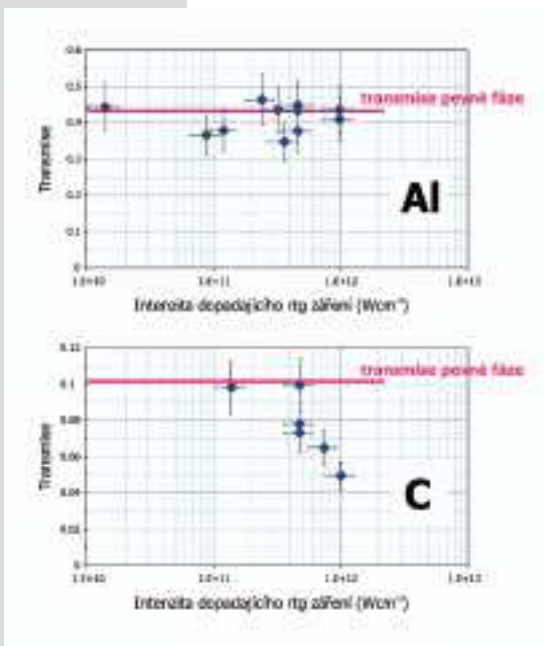
Gazda, D., Friedman, E., Gal, A., Mareš, J., *Phys. Rev. C* **76**: 055204 (2007).

Strong solutions to stochastic wave equations with values in Riemannian manifolds • Institute of Mathematics

Wave equations, in their classical form, describe natural phenomena such as propagation of acoustic, electro-magnetic and seismic waves, vibrations of strings, membranes or elastic bodies. These equations, in their pure mathematical form, appear also in modern theoretical physics (*e.g.*, in quantum mechanics, general relativity and the Yang-Mills theory of optics) and here they are called

← Illustrative abstract

← Illustrative abstract



Transmission of XUV through aluminium and carbon
Transmission of intense soft x-ray radiation through aluminium and carbon – the data are the first of its kind ever obtained in a laboratory. In contrast to aluminium, where solid-state transmission is retained at high intensities, in ionized carbon the transmission rapidly decreases for large intensities

photo by archiv FZU

geometric wave equations. Their presence is a consequence of the physical theories rather than phenomena similar to vibrations as we know them from classical theory. The main difference between the classical wave equation and the geometric wave equation, from the mathematical point of view, relies on the fact that solutions of the classical equation are functions with values in a Euclidean space (*e.g.*, wave propagating on the surface of an ocean in the three-dimensional space), whereas solutions of the geometric equation are a function with values in a deformed space (the so-called Riemannian manifold), occurring naturally in physical applications

Study of the geometric wave equations began in the 1970s so that the discipline is quite young; nevertheless, it is developing very rapidly with important applications in modern theoretical physics. The paper is a fundamental contribution to this field of research, opening new ways of research. It was proven many times using simulations that equations describing various physical phenomena (propagation of heat, flow of fluids or motion of bodies in a force field) are more realistic models provided that they contain a term corresponding to random influences of the environment. And it is exactly this phenomenon that is studied in the paper in question. It is the first attempt to introduce random influences to geometric wave equations. A rigorous form of the equation is established and it is proven that it meets both physically and mathematically natural principles. In physically justified cases existence and uniqueness have been established.

Z. Brzezniak and M. Ondrejat: Strong solutions to stochastic wave equations with values in Riemannian manifolds, *J. Funct. Anal.*, **253**, 2: 449–481 (2007).

Illustrative
abstract

Causality Detection Based on Information-Theoretic Approaches in Time Series Analysis • Institute of Computer Science

Complex, mutually interacting systems can be observed under various circumstances in nature, in the human body, or in technological processes. If the structure or functional connections in such systems are not known a priori, it is necessary to uncover mutual relations of the systems of interest using the data registered in those systems. Data or signals reflecting the evolution of the systems in time are recorded as time series. We have studied the possibilities to infer from bi- and multivariate time series

the mutual and/or causal relationships in complex systems using ideas and methods of information theory [1]. The most perspective methods suitable for analysis of electrophysiological signals have been developed and tested [2]. The first applications to real data from animal experiments have brought promising results giving way to understand the interactions of heart rhythms, respiration and EEG brain waves under and while awaking from anaesthesia [3].

[1] Hlaváčková-Schindler, K., Paluš, M., Vejmelka, M., Bhattacharya, J.: Causality Detection Based on Information-Theoretic Approaches in Time Series Analysis. "Physics Reports"— Review Section of *Physics Letters* **441**, 1: 1–46 (2007)

[2] Paluš, M., Vejmelka, M.: Directionality of Coupling from Bivariate Time Series: How to Avoid False Causalities and Missed Connections. *Physical Review* **75**, (2007)

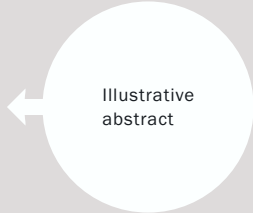
[3] Musizza, B., Stefanovska, A., McClintock, P. V. E., Paluš, M., Petrovic, J., Ribaric, S., Bajrovic, F. F.: Interactions between Cardiac, Respiratory and EEG-delta Oscillations in Rats during Anaesthesia. *Journal of Physiology* **580**, 1: 315–326 (2007)

Support of objective ranking of research and development projects • Institute of Information Theory and Automation

Distribution of public resources is an important but costly process performed by many national and international bodies. Peer review by several experts, complemented by a priori given criteria and mark scales, is a reliable basis of evaluations of research and development projects. The necessary final complete ordering of the project proposals according to their quality is the common weak point of all established procedures as it is done, i) without a detailed knowledge of all sorted projects, ii) within a limited time span, iii) predominantly on the basis of subjective and discrete marks. Consequently, numerical differences of the whole project marks are mostly small and random.

This makes the final ordering demanding and unreliable. The described research result formulates and solves the final proposal ordering as an estimate of an objective unknown rank of the proposal. The processed experts' marks are generally noisy and biased images of the estimated rank. Processing of multiple-experts' marks by modern statistical methods suppresses these deficiencies and provides a more reliable image of the project quality. A guess of reliability and objectivity of evaluating experts is obtained as a by-product. The research was motivated by a specific evaluation procedure of European Commission and was successfully verified on anonymous data provided by it. Routine implementation of the proposed procedure will make the sensitive step of the final project sorting more objective, simpler and cheaper.

Miroslav Kárný, Tatiana Valentine Guy: Ranking as Parameter Estimation, *International Journal of Operational Research*, **3**, 6, 2008



Illustrative abstract

2 • Section of Applied Physics

The Section united seven departments, the research focus of which was characterized by the following exploratory aims:

Physical properties of advanced materials in relation to their microstructure and processing

• Institute of Physics Materials

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

Dynamics of fluid systems and transformation processes in the hydrosphere

• Institute of Hydrodynamics



Research objectives

Research into experimental methods for examination of physical properties of matter and their application in advanced technologies • Institute of Scientific Instruments

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

Time dependent response of materials, systems and environments on natural and human actions
• Institute of Theoretical and Applied Mechanics

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

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

List of studies

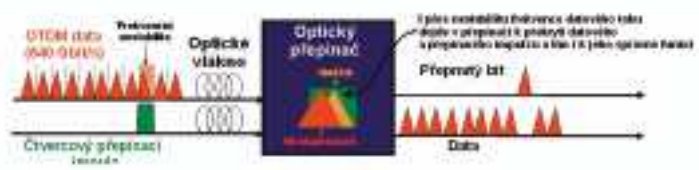
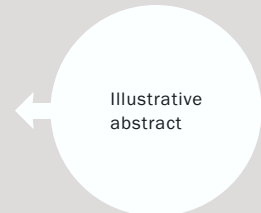
1. Surface plasmon resonance sensors for parallelized observation of molecular Interactions
• Institute of Photonics and Electronics
2. Ultrashort flat-top optical pulses for timing jitter-tolerant signal processing at 640 Gbit/s
• Institute of Photonics and Electronics
3. Optical properties of gradient subwavelength structures • Institute of Photonics and Electronics
4. Atlas of phase diagrams for lead-free soldering • Institute of Physics of Materials
5. An explanation of reasons of hardening of the alloy Fe-Al-Zr at elevated temperatures
• Institute of Physics of Materials
6. Spin-mixing conductances of thin magnetic layers • Institute of Physics of Materials
7. Probe diagnostics on the CASTOR tokamak • Institute of Plasma Physics
8. Potential application of tandem shock waves to contactless disintegration of tumor tissues
• Institute of Plasma Physics
9. Production of syngas by gasification of biomass in plasma generated from water
• Institute of Plasma Physics
10. Stabilization of the corundum phase in plasma sprayed alumina deposits
• Institute of Plasma Physics
11. Two dimensional mapping of boundary plasma perturbations in the tokamak
• Institute of Plasma Physics
12. Design and manufacture of optical elements for stress control of float glass production in glassworks • Institute of Plasma Physics
13. Volume consolidation of amorphous polymers after a sudden temperature decrease
• Institute of Hydrodynamics
14. Vortex identification, vorticity and decomposition of motion • Institute of Hydrodynamics
15. Quantitative mapping of dopants in semiconductors by means of energy filtered photoemission electron microscopy • Institute of Scientific Instruments
16. Formulation of a model and dynamic parameters of the ventricular repolarization
• Institute of Scientific Instruments
17. Narrowband power laser based on laser diode array for preparation of hyperpolarized xenon
• Institute of Scientific Instruments
18. Brittle-ductile material behavior at the crack front in bcc iron • Institute of Thermomechanics
19. Tomographic diagnostics of nonstationary phenomena in thermal plasma
• Institute of Thermomechanics
20. Microfluidic no-moving-part devices controlled by pressure • Institute of Thermomechanics
21. Harmonic wave propagation in a continuum with parameter random imperfections
• Institute of Theoretical and Applied Mechanics

22. Adaptation strategies for cultural heritage management in the face of climate action and change
 - Institute of Theoretical and Applied Mechanics
23. PICTURE – Pro-active management of the impact of cultural tourism upon urban resources economies. Strategic urban governance framework for the sustainable management of cultural tourism
 - Institute of Theoretical and Applied Mechanics

Ultrashort flat-top optical pulses for timing jitter-tolerant signal processing at 640 Gbit/s
 • Institute of Photonics and Electronics

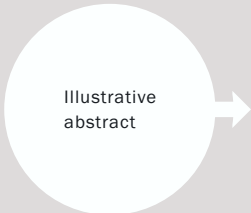
Optical fibers are capable of transmitting up to 50 Tbit/s of data, while electronics-based systems operate generally at speeds below 100 GHz (typically 10 and 40 Gbit/s). To benefit from the capacity given by optical fibers, multiple (8-64) electronically processed signals carried using different wavelengths (channels) are usually combined (Wavelength Division Multiplexing, WDM). In this way, single-fiber capacity up to 2 Tbit/s is reached (typically 80-640 Gbit/s). However, increasing society demand for higher capacity requires multiplexing of a higher number of channels (128, 256, 512), which requires extremely complex (and thus also expensive) systems. An alternative approach would be a combination of electronics-based signals in the temporal domain using optical means (Optical Time Division Multiplexing, OTDM) to generate data streams of 320 Gbit/s and higher at a single wavelength, and subsequent WDM of fewer (8-64) channels.

To use OTDM, however, it is necessary to develop new ultrafast optical components and to suppress the influence of different sources of noise (amplitude, frequency) that easily degrade ultrahigh capacity transmission systems. In collaboration with EMT in Montreal, we developed one of the components necessary for robust OTDM systems, *viz.*, a fiber filter for synthesis of ultrashort optical pulses with a flat top temporal waveform [1, 2]. The filters were fabricated in our institute; they are based on diffractive gratings ‘inscribed’ directly into an optical fiber. The flat-top pulses allow for significant suppression of the influence of the timing jitter, which we proved in collaboration with TU in Copenhagen [3, 4]. We made the first demonstration of using flat-top pulses for OTDM systems operating at 320 Gbit/s [3] and 640 Gbit/s [4].



Transmittance of gradient and homogeneous layers. Transmittance of both gradient and homogeneous single layer ($n_g = 1.4$) for inclined incidence of s- (full line) and p- waves (dotted line) vs. frequency dependent parameter $\gamma(u)$ with modulation depth $m = 0.75$ and angle of incidence $\theta = 65^\circ$. Transmittances of the homogeneous layers for s- and p-waves are denoted as S_{hmg} and p_{hmg} , respectively
 photo by UFE

[1] Y. Park, Y., Kulishov, M., Slavík, R., and J. Azaña, J.: Picosecond and sub-picosecond flat-top pulse generation using uniform long-period fiber grating. *Optics Express*, 14, **26**: 12671–12678 (2006).
 [2] R. Slavík, R., Park, Y., Azaña, J.: Tunable dispersion-tolerant picosecond flat-top waveform generation using an optical differentiator. *Optics Express*, 15, **11**: 6717–6726 (2007).
 [3] Slavík, R., Oxenlove, L. K., Galili, M., Mulvad, H. C. H., Park, Z., Azaña, J., Jeppesen, P.: Demultiplexing of 320 Gbit/s OTDM data using ultrashort flat-top pulses. *IEEE Photonics Technology Letters* 19, **22**: 1855–1857 (2007).
 [4] Oxenlove, L. K., Slavík, R., Galili, M., Mulvad, H. C. H., Clausen, A. T., Park, Y., Azaña, J., Jeppesen, P.: 640 Gbit/s timing jitter tolerant data processing using a long-period fiber grating-based flat-top pulse shaper. *IEEE Journal of Selected Topics in Quantum Electronics*, (2008) (in press)


 Illustrative abstract

Atlas of Phase Diagrams for Lead-free Soldering • Institute of Physics Materials

Current public awareness of the substitution of materials endangering human health and constituting ecological danger to nature and human life has never been greater. Classical solders based on the PbSn alloy and containing significant amount of lead are definitely among those materials. The main reason is the danger of lead accumulation in the human body; it leads to disorders in the nervous and reproductive systems, delays in neurological and physical development of children and it causes cognitive and behavioural changes. Increased attention given to the search of the lead substitution in the electronic industry by the scientific community was a logical consequence of this issue. The international project COST 531 – Lead Free Solders, partially financed by the European Union, is one such example.

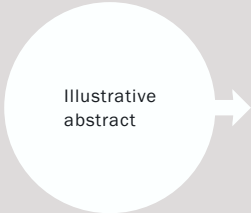
The Institute of Physics of Materials participated in this project and the *Atlas of Phase Diagrams for Lead-free Soldering*, published under the supervision of IPM AS CR, is one of the most important results reached through this project. This atlas contains the phase diagrams of binary and selected ternary systems, important for lead-free soldering and other crucial information, important for technological development and practical applications of such new materials. The liquidus curves or surfaces, the temperatures of the most important phase transformations and compositions of phases taking part in these transformations are published here in a comprehensible manner, *i.e.*, in graphical form and in tables.

The atlas also contains information about crystal structures of phases, existing in these systems. These results were obtained by theoretical modelling, using a thermodynamic database for lead-free solders systems. This database was also developed in the scope of the international cooperation COST 531 project, *i.e.*, Lead-free Solders, and IPM AS CR participated significantly in the development. The atlas was prepared in cooperation with National Physical Laboratory, Teddington, U.K., University of Leeds, U.K., and Institute of Chemistry of Masaryk University, Brno. It constitutes volume one of a two-volume publication. Volume two was prepared at the Universität Wien and deals with other material mostly mechanical properties of selected lead-free solder materials.

The atlas will be of great importance for people dealing with development and application of lead-free soldering, both in the research area and in industry, as it contains very important information about properties necessary for the development, production and use of lead-free solders in the electronics industry.

Dinsdale, A. T., Watson, A., Kroupa, A., Vřešťál, J., Zemanová, A., Vízdal, J.: *Atlas of phase diagrams for Lead-free Solders*. COST Office, Brno 2008 (in press).

Kroupa, A., Dinsdale, A. T., Watson, A., Vřešťál, J., Vízdal, J., Zemanová, A.: The Development of the COST 531 Lead-free Solders Thermodynamic Database. *JOM* (monthly journal of The Minerals, Metals and Materials Society) **59**, 20–25 (2007)


 Illustrative abstract

Potential application of tandem shock waves to contactless disintegration of tumor tissues • Institute of Plasma Physics

The generator of two consecutive (tandem) shock waves focused on a common focal point has been developed. With this generator it is possible to achieve localized action of the waves in advance given the presence of an originally acoustically homogeneous environment, which the tumor and health tissues really are. The first wave creates in the tissue an acoustic inhomogeneity (dilution wave/cavitations), and the second wave strongly interacts with this inhomogeneity. It results in the creation of a very complex pressure field with extremely high pressure gradients in the characteristic scale of tens of micrometers. It was proved that these pressure fields can efficiently interact with cell-scale structures. Thus tandem shock waves in combination with special drugs can be used for treatment of some tumors.

- [1] P. Sunka, V. Stelmashuk, J. Benes, P. Pouckova, J. Kralova, Potential applications of tandem shock waves in cancer therapy, Pulsed Power and Plasma Science Conference 2007, PPPS-2007, Albuquerque, NM, USA, June 17-22, 2007, *IEEE Conference Record – Abstracts*, IEEE Catalog Number: 07CH37865, ISBN: 1-4244-0914-4, Library of Congress: 81-644315, Paper No. 6C7, p. 469; 2007 IEEE Pulsed Power Conference, *Digest of Technical Papers 1976–2007*, IEEE Catalog Number: 07CH37864C, ISBN: 1-4244-0914-4, Paper No. 5P84, p. 1074-1077
- [2] J. Kaspar, K. Hana, P. Smrcka, J. Brada, J. Benes, P. Sunka, Magnetic resonance imaging in biomedical engineering, *AIP Conference Proceedings 958*, Nuclear Physics Methods and Accelerators in Biology and Medicine, edited by C. Crranja, C. Leroy, and I. Stekl, ISBN: 978-0-7354-0472-4/07, pp. 142–146

Formulation of a model and dynamic parameters of the ventricular repolarization

• Institute of Scientific Instruments

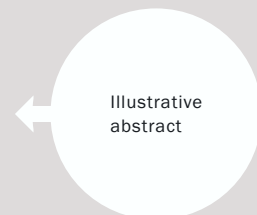
The QT interval is an important marker in cardiology because it represents the ventricular depolarization and repolarization. The QT intervals depend on previous RR intervals and the analysis of the QT/RR coupling is the essential task of the analysis of QT intervals. The standard analyses focus on steady state measurements and presume a static nonlinear QT/RR coupling. It is well known, however, that QT arrhythmia is initiated by a fast change in RR intervals. From ECG measurements with the excitation of RR, the authors derived and optimized a generally valid dynamic model of the QT/RR coupling. The model has three parameters that, together with QTc and QTv values, calculated from the model, form the complete and minimal set of parameters describing the static and dynamic properties of the QT/RR coupling. The validity of the model was tested via agreement between measured and predicted QT values. Since no such concise model has existed until now, it may be assumed its significant contribution is to patient classification and to analysis of drug effects.

Haláček, J., Jurák, P., Villa, M., Souček, M., Fráňa, P., Nykodým, J., Eisenberger, M., Leinveber, P., Vondra, V., Somers, V. K., Kára, T.: Dynamic coupling between heart rate and ventricular repolarisation. *Biomedizinische Technik* 52, 3: 255–263 (2007).

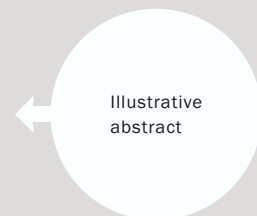
Haláček, J., Jurák, P., Villa, M., Novák, M., Vondra, V., Souček, M., Fráňa, P., Somers, V. K., Kára, J.: Dynamic QT/RR Coupling in Patients with Pacemakers. In: *Proceedings of the 29th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBS)*. Danvers, Mass., USA IEEE 2007: 919-922.

Microfluidic no-moving-part devices controlled by pressure • Institute of Thermomechanics

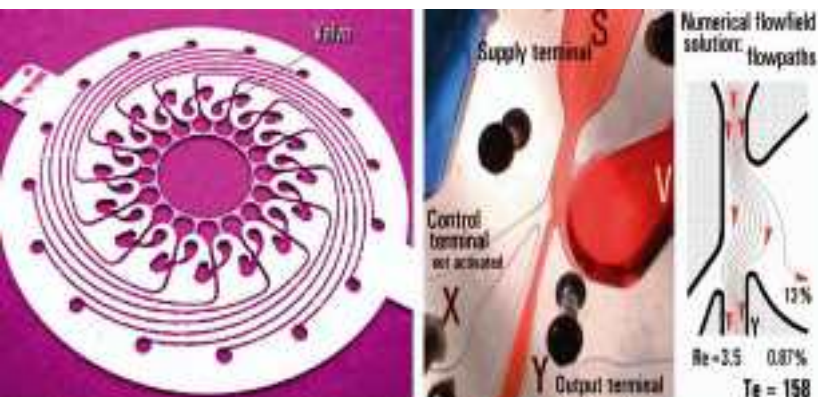
Microfluidics – the technique of handling fluid flows in extremely small-sized channels and cavities – is a new, fast developing field having a promising prospect in a number of applications, *e.g.*, those in biomedicine. The basic problem to be solved in very small devices, such as fluid flow control valves, is fluid inertia being fast damped by viscosity. Common principles of no-moving-part fluidic valves, based on the inertia of the jet formed by discharge from a nozzle, are out of the question. The jet fluid tends to leave elsewhere. This may be overcome by a clever adjustment of pressure conditions. In the cavities



Illustrative abstract



Illustrative abstract



Mikrofluidic no-moving part devices controlled by pressure. *Left:* Photograph of a multiplexer containing 16 microvalves for simultaneous testing of catalysts in microreactors operating in parallel [1]. *Centre:* Flow in one of the microvalves visualised in a scaled-up laboratory model: path from S to Y is open, but it is difficult to overcome viscous damping. Fluid passes into the vent V, necessary to get the fluid out when the control X is activated. *Right:* Fluid forced to enter Y by the action of pressure difference characterised by the high value of the parameter T_e

photo by archiv UT

etched in stainless steel shown in the photo (developed by the author in collaboration with colleagues at the University of Sheffield), the pressure conditions force the fluid to flow into the desirable output terminal Y. Relative intensity of the pressure action is characterised by a newly introduced dimensionless parameter Te [2]. Principles and applications of pressure-assisted and pressure-driven microfluidics are summarized in the monograph [3].

[1] Tesař, V., Tippetts J. R., Low Y. Y., Allen R. W. K.: Development of a Microfluidic Unit for Sequencing Fluid Samples for Composition Analysis, *Chem. Eng. Res. Design* **82**: 708–718 (2004).

[2] Tesař V., Tippetts, J. R. and Allen, R. W. K. and Low, Y. Y.: Subdynamic asymptotic behavior of microfluidic valves, *J. Microelectromechanical Systems ASME & IEEE*, **14**: 335–347 (2005).

[3] Tesař, V.: *Pressure-Driven Microfluidics*, Boston: Artech House Publishers, 2007

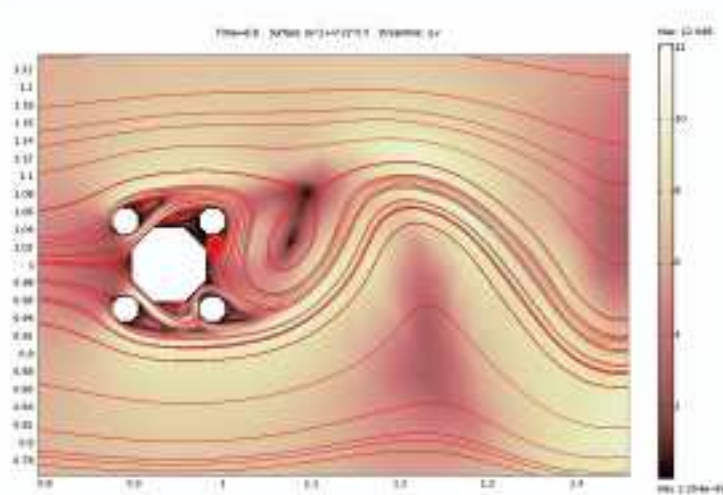
Illustrative
abstract

Adaptation strategies for cultural heritage management in the face of climate action and change

• Institute of Theoretical and Applied Mechanics

Recent changes in the earth's climate have raised concern about the increased risk that historic monuments will be lost. The European Commission has therefore been supporting research into pro-active protection of monuments. The 6th EC Framework Programme project with the biblical title "Noah's Ark" brought out an atlas of the impact of expected changes in climate, analyzed by computations on a climatic model, together with guidelines on how best to prevent the harmful impact of climate. Historic materials, art and architecture objects are here classified in a system of categories and classes according to the threat of their destruction or their vulnerability to local damage due to the negative actions of climate. The individual categories take into account the types of climatic hazards studied in the project. The main threats come from strong winds, floods and landslides, and also from the increasingly intense effects of four major weather phenomena: precipitation, solar irradiation, rising dampness and environmental fatigue, caused by repeated long-term changes in extreme situations.

Cultural heritage objects are then sorted into five classes, from robust objects which are not under threat of natural hazards to those that are highly sensitive and may easily be lost or heavily damaged. The system of categories and classes is complemented by scientific references to suitable adaptation or protective approaches, procedures and technologies that cultural heritage managers and real estate owners can exploit to safeguard the built stock, art monuments and cultural landscape from the



A model of the Tyn Cathedral tower produced for a wind tunnel testing air pressure measurements

Numerical simulation of the wind flow streamlines and velocity in the vicinity of the tower. Places with high velocities and creation of vortices need to be analyzed very carefully, with respect to the loading. The numerical model can serve as a virtual wind tunnel

photo by archiv UTAM

destructive action of present-day climate loads and the influences of anticipated changes in climate. The project outcomes stress that deterioration due to long-term weathering threatens accelerated loss of the cultural heritage, whether or not climate change is taking place.

Sabbioni, C., Bonazza, A., Messina, P., Cassar, M., Biddulph, Ph., Blades, N., Brimblecombe, P., Grossi, C. M., Harris, I., Tidblad, J., Kozłowski, R., Bratasz, L., Jakiela, S., Drdáký, M., Bláha, J., Herle, I., Lesák, J., Mašín, D., Pospíšil, S., Slížková, Z., Saiz-Jimenez, C., Gonzales Grau, J. M., Grøntoft, T., Svenningsen, G., Wainwright, I., Hawkings, Ch., Bolez Gomea, A., Ariño Vila, X., Llop, E.: *Vulnerability Atlas and Guidelines*, ISBN 978-88-903028-0-0, Noah's Ark Consortium, p. 206, May 2007

Drdáký, M., Slížková, Z.: Strategies preventing weather damage on architectural heritage, in *Proceedings of the Int. Symp. "Studies on Historical Heritage"* (G. Arun, ed.), ISBN 978-975-461-433-6, Yildiz Technical University, Maya Basin Yayin, Turkey, pp.469-476, 2007

3 • Section of Earth Sciences

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

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

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

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

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

Research into properties of geomaterials, development of methods of their ecological exploitation and interpretation of geodynamics processes • Institute of Rock Structure and Mechanics

1. Analysis of spatial distribution of earthquake foci as a tool for understanding processes at convergent plate margins • Institute of Geophysics
2. Intra-hole fluid convection: high-resolution temperature time monitoring • Institute of Geophysics
3. Solar inertial motion and its relation to solar-terrestrial variability • Institute of Geophysics
4. Seismic wave propagation in anisotropic attenuating media • Institute of Geophysics
5. Geochemistry and evolution of the subcontinental lithospheric mantle in Central Europe
• Institute of Geology
6. Behaviour of zircon in high-grade metamorphic rocks – evidence from Hf isotopes, trace elements and textural studies • Institute of Geology
7. Refining of relative rock-dating – a contribution to the revision of global stratigraphy on selected important stratigraphic levels • Institute of Geology
8. Systematic study of magnetospheric line radiation using the Demeter spacecraft
• Institute of Atmospheric Physics
9. Quantification of the risk of the intensification of convective processes in the vicinity of gust fronts
• Institute of Atmospheric Physics
10. Relations between the climate variability characteristics and geomagnetic activity
• Institute of Atmospheric Physics
11. Pre-storm enhancements of the ionospheric F2 region peak electron density
• Institute of Atmospheric Physics

Research objectives

List of studies

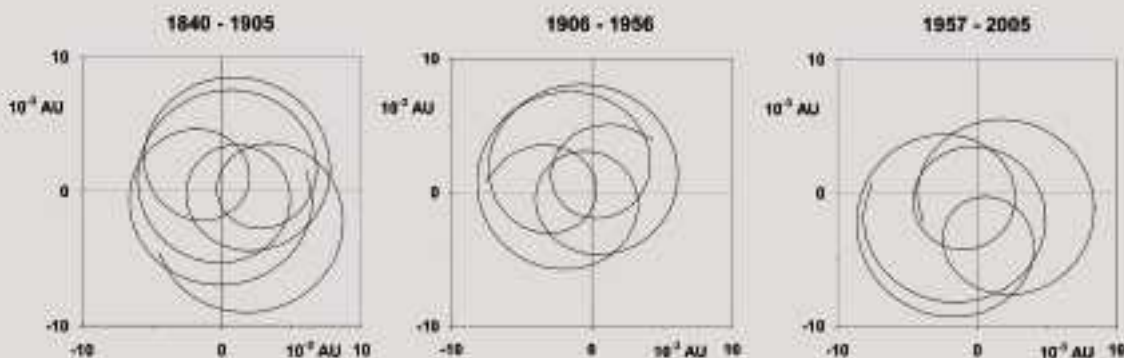
12. The influence of solar wind turbulence on geomagnetic activity • Institute of Atmospheric Physics
13. Selected extremes of the natural and anthropogenic origin and their impact in Moravia and Silesia • Institute of Geonics
14. Modelling of T-H-M processes in rock environment: parallel computing and applications • Institute of Geonics
15. Image analysis of textures and structures of geomaterials • Institute of Geonics
16. Illite “crystallinity”, maturation of organic matter and microstructural development associated with the lowest-grade metamorphism of Neoproterozoic sediments in the Teplá-Barrandian unit, Czech Republic • Institute of Rock Structure and Mechanics
17. 3D seismic travel time surveying, a comparison of the time-term method and tomography, and an example from an archaeological site • Institute of Rock Structure and Mechanics
18. Anomalous rare earth element, yttrium and zirconium mobility associated with uranium mineralization • Institute of Rock Structure and Mechanics

Illustrative
abstract

Solar inertial motion and its relation to solar-terrestrial variability • Institute of Geophysics

Investigations have been related to the solar motion around the centre mass of the Solar System due to variable positions of the planets, primarily the giant ones. The solar inertial motion (SIM) was classified into two basic types, the ordered motion in a trefoil and the chaotic motion. The Sun returns to the trefoil trajectory regularly once every 179 years. The authors proved statistically significant phase synchronization (first quantitative relation) between the SIM and sunspot cycles in the intervals of the trefoil SIM, thus supporting the hypothesis of the SIM likely being an origin of solar variability. Stable behaviour of solar and geomagnetic activities and their 10-year periodicity were shown, by analysing a series of sunspot numbers and the index *aa*, for the interval of the SIM trefoil motion in the interval 1906–1956.

Their behaviours differ before and after this interval after the Sun moved chaotically. An exceptional character of this interval is also manifested, *e.g.*, by stable and very low volcanic indices or by a noise



The solar orbit between 1840 and 2005 plotted in the three partial intervals: in a disordered type 1840–1905, in the trefoil, stable type 1906–1956, and in a slightly disordered type 1957–2005 when the SIM slightly differs from that in the first interval

photo by archiv GFU

behaviour of surface air temperature in equatorial regions. The SIM due to the inner planets (Mercury, Venus, Earth and Mars) is heart-shaped, with the dominant period of 1.6 years and with the significant period of 2.13 years that are both detected in a series of solar and solar-terrestrial phenomena (MTQP, 1.5–1.7 years; QBO). The SIM is computable in advance (celestial mechanics). Though a proper physical mechanism between the SIM and the mentioned phenomena is not known, predictions can be based on the identity of the SIM sequences, as, *e.g.*, in the years 1840–1905 and 1980–2045.

Charvátová, I.: The prominent 1.6-year periodicity in solar motion due to the inner planets. *Annales Geophys.* **25**: 1–6 (2007).

Charvátová, I., Střeščík, J.: Relations between the solar inertial motion, solar activity and a geomagnetic index since the year 1844. *Advances in Space Research*, doi: 10.1016/j.asr.2007.05.086 (2007).

Paluš, M., Kurths, J., Schwarz, U., Seehafer, N., Novotná, D., Charvátová, I.: The solar activity is weakly synchronized with the solar inertial motion. *Physics Lett. A*, doi: 10.1016/j.physleta.2007.01.039 (2007)

Relations between the climate variability characteristics and geomagnetic activity

• Institute of Atmospheric Physics

A possible influence of solar/geomagnetic activity on climate variability has been the subject of many recent studies due to a substantial increase of solar/geomagnetic activity during the last century. There is no generally accepted mechanism for tropospheric responses on effects of the solar/geomagnetic variability.

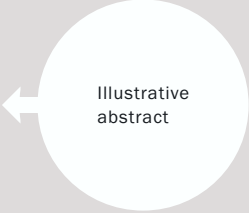
Long-term records of the near surface air temperature from several midlatitude European locations, the North Atlantic Oscillation (NAO) index, as well as the geomagnetic activity aa-index and the sunspot numbers have been analyzed to detect possible common oscillatory modes. The statistically significant oscillatory modes with a period of approximately 8 years have been detected in the geomagnetic activity index as well as in the NAO index and surface air temperature records. The existence of the common oscillatory mode gives us a solid basis for further research into relations between the geomagnetic activity and climate variability.

Paluš, M., Novotná, D.: Common oscillatory modes in geomagnetic activity, NAO index and surface air temperature records. *Journal of Atmospheric and Solar-Terrestrial Physics*, **69**: 1541–1550 (2007)

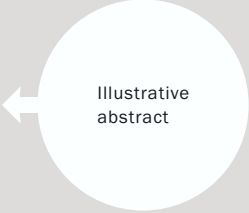
3D seismic travel time surveying: a comparison of the time-term method and tomography (an example from an archaeological site) • Institute of Rock and Mechanics

The authors deal with processing of high-resolution 3D seismic refraction data in highly heterogeneous media often found on archaeological localities. Currently, this type of data is routinely processed by means of the travel time tomography. However, the tomography results are too smooth and lack details necessary for archaeological interpretation. A new approach, based on modification of the time-term method is described. The modified time-term and tomography are then applied on data from the 3D geophysical research of the Děvín Castle (Prague, Zlíchov). It is shown, that the modified time-term method has better resolution and gives more detailed images of the subsurface than the tomography. Finally, the archaeological interpretation of the measured data is presented, when entering the castle, remnants of moat and walls were found.

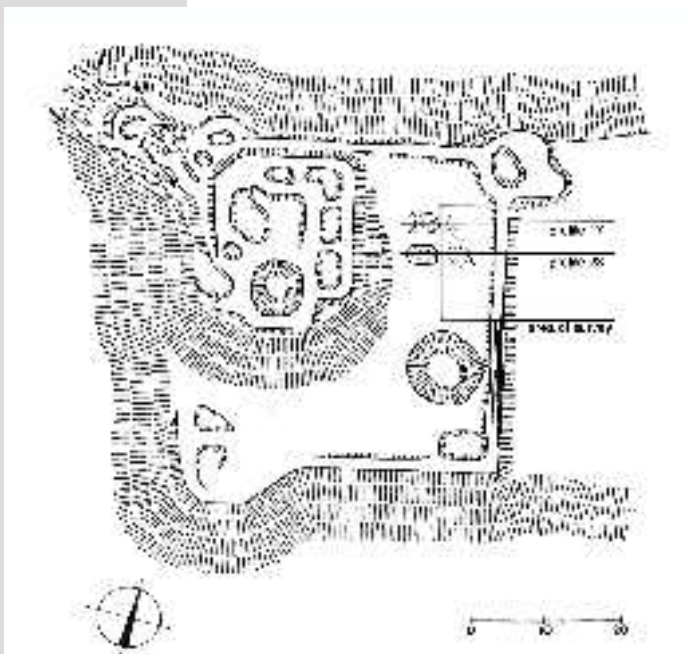
Valenta J., Dohnal J.: 3D seismic travel time surveying: a comparison of the time-term method and tomography (an example from an archaeological site). *Journal of Applied Geophysics* **63**: 46–58 (2007).



Illustrative
abstract



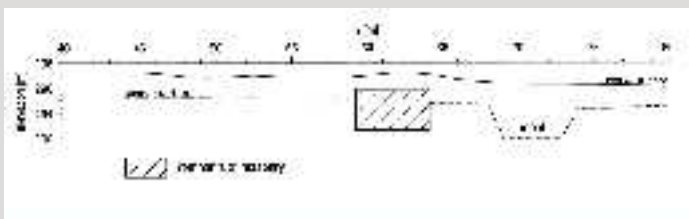
Illustrative
abstract



A map of remnants of the Děvín Castle according to the archaeological investigation. Plotted is the area of geophysical research – rectangular area of the 3D measurements and two seismic profiles

The interpreted cross-section along profile 23. Plotted is the thickened base of a rampart at the side of the gate, a three metres deep moat and the possible surface from the time, when the castle was built

photo by archiv ÚSMH



4 • Section of Chemical Sciences

The Section combines six departments, the research focus of which was characterized by the following exploratory aims:

Advanced analytical techniques for bioanalysis, environmental analysis and nanotechnology

- Institute of Inorganic Chemistry

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

Structure, reactivity and dynamics of molecular and biomolecular systems: theory, experiment, application • J. Heyrovsky Institute of Physical Chemistry

Investigation of multiphase reacting systems for the design of processes important in the synthesis and preparation of novel materials, in energy production and in environmental protection

- Institute of Chemical Process Fundamentals

Advances in polymer materials and supramolecular systems: Synthesis and research on properties, phenomena and implementation in special application and innovative technologies

- Institute of Macromolecular Chemistry

Research objectives

Regulation of Life Processes: Chemical Modulators of Selected Biological Systems Relevant to Medicine and Agriculture • Institute of Organic Chemistry and Biochemistry

1. Pressurized hot water: an unconventional solvent • Institute of Analytical Chemistry
2. Rapid detection and identification of pathogenic microorganisms and viruses by electromigration techniques and mass spectrometry • Institute of Analytical Chemistry
3. Method for speciation analysis of arsenic in biological material • Institute of Analytical Chemistry
4. Gold and silver crystals modified with selected carboranethiol derivatives
• Institute of Inorganic Chemistry
5. The glass melting process and his new concepts • Institute of Inorganic Chemistry
6. First identification of $\text{Pb}_2\text{SbSnO}_{6.5}$ yellow in central European painting of 19th century: modern analytical methods to the study of historical materials • Institute of Inorganic Chemistry
7. Selected ion flow tube mass spectrometry • J. Heyrovsky Institute of Physical Chemistry
8. Carbon nanostructures and nanocomposites • J. Heyrovsky Institute of Physical Chemistry
9. Synthesis and catalytic application of zeolite-based hierarchic catalysts
• J. Heyrovsky Institute of Physical Chemistry
10. Publication of the book Landolt-Börnstein IV/13A. Vapor-Liquid Equilibrium in Mixtures and Solutions • Institute of Chemical Process Fundamentals
11. Preparation of novel nanostructured Si/Ge/C based materials
• Institute of Chemical Process Fundamentals
12. Swelling of polymeric membranes in room temperature ionic liquids
• Institute of Chemical Process Fundamentals
13. LC-NMR analysis of siloxane polymers • Institute of Chemical Process Fundamentals
14. Application of polymeric foams to separation, storage and absorption of hydrogen
• Institute of Macromolecular Chemistry
15. Responsive microparticles for biotechnological applications • Institute of Macromolecular Chemistry
16. Proximity effect in the cooperation of hydrogen bonds and other binding between macromolecules
• Institute of Macromolecular Chemistry
17. New generation of organic low-solvent high-performance protective coatings
• Institute of Macromolecular Chemistry
18. Efficient construction of functionalized oligonucleotides and DNA duplexes using cross coupling reactions of nucleoside triphosphates followed by incorporation by DNA polymerase
• Institute of Organic Chemistry and Biochemistry
19. Two-Dimensional Electrophoretic Analysis of a New Human Cell Line EM-G3 Derived from Breast Cancer Progenitor Cells and Comparison with Normal Mammary Epithelial Cells
• Institute of Organic Chemistry and Biochemistry
20. Big Process – Small Model: Triatomic Ag^{20+} +Ethylene
• Institute of Organic Chemistry and Biochemistry

Selected ion flow tube mass spectrometry • J. Heyrovsky Institute of Physical Chemistry

Researchers at the Department of Chemical Physics, Dr. Španěl and Dr. Dryahina, have developed a general method for accurate calculation of absolute trace gas concentrations in the air and breath from selected ion flow tube mass spectrometry (SIFT-MS) data. This method allows analyses of compounds present in the air at concentrations of parts per billion independently on the air humidity and thus the use of much smaller instruments for SIFT-MS than was possible so far. The first of such instruments was commissioned in their mass spectrometry laboratory in year 2006. Detailed research of the processes occurring in the plasma of the ion source part of this instrument has allowed a further increase of sensitivity and optimisation of the detection limit of the SIFT-MS method.

List of studies

Illustrative abstract

The authors obtained new and original data for the concentration of metabolites present in exhaled breath of young volunteers (17–19 years) at levels below one part per million and described concentrations of acetone, ammonia and hydrogen cyanide as a function of age from 4 to 83 years. Towards the end of 2007, they initiated research of potential of SIFT-MS for asthma diagnostics in collaboration with the Na Homolce Hospital and for classification of bacterial cultures in collaboration with the National Institute of Health. Dr. Španěl also contributed to introducing physical methods of analysis in life sciences and medicine by writing and publishing review papers.



Selected ion flow tube mass spectrometry.
Trace gas analysis of breath by selected ion flow tube mass spectrometry (SIFT-MS)

photo by archiv ÚFCH JH

- [1] Španěl, P., Dryahina, K., Smith, D.: A general method for the calculation of absolute trace gas concentrations in air and breath from selected ion flow tube mass spectrometry data. *International Journal of Mass Spectrometry* **249/250**: 230–239 (2006).
- [2] Španěl, P., Dryahina, K., Smith, D.: Microwave plasma ion sources for selected ion flow tube mass spectrometry: Optimizing their performance and detection limits for trace gas analysis. *International Journal of Mass Spectrometry* **267**: 117–124 (2007).
- [3] Španěl, P., Dryahina, K., Smith, D.: The concentration distributions of some metabolites in the exhaled breath of young adults. *Journal of Breath Research* **1**: 026001 (2007).
- [4] Španěl, P., Dryahina, K., Smith, D.: Acetone, ammonia and hydrogen cyanide in exhaled breath of several volunteers aged 4–83 years. *Journal of Breath Research* **1**: 011001 (2007).
- [5] Smith, D., Španěl, P.: The challenge of breath analysis for clinical diagnosis and therapeutic monitoring. *The Analyst* **132**: 390–396 (2007).

Illustrative
abstract

Realisation: Publication of the book Landolt-Börnstein IV/13A. Vapor-Liquid Equilibrium in Mixtures and Solutions
• Institute of Chemical Process Fundamentals

Vapor-liquid equilibrium (VLE) data represent the basic information for chemical engineering calculations, in particular for the design and operation of distillation plants in the chemical, pharmaceutical, polymer, petrochemical and related industries. The data are also prerequisite to understanding molecular interactions and developing theories of liquids and their mixtures. The volume published within the series of Landolt-Börnstein handbooks covers vapor-liquid equilibrium data on subcritical binary homogeneous (single-phase) and heterogeneous (two-phase liquid-liquid) systems. The monograph crowns the efforts on compiling a VLE data bibliography which started as early as 1955. Since 1973 the bibliography has been fully computerized and was published in triennial intervals by Elsevier; since 1993 it has been supplemented by CD-ROM with bibliographic data in electronic form and retrieval software.

The present completed version provides information on 20935 two- to nine-component systems from 13471 literature sources covering the period 1888 through mid-2006. The VLE database included in the book contains numerical data for 3316 systems. Numerical values for 802 binary mixtures, chosen to be representative of all the compound classes and property types, are displayed in tables and graphs. Additional data are provided on an attached CD-ROM. Full-text electronic version of the book is also available on a CD-ROM with hypertext links to all data files in PDF format. The work was carried out in cooperation with Laboratoire ITODYS, Université Paris VII.

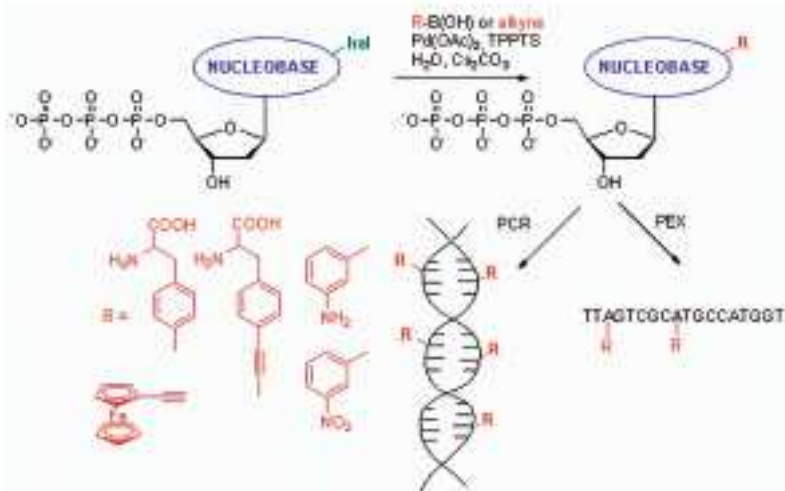
Wichterle I., Linek, J., Wagner, Z., Fontaine, J.-C., Sosnkowska-Kehiaian, K., Kehiaian H. V.: *Landolt-Börnstein IV/13A. Vapor-Liquid Equilibrium in Mixtures and Solutions*. Springer, Berlin 2007, 583pp.

Efficient construction of functionalized oligonucleotides and DNA duplexes using cross-coupling reactions of nucleoside triphosphates followed by incorporation by DNA polymerase

• Institute of Organic Chemistry and Biochemistry

A novel efficient methodology of cross-coupling free (non-protected) halogenated nucleoside triphosphates in water was developed and published. This single-step method enables an expeditious and efficient synthesis of modified dNTPs bearing diverse types of aryl and alkynyl substituents as substrates for DNA polymerases. Incorporation of these dNTPs by DNA polymerases using a primer extension method followed by denaturation and separation enables isolating oligonucleotides bearing several specific modifications. Incorporation by PCR leads to DNA duplexes with high density of modifications. Hence, a combination of aqueous cross-coupling reactions of dNTPs with enzymatic incorporation is a new two-step approach to construction of functionalized DNAs. Oligonucleotides bearing amino acid residues or oligonucleotide probes bearing ferrocene or nitro- or aminophenyl labels for electrochemical detection and bioanalytical applications were prepared in this way.

Illustrative abstract



Efficient construction of functionalized oligonucleotides and DNA duplexes

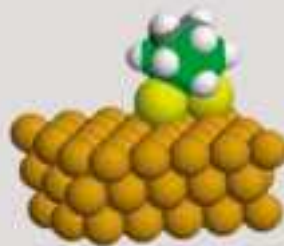
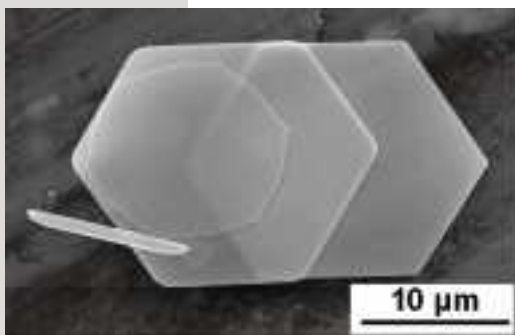
photo by archiv ÚOCHB

- [1] Čapek, P.; Cahová, H.; Pohl, R.; Hocek, M.; Gloeckner, C.; Marx, A.: An efficient construction of functionalized DNA bearing amino acid groups by cross-coupling reactions of nucleoside triphosphates followed by primer extension or PCR *Chem. Eur. J.* **13**: 6196–6203 (2007).
 [2] Brázdilová, P.; Vrábek, M.; Pohl, R.; Pivoňková, H.; Havran, L.; Hocek, M.; Fojta, M.: Ferrocenylethynyl Derivatives of Nucleoside Triphosphates. Synthesis, Incorporation, Electrochemistry and Bioanalytical Applications *Chem. Eur. J.* **13**: 9527–9533 (2007).
 [3] Cahová, H.; Havran, L.; Brázdilová, P.; Pivoňková, H.; Pohl, R.; Fojta, M.; Hocek, M.: Aminophenyl- and Nitrophenyl-Labeled Nucleoside Triphosphates. Synthesis, Enzymatic Incorporation and Electrochemical Detection. *Angew. Chem. Int. Ed.* (in press).

Illustrative
abstract**Gold and silver crystals modified with selected carboranethiol derivatives • Institute of Inorganic Chemistry**

Gold is a suitable substrate for studies of two dimensional self-assembled monolayers of various organic molecules, particularly because of its inert character. Over the last decade this area has attracted the interest of research institutions as well as of commercial companies for reasons of potential applications in electronics. In 1982, at Bell Laboratories, a group of scientists described an efficient method for the preparation of mono-molecular layers on surfaces of gold films. The principle of their method was based on a high reactivity of thiol and disulphide molecules with a bare gold surface. In our study we have been interested in two aspects closely associated with the modification of metal surfaces: firstly, the preparation of gold and silver flat surfaces as suitable substrates for the study of self-assembled monolayers, and secondly, inorganic molecular systems which can, upon their attachment to either a gold or silver flat surface and assembly into a two-dimensional arrangement, change the electron transport from the substrate into the outer environment.

We have, for the first time ever, used the thiol derivatives of ortho-carborane, a cluster species with high inherent dipole moment, for purposes of a surface modification. The attachment of these molecular dipoles to a flat gold film caused asymmetry of electrochemical processes that take place on the surface [1]. Gold and silver flat surfaces were achieved with the preparation of single-crystals of micrometer dimensions. Their shapes can be described as plates, polyhedra and strips. The fundamental characterization of the gold micro-plates showed large and flat faces with an (111) orientation. Naturally grown flat surfaces of the micro-plates provided substrates with better flatness than any of the commercially available gold coatings. In comparison with gold or silver, a cheaper and more industrially important metal, ultimately formed strips and polyhedra [2], both of which are potentially applicable in metallurgy for sintered made products [3].



The space-filling model of the carboranethiol cluster molecule on a gold flat surface with (111) crystallographic orientation

The SE micrograph of gold single-crystal micro-plates with hexagonal motifs

photo by archiv ÚACH

[1] Baše, T., Bastl, Z., Plzák, Z., Grygar, T., Plešek, J., Carr, M. J., Malina, V., Šubrt, J., Boháček, J., Večerníková, E., Kříž, O. *Langmuir* **25**: 7776 (2005); [2] Baše, T., Šubrt, J. – International Patent Application PCT/CZ2007/000064 (2007); [3] Baše, T. World Nano-Economic Congress, April 23–24, Pretoria, South Africa (2007)

Illustrative
abstract**Pressurized hot water – an unconventional solvent • Institute of Analytical Chemistry**

Liquid water is usually considered a highly polar solvent with an important role of hydrogen bonds. Such a picture of water is not always fitting. With rising temperature, the solvent properties of liquid water change gradually in response to the declines in relative permittivity (dielectric constant) and in cohesive energy density. As the temperature increases, therefore, water gradually becomes a better solvent of nonpolar organic compounds including hydrocarbons. Consequently, there are some situations in which pressurized hot water can be used as an alternative to harmful organic solvents. High-temperature investigations of aqueous solubilities of organics have so far been largely concerned with relatively small organic molecules (up to 8 carbon atoms).

However, the aqueous solubilities of solid organic nonelectrolytes with larger molecules at temperatures above 100 °C can be helpful in applications of pressurized hot water. As the current literature contains only a few data sets of the kind we have carried out extensive measurements of the aqueous solubilities of solid polycyclic aromatic hydrocarbons and solid tricyclic aromatic heterocycles within a wide range in temperature. We have also used the experimental data to construct simple predictive correlations to estimate the aqueous solubilities of aromatic solids at elevated temperatures. The correlations are sufficiently accurate to be used for an initial engineering design of extraction processes employing pressurized hot water.

Karásek, P., Planeta, J., Roth, M.: Solubility of Solid Polycyclic Aromatic Hydrocarbons in Pressurized Hot Water at Temperatures from 313 K to the Melting Point. *Journal of Chemical and Engineering Data* 51, **2**: 616–622 (2006); Karásek, P., Planeta, J., Roth, M.: Solubility of Solid Polycyclic Aromatic Hydrocarbons in Pressurized Hot Water: Correlation with Pure Component Properties. *Industrial & Engineering Chemistry Research* 45, **12**: 4454–4460 (2006); Karásek, P., Planeta, J., Roth, M.: Aqueous Solubility Data for Pressurized Hot Water Extraction for Solid Heterocyclic Analogs of Anthracene, Phenanthrene and Fluorene. *Journal of Chromatography A* 1140, **1-2**: 195–204 (2007); Karásek, P., Planeta, J., Roth, M.: Simple First-Order Group Contribution Scheme for Solubilities of Solid Polycyclic Aromatic Hydrocarbons and Solid Polycyclic Aromatic Heterocycles in Pressurized Hot Water. *Industrial & Engineering Chemistry Research*, (in press); Karásek, P., Planeta, J., Roth, M.: Solubilities of Triptycene, 9-Phenylanthracene, 9,10-Dimethylanthracene, and 2-Methylanthracene in Pressurized Hot Water at Temperatures from 313 K to the Melting Point. *Journal of Chemical and Engineering Data* 53, **1**: 160–164 (2008).

5 • Section of Biological and Medical Sciences

The Section includes seven institutes whose research objectives were as follow:

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

Genome and epigenome: 1D and 3D Structure, Dynamics, Interactions with Proteins and Functions
• Institute of Biophysics

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

Microorganisms in Research and Biotechnology • Institute of Microbiology

Mechanisms of regulation of plant growth and development on the level 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

New biotechnologies, nanomaterials and stem cells for use in regenerative medicine
• Institute of Experimental Medicine

Molecular Genetics and Cellular Bases of Key Biological Processes: Gene Expression, Oncogenesis, Virus Replication, Immunity and Development of the Organism • Institute of Molecular Genetics

Establishment of the Biotechnology Institute ASCR • Institute of Molecular Genetics

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



List of studies

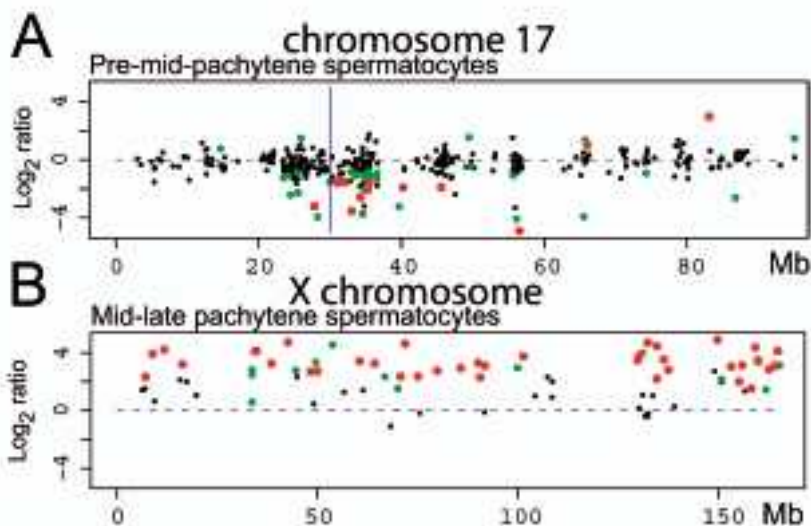
1. Structural dynamics of RNA at the atomistic level • Institute of Biophysics
2. Understanding the role of HMGB1 in the functioning of human topoizomerase II α and maintaining of genomic stability • Institute of Biophysics
3. Potent cytotoxic photoactivated platinum complex • Institute of Biophysics
4. Direct Linkage of Mitochondrial Genome Variation to Risk Factors for Type 2 Diabetes in Conplastic Strains • Institute of Physiology
5. Circadian clock within rat colonic epithelial cells • Institute of Physiology
6. Modulation of locomotion and spatial behavior by ligands of dopamine D1 and D2 receptors • Institute of Physiology
7. Regulation of DNA-binding properties of transcription factor FOXO4 • Institute of Physiology
8. Molecular mechanisms of activation and desensitization of the capsaicin receptor (TRPV1) • Institute of Physiology
9. Cytokine spectra in human milk and colostrum • Institute of Microbiology
10. Large propeptides of fungal β -N-acetylhexosaminidases are novel enzyme regulators that must be intracellularly processed to control activity, dimerization, and secretion into an extracellular environment • Institute of Microbiology
11. New type of oxidase in fungi • Institute of Microbiology
12. Addressing the role of auxin efflux carriers • Institute of Experimental Botany
13. Cytokinin receptors • Institute of Experimental Botany
14. Characterization of human embryonic stem cell lines by the International Stem Cell Initiative • Institute of Experimental Medicine
15. Early Childhood Lower Respiratory Illness and Air Pollution • Institute of Experimental Medicine
16. Membrane potential governs lateral segregation of plasma membrane proteins and lipids in yeast • Institute of Experimental Medicine
17. Infertility as a consequence of incomplete meiotic X-chromosome inactivation • Institute of Molecular Genetics
18. Inbred chicken lines resistant to avian sarcoma and leukosis viruses display genetic defects of specific receptors • Institute of Molecular Genetics
19. The melanocyte fate in neural crest is triggered by Myb proteins through activation of c-kit • Institute of Molecular Genetics
20. A proteomic approach to studying the differentiation of neural stem cells • Institute of Animal Physiology and Genetics
21. Incudomalleal joint formation: the roles of apoptosis, migration and downregulation • Institute of Animal Physiology and Genetics
22. Genetic analysis of autosomal and x-linked markers across a mouse hybrid zone • Institute of Animal Physiology and Genetics

Illustrative abstract

Infertility as a consequence of incomplete meiotic X-chromosome inactivation • Institute of Molecular Genetics

Infertility of carriers of certain chromosomal rearrangements in mice and in humans is associated with incomplete pairing of aberrant chromosomes in meiosis and their co-localization with XY body in primary spermatocytes were studied. The authors used genome-wide microarray analysis of gene expression to uncover the downregulation of genes located in the non-synapsed region. Moreover, the inactivation of the X-linked genes, characteristic of normal pachytene spermatocytes, was disturbed in infertile males. The aberrant chromosomal pairing in the meiotic prophase was proved by the presence of phosphorylated γ H2AX histone and BRCA1 marker on the rearranged autosome and associated X chromosome. The paper presents the first molecular evidence for meiotic inactivation of X chromosome as a surveillance mechanism to control normal pairing of homologous chromosomes.

Homolka, D., Ivanek, R., Capkova, J., Jansa, P., Forejt, J.: Chromosomal rearrangement interferes with X-chromosome inactivation. *Genome Res.* **17**: 1431–1437 (2007)



Abnormal gene activity in germ cells of infertile males.

Genome-wide analysis of gene expression by using DNA microarrays showed: (A) Silencing of some genes in the region of translocation break (blue vertical) on Chromosome 17; (B) Failure of inactivation of genes along the X chromosome in pachytene spermatocytes of sterile mice.

According to the proposed hypothesis, the failure of proper X inactivation is the consequence of disregulations on the Chromosome 17 and is linked to the male infertility

photo by archiv UMG

Structural dynamics of RNA at the atomistic level • Institute of Biophysics

Biochemical and biological functions of RNA molecules are determined by their 3D structures. In this project we demonstrated that modern simulation techniques (Molecular Dynamics, MD, with atomistic description) combined with bioinformatics is a surprisingly efficient tool to complement and extend the available experimental techniques. This was shown for one of the key RNA segments of the ribosome, the GTPase associated center RNA (helices 42–44). Using simulations we found that the GTPase center RNA has been constructed by evolution as a uniquely flexible and directional RNA nano-arm, with alternating two rigid and two elbow-like flexible elements and terminated by an adjustable head capable of complex molecular interactions.

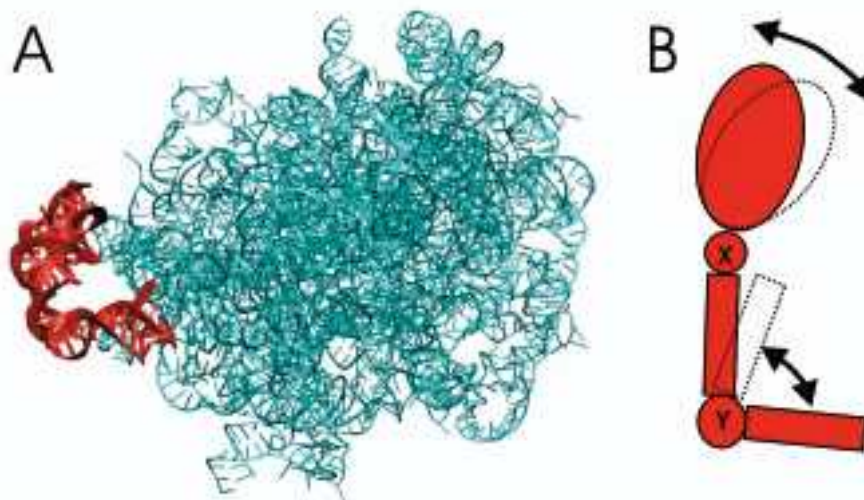
Bioinformatics allowed us to confirm that these unique flexibility features have been entirely conserved in all three domains of life in the course of evolution, and thus the elasticity provides key constraints on the base sequence in this particular part of the ribosomal machine. We discovered an entirely different type of flexibility, structural adaptability of unpaired conserved purine bases, in the HIV-1 DIS RNA “kissing” loop complex. Finally, we observed no visible RNA dynamics in simulations of Hairpin ribozyme. Instead, however, we found a string of functional long-residency water molecules lining up in the catalytic center of this RNA enzyme, which most likely are actively involved in catalysis. In summary, properly applied simulations allows efficient disclosure and characterizes many strikingly variable strategies that RNA molecules utilize in detailed tuning of their functions. Many of these tricks are not accessible to experimental investigations.

Rázga, F., Koča, J., Mokdad, A., Šponer, J.: Elastic properties of ribosomal RNA building blocks: molecular dynamics of the GTPase-associated center rRNA. *Nucleic Acids Research*, **35**, 4007–4017 (2007)

Réblová, K., Fadrná, E., Sarzynska, J., Kulinski, T., Kulhánek, P., Ennifar, E., Koča, J., Šponer, J.: Conformations of flanking bases in HIV-1 RNA DIS kissing complexes studied by *Molecular Dynamics*. *Biophysical Journal*, **93**, 3932–3949 (2007)

Rhodes, M. M., Réblová, K., Šponer, J., Walter, N. G.: Trapped water molecules are essential to structural dynamics and the function of a ribozyme. *Proceedings of the National Academy of Sciences of the USA*, **103**, 13380–13385 (2006).

← Illustrative abstract



Structural dynamics of RNA at the atomistic level. A. The position of the GTPase associated center RNA (red) in the x-ray structure of large subunit of bacterial ribosome (blue). B. The GTPase associated center RNA is a sophisticated dynamical RNA-based nanoarm, the arrows indicate available motions around its two flexible elbows X and Y

photo by archiv BFÚ

Illustrative abstract

Direct Linkage of Mitochondrial Genome Variation to Risk Factors for Type 2 Diabetes in Conplastic Strains
 • Institute of Physiology

Studies performed within the Center of Applied Genomics (1M6837805002) have demonstrated a direct linkage between mitochondrial genome (mtDNA) and risk factors for diabetes using rat conplastic strains. Recently, the relationship of mtDNA variants to metabolic risk factors for diabetes and other common diseases has been attracting increasing attention. However, progress in this area has been limited because, (1) the phenotypic effects of variation in the mitochondrial genome are difficult to isolate owing to a confounding variation in the nuclear genome, imprinting phenomena, and environmental factors, and (2) few animal models have been available for directly investigating the effects of mtDNA variants on complex metabolic phenotypes *in vivo*. Substitution of different mtDNA on the same nuclear genetic background in conplastic strains provides a way to unambiguously isolate effects of the mitochondrial genome on complex traits.

We have created SHR.BN-mtDNA conplastic strains by transferring mtDNA from Brown Norway (BN/Crl) to spontaneously hypertensive rats of the SHR/Ola strain. SHR and SHR.BN-mtDNA strains thus have an identical nuclear genome but their mtDNAs differ in number of mutations, 7 of which result in amino acid substitutions in oxidative phosphorylation proteins, including a unique mutation in COX1 gene encoding the catalytic subunit of cytochrome c oxidase. Conplastic strains differed in several risk factors for diabetes type 2 such as muscle glycogen and ATP content, glucose tolerance and blood lipids. These results provide the first direct evidence linking a naturally occurring variation in the mtDNA to known risk factors for type 2 diabetes and establish that spontaneous variation in the mitochondrial genome per se can promote systemic metabolic disturbances relevant to the pathogenesis of common diseases.



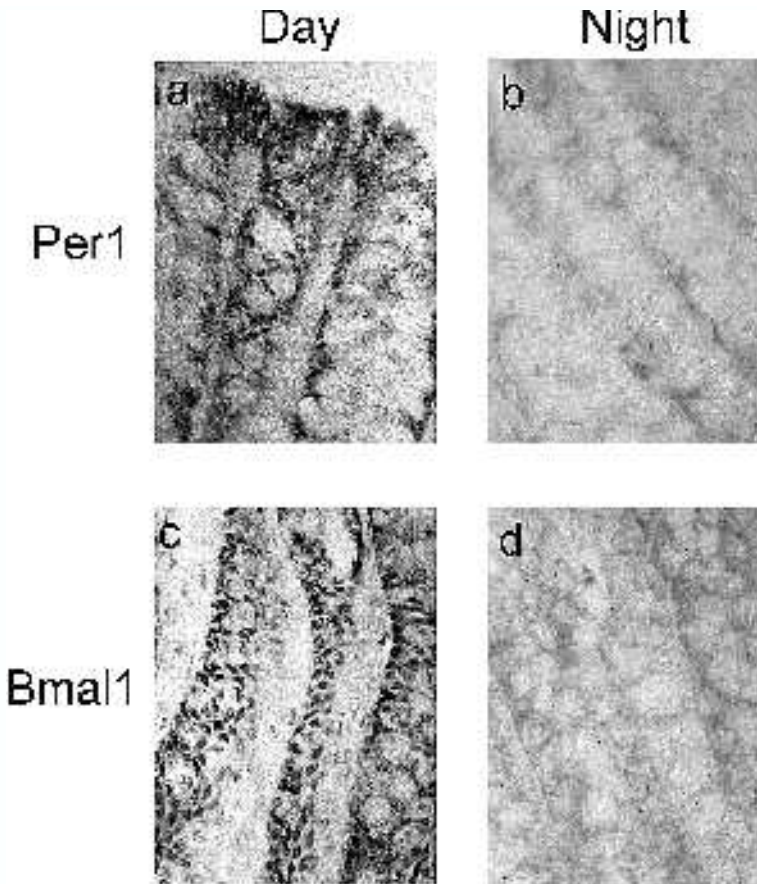
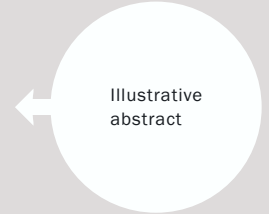
Conplastic strains. Strains with identical nuclear genome of the spontaneously hypertensive rat (SHR) but with different genomes of mitochondrial DNA, BN (Brown Norway) versus SHR

photo by archiv FGÚ

M. Pravenec, M. Hyakukoku, J. Houštěk, V. Zídek, V. Landa, P. Mlejnek, I. Mikšík, K. Dudová-Mothejzík, P. Pecina, M. Vrbacký, Z. Drahota, A. Vojtíšková, T. Mráček, L. Kazdová, O. Oliyarnyk, J. Wang, C. Ho, N. Qi, K. Sugimoto, T. W. Kurtz: Direct linkage of mitochondrial genome variation to risk factors for type 2 diabetes in conplastic strains. *Genome Res.* **17**:1319–1326, 2007 (IF 10,256)

Circadian clock within rat colonic epithelial cells • Institute of Physiology

Researchers from Department of Neurohumoral Regulations and Epithelial Physiology of the Institute of Physiology discovered that colonic epithelial cells harbor a daily, *i.e.*, circadian, clock. They demonstrated that genes responsible for the clockwork, *i.e.*, the clock genes, are expressed rhythmically during the day and night for a period of 24 hours. Moreover, the levels of protein products of the clock genes exhibit daily variations as well. Circadian clock in the colon was in phase with the circadian clock in the liver but phase-delayed relative to the master clock in the suprachiasmatic nucleus in the brain. Next, the authors elucidated that the newly described circadian clock in the colon controls rhythmical intestinal functions, *e.g.*, it likely drives rhythmical expression of a dominant electroneutral Na^+/H^+ exchanger NHE3. They also ascertained that a change in the feeding regime significantly resets the colonic clock independently of the signaling from the central master clock within the suprachiasmatic nucleus. The results stress the importance of the existence of the circadian clock in the colon and of a correct synchronization of the clock with the external environment for proper intestinal functions. Desynchronization of the colonic circadian clock, as occurs when time zones are often crossed or in shift work, are thus put into context with development of gastrointestinal diseases including colonic cancer.



Immunostaining of PER1 (a,b) and BMAL1 (c,d) proteins in the rat colonic epithelium. Immunopositive cells are localized selectively in the crypt epithelium. The intensity of PER1 and BMAL1 immunoreactivity was higher during the daytime than at night

photo by archiv FGÚ

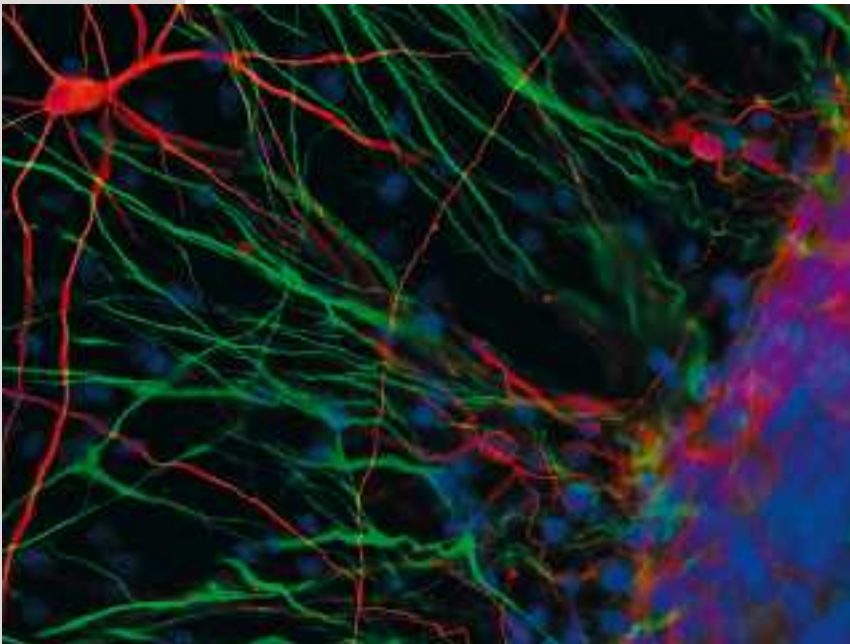
Illustrative
abstract

Sládek M., Rybová M., Jindráková Z., Zemanová Z., Polidarová L., Mrnka L., O'Neil J., Pácha J., Sumová A.: Insight into circadian clock within the rat colonic epithelial cells. *Gastroenterology* **133**: 1240–1249, 2007 (IF 12.457)

A proteomic approach to studying the differentiation of neural stem cells
• Institute of Animal Physiology and Genetics

The mechanisms that regulate the maintenance of stem cell self-renewal versus differentiation are complex and remain mostly unknown. Understanding neurogenesis and neural cell differentiation presents a unique challenge for the treatment of nervous system disorders. To gain more insight into molecular mechanisms of the differentiation of neural cells, we combined the advantage of porcine fetal Neural Stem Cells (NSCs) and a *in vitro* differentiation model and proteomic analysis. Using 2-DE followed by MS, we profiled constituent proteins of NSCs and their differentiated progenies at first and then indicated protein species that were significantly up- or downregulated during the differentiation.

The largest identified group of constituent proteins was related to RNA and protein metabolism and processing, including chaperones, and the second largest consisted of proteins involved in cell organization (cytoskeleton and annexins). Differentiation of neural cells was found to be accompanied by changes in the expression of proteins involved in DNA and RNA binding, mRNA processing and transport, stress responses, iron storage, and redox regulation. Additional immunoblot analysis verified the induction of α -B crystallin and heterogenous nuclear ribonucleoproteins (hnRNPs) A1 and A2/B1. Furthermore, immunocytochemistry demonstrated specific localization of α -B crystallin in the cytoplasm or nucleus of glial cells and confirmed cellular expression patterns of hnRNPs A1 and A2/B1. These findings represent a significant step towards understanding neural cell differentiation and identification of the regulatory proteins associated with this process.



Differentiation of neural stem cells.
Porcine neural stem cells, differentiating into neurons (green) and astroglia (red). Cell nuclei counterstained in blue.
Undifferentiated neural stem cells are in lower right corner

photo by archiv ÚZFG

Skalníková, H., Halada, P., Vodička, P., Motlík, J., Řehulka, P., Horning, O., Chmelík, J., Norregaard-Jensen, O., Kovářová, H.: A proteomic approach to studying the differentiation of neural stem cells. *Proteomics*. **7**:1825–1838 (2007)

6 • Section of Bio-Ecological Science

Section is comprised of four institutes with the following research objectives:

Structure, function and evolution of biodiversity of photoautotrophic organisms and fungi origin and causes of their variation, population, community and ecosystem dynamics; application of selected results in the Průhonice Park • Institute of Botany

Structure, functioning and development of aquatic ecosystems • Biology Centre

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

Biodiversity and ecology of vertebrates: implications in conservation and sustainable management of natural populations • Institute of Vertebrate Biology

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

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

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

Study of the regulation of insect organisms, dynamics of insect populations and function of insect in ecosystems • Biology Centre

1. Metamorphosis of holometabolous insects • Biology Centre
2. Spatial Variation of Deuterium Enrichment in Bulk Water of Snowgum Leaves • Biology Centre
3. Evolution of the protist *Leishmania donovani*, a causative agent of serious human disease
• Biology Centre
4. Diel vertical migrations, distribution and ontogeny of bathypelagic layer of European perch (*Perca fluviatilis* L.) fry in reservoirs • Biology Centre
5. The role of Archaea in processes of green house gases production and consumption in soil
• Biology Centre
6. Applications of flow cytometry to plant biosystematics, ecology, and population biology
• Institute of Botany
7. Invasion of giant hogweed (*Heracleum mantegazzianum*) in Europe
• Institute of Botany
8. Circulation of cyanobacteria, algae and bacteria in the catchment area of Werenskoilbreen glacier, Svalbard, Norway • Institute of Botany
9. Diversity and evolution of Hieracium (Asteraceae) • Institute of Botany
10. Co-evolution between brood parasite and their hosts • Institute of Vertebrate Biology
11. A new disease (brucellosis) of the common vole (*Microtus arvalis*), caused by *Brucella microti*, sp. nov. (species nova, new species) • Institute of Vertebrate Biology
12. Stoats (*Mustela erminea*) provide evidence of natural overland colonization of Ireland
• Institute of Vertebrate Biology

Research objectives

List of studies

13. Ecophysiological controls over the net ecosystem exchange of mountain spruce stand. Comparison of the response in direct versus diffuse solar radiation • Institute of Systems Biology and Ecology
14. Agricultural policy-induced landscape changes: effects on biodiversity and ecosystem services • Institute of Systems Biology and Ecology
15. Structure of the dimeric N-glycosylated form of fungal beta-N-acetylhexosaminidase revealed by computer modeling, vibrational spectroscopy, and biochemical studies • Institute of Systems Biology and Ecology

Illustrative
abstract

Evolution of the protist *Leishmania donovani*, causative agent of this serious human disease • Biology Centre

Leishmaniasis is a geographically pervasive disease of humans, whose incidence has been increasing. There are about 2 million people infected per year and over 350 million in 88 countries are currently at risk. The disease is caused by flagellated protist of the genus *Leishmania* (Kinetoplastida), which is transmitted to the human host from phlebotom flies (Diptera: Phlebotominae). About 20 *Leishmania* species are pathogenic for humans. Leishmaniasis is a complex disease, including cutaneous and also visceral forms of the disease, the latter of which is lethal if untreated. The *Leishmania donovani* complex has pathogenic members that have been classified to four distinct species, *L. archibaldi*, *L. chagasi*, *L. donovani*, and *L. infantum*, based on their vectors, reservoir hosts and pathology. We performed a substantial taxonomy revision of the complex based on phylogenetic and population genetics analyses of over 18,000 characters from selected 25 representative strains. In addition, we have formulated a new hypothesis about the origin and spread of the *L. donovani* complex.

Strong correlation between the genetics and phylogeny of strains and their geographical origin has been discovered. On the other hand, no relation has been found between the genetic clustering, pathology of the disease and its traditional classification. We propose a revised taxonomy distinguishing only two species within the complex, *L. donovani* in Africa and India, and *L. infantum* in Europe. Our evolutionary scenario supposes the appearance of the complex ancestor in Central America about 46–36 million years ago (MYA), diversification of the complex in Asia about 1.2–0.7 MYA and arrival to Europe and Africa about 0.6–0.4 and 0.5–0.3 MYA, respectively. We can expect that due to proposed global climate changes leishmaniasis will spread to the European regions that have been restricted to the vectors due to low temperatures.

Lukeš, J., Mauricio, I. L., Schonian, G., Dujardin J. C., Soteriadou, K., Dedet, J. P., Kuhls, K., Tintaya, K. W. Q., Jirků, M., Chocholová, E., Haralambous, C., Pratlong, F., Oborník, M., Horák, A., Ayala, F. J., Miles, M. A.: Evolutionary and geographical history of the *Leishmania donovani* complex with a revision of current taxonomy. *Proceedings of the National Academy of Sciences of the USA* 104: 9375–9380 (2007)

Zemanová, E., Jirků, M., Mauricio, I. L., Horák, A., Miles, M. A., Lukeš, J.: The *Leishmania donovani* complex: Genotypes of five metabolic enzymes (ICD, ME, MPI, G6PDH, and FH), new targets for multilocus sequence typing. *International Journal for Parasitology* 37: 149–160 (2007)

Mauricio, I. L., Yeo, M., Baghaei, M., Doto, D., Pratlong, F., Zemanová, E., Dedet, J. P., Lukeš, J., Miles, M. A.: Towards multilocus sequence typing of the *Leishmania donovani* complex: Resolving genotypes and haplotypes for five polymorphic metabolic enzymes (ASAT, GPI, NH1, NH2, PGD). *International Journal for Parasitology* 36: 757–769 (2006)

Zemanová, E., Jirků, M., Mauricio, I. L., Miles, M. A., Lukeš, J.: Genetic polymorphism within the *Leishmania donovani* complex: Correlation with geographic origin. *American Journal of Tropical Medicine and Hygiene* 70: 613–617 (2004)

Illustrative
abstract

Metamorphosis of holometabolous insects • Biology Centre

Metamorphosis of holometabolous insects such as beetles or butterflies is a marked change of form between juvenile and adult stages that enables the larva to efficiently utilize food sources and the flying adult to spread the species. Knowledge of metamorphosis is not only necessary for a general understanding of development, but also for effective control of insect pests. The entry to metamorphosis depends on the morphogenesis-promoting ecdysteroids and the antagonistically acting juvenile hormone (JH). The JH has been known to prevent metamorphosis since the work of

V. B. Wigglesworth (1934). However, the mechanism of the JH action has remained an enigma as neither a JH receptor nor its signaling pathway are known.

By using the red flour beetle *Tribolium castaneum*, we showed that a gene *Methoprene-tolerant (Met)*, originally uncovered as a mutation conferring resistance to JH in the fly *Drosophila*, mediates the anti-metamorphic JH effect. Loss of *Met* function renders the *Tribolium* insensitive to the JH and, unlike in *Drosophila*, it also causes the beetle larvae to metamorphose precociously. In response to the JH, *Met* controls metamorphosis by regulating expression of the Broad-Complex gene, which is required for the metamorphic changes. Our latest studies (Konopova and Jindra 2007, 2008) for the first time demonstrate the key role of *Met* in the regulation of insect metamorphosis by JH and thus support the disputed function of *Met* as a receptor or transducer of the JH signal.

Konopová, B., Jindra, M.: Juvenile hormone resistance gene Methoprene-tolerant controls entry into metamorphosis in the beetle *Tribolium castaneum*. *Proc. Natl. Acad. Sci. USA*, **104**: 10488–10493 (2007)

Konopová, B., Jindra, M.: Broad-Complex acts downstream of Met in juvenile hormone signaling to coordinate primitive holometabolism metamorphosis. *Development*, **135**: (in press) (2008)

The role of Archaea in processes of green house gases production and consumption in soil • Biology Centre

In the frame of our microbiological research of processes responsible for production and consumption of green house gases (GHG) in soil, we verified the hypothesis, that microflora of pasture soil under severe impact of outdoor cattle husbandry has been enriched by methanogenic Archaea. This group of microorganisms plays the key role in the production of methane, the important green house gas. We verified that methane emission increased in the soil enriched by those microorganisms. The phylogenetic analysis of *mcrA* gene encoding the key enzyme – methyl coenzyme M reductase confirmed as the Archaea source the microflora of the cattle intestinal tract.

Our recent research is focused not only on the soil Archaea in the role of green house gases producers but also of the GHG consumers. An important part of our research is also the archaeal role in a transformation of the soil nitrogen forms. The results of our research, which is managed in upland over wintering pasture, highlighted the importance of this ecosystem type for the GHG investigation. The meaning of our research is an elucidation of soil microflora role in processes responsible for production and consumption of green house gases in the chosen agroecosystem, which ought to bring other social benefits consisting in recommendations for an optimization of the management with respect to reduction of the GHG emission from the soil.

K. Radl, V. Gattinger, A. Chroňáková, A. Němcová, A. Čuhel, J. Šimek, M., Schloter, M., Elhottová, D.: Effects of cattle husbandry on abundance and activity of methanogenic archaea in upland soils. *Nature ISME J.*, **1**: 443–452 (2007).

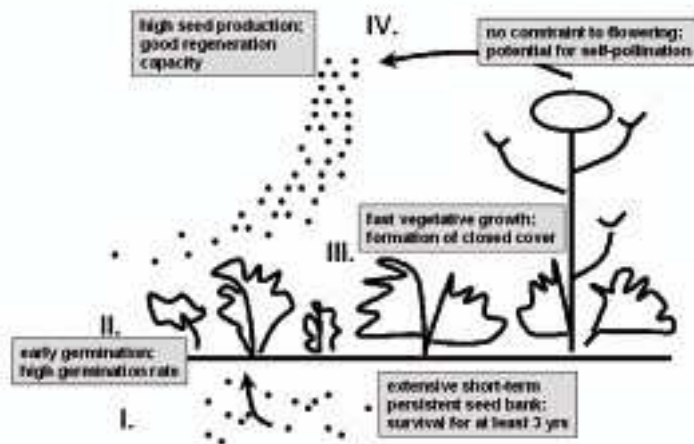
Invasion of giant hogweed (*Heracleum mantegazzianum*) in Europe • Institute of Botany

The giant hogweed (*Heracleum mantegazzianum*), native to the Caucasus, is a serious invasive species in Europe. Since 2002, various aspects of this species' biology, ecology, genetics, biogeography and management were addressed within the Giant Alien project of the 5th Framework Programme of EU. In 2007, the results were summarized in a monograph reviewing current knowledge of the invasion of this species in Europe (Pyšek *et al.* 2007). Three species of large hogweeds (*H. mantegazzianum*, *H. sosnowskyi*, *H. persicum*) invade Europe and their distribution throughout the continent reflects different germination requirements and seed bank characteristics; Central Europe is invaded by *Heracleum mantegazzianum*.

← Illustrative abstract

← Illustrative abstract

A high genetic variation was found in the invaded range, most likely due to repeated introductions of all three species to Europe (Jahodová *et al.*, *Diversity and Distributions* 2007). Genetic studies identified suitable markers for *Heracleum mantegazzianum* (Henry *et al.*, 2007). The invasive success of this species is determined by a combination of several traits, mostly related to reproduction: high fecundity, extremely high germination rate, short-term persistent seed bank, reproductive assurance through self-pollination, efficient dispersal and high regeneration ability; Obr_BU_1c_2); these traits are described, quantified and analysed in the monograph chapters (Pyšek *et al.*, 2007). A comparison of theoretical simulations of population dynamics with real data, obtained from aerial photographs, suggests that about 2.5% of the seed is subject to long-distance dispersal, which results in a dynamic spread and colonization of new sites (Nehrbass *et al.*, 2007). Because of extremely high regeneration of giant hogweed plants, control measures aimed at preventing it from seed production need to be based on appropriate timing. If conducted too early, plants regenerate, if too late, seeds ripe on cut umbels (Pyšek *et al.*, *Biological Invasions* 2007). The results are important for control and management of giant hogweed in Europe.



Invasion of giant hogweed (*Heracleum mantegazzianum*) in Europe.

Traits identified as contributing to the successful invasion by *H. mantegazzianum*, plotted on the scheme of the life cycle of a monocarpic plant: I - soil seed bank; II - stage of seedling recruitment; III - growth phase; IV - the terminal phase of seed production

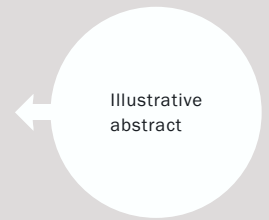
photo by archiv BÚ

Pyšek, P., Cock, M. J. W., Nentwig, W. & Ravn, H. P.: *Ecology and management of Giant Hogweed (Heracleum mantegazzianum)*. CAB International, Wallingford, UK, 331 pp. (2007); Jahodová, Š., Trybush, S., Pyšek, P., Wade, M., Karp, A.: Invasive species of *Heracleum* in Europe: an insight into genetic relationships and invasion history. *Diversity and Distributions* **13**:99-114 (2007); Pyšek, P., Krinke, L., Jarošík, V., Perglová, I., Pergl, J., Moravcová, L.: Timing and extent of tissue removal affect reproduction characteristics of an invasive species *Heracleum mantegazzianum*. *Biological Invasions* **9**:335-351 (2007); Nehrbass, N., Winkler, E., Müllerová, J., Pergl, J., Pyšek, P., Perglová, I.: A simulation model of plant invasion: long-distance dispersal determines the pattern of spread. *Biological Invasions* **9**:383-395 (2007); Henry, P., Provan, J., Goudet, J., Guisan, A., Jahodová, Š., Besnard, G.: A set of primers for plastid indels and nuclear microsatellites in the invasive plant *Heracleum mantegazzianum* (Apiaceae) and their transferability to *Heracleum sphondylium*. *Molecular Ecology Resources* **8**:161-1633 (2008); Jahodová, Š., Fröberg, L., Pyšek, P., Geltman, D., Trybush, S., Karp, A.: Taxonomy, identification, genetic relationships and distribution of large *Heracleum* species in Europe. In: Pyšek P. *et al.* (eds.), *Ecology and management of giant hogweed (Heracleum mantegazzianum)*, CAB International, Wallingford, UK, pp. 1-19 (2007); Pyšek, P., Müllerová, J., Jarošík, V.: Historical dynamics of *Heracleum mantegazzianum* invasion on regional and local scales. *Ibid.*, pp. 42-54; Perglová, I., Pergl, J., Pyšek, P.: Reproductive ecology of *Heracleum mantegazzianum*. *Ibid.*, pp. 55-73; Moravcová, L., Pyšek, P., Krinke, L., Pergl, J., Perglová, I., Thompson, K.: Seed germination, dispersal and seed bank in *Heracleum mantegazzianum*. *Ibid.*, pp. 74-91; Pyšek, P., Perglová, I., Krinke, L., Jarošík, V., Pergl, J., Moravcová, L.: Regeneration ability of *Heracleum mantegazzianum* and implication for control. *Ibid.*, pp. 112-125; Moravcová, L., Gudžinskas, Z., Pyšek, P., Pergl, J., Perglová, I.: Seed ecology of *Heracleum mantegazzianum* and *H. Sosnowskyi*, two invasive species with different distributions in Europe. *Ibid.*, pp. 157-169; Pyšek, P., Cock, M. J. W., Nentwig, W., Ravn, H. P.: Master of all traits: Can we successfully fight giant hogweed? *Ibid.*, pp. 297-312.

Co-evolution between brood parasite and their hosts • Institute of Vertebrate Biology

Interspecific brood parasitism in birds is a strong selective force affecting the life histories of many small passerines (hosts) in many respects. During the course of the co-evolutionary struggle between the common cuckoo and its hosts, much adaptation and counteradaptation has evolved and this scenario represents a suitable model for the study of the co-evolutionary processes. One of the crucial adaptations in the hosts is the discrimination and rejection of the parasitic egg from their nests. We tested this ability in selected model species: the blackcap and song thrush. Using a series of experiments, we found that the combination of UV and visible parts of the colour spectrum together with the specific signature of the egg shell of the parasitic egg plays a major role in the evolution of discrimination processes, as well as in the evolution of mimicry of the parasitic egg.

Further, we discovered experimentally that cuckoo hosts are highly consistent in their response towards the parasitic egg when parasitised repeatedly within one breeding attempt. In some hosts of avian brood parasites, several populations apparently escape parasitism, while others are parasitised. Therefore we investigated populations of the reed warbler across Europe. This was the first study focusing on patterns of the common-cuckoo-host interactions within a specific host species on a large scale. The results indicate that if the host density is below a specific threshold, cuckoo parasitism is absent regardless of the state of other potentially confounding variables. In the brood parasite we studied two adaptations, namely eviction and begging behaviour of the cuckoo chick. Even though eviction behaviour was described already by Aristotle (384–322 B. C.), we were the first to describe different parameters enhancing this evolutionary important behaviour since it eliminates the competition of the parasite chick with its nestmates. Another type of tactic which excludes the influence of nestling competition is begging behaviour. Apart from the typical begging call, characteristic for a variety of bird species, we discovered a special vocal display in the absence of hosts. This finding provides new insights into the host-parasite conflict and the evolution of signalling in birds.



The host (reed warbler) and a chick of the brood

photo by O. Mikulica, archiv ÚBO

- Honza, M., Polačiková, L., Procházka, P.: Ultraviolet and green parts of the colour spectrum affect egg rejection in the song thrush (*Turdus philomelos*). *Biological Journal of the Linnean Society* 92, **2**: 269–276 (2007)
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- Honza, M., Požgayová, M., Procházka, P., Tkadlec, E: Consistency in egg rejection behaviour: Response to repeated brood parasitism in the blackcap (*Sylvia atricapilla*). *Ethology* 113, **4**: 344–351 (2007)
- Honza, M., Vošlajerová, K., Moskat, C.: Eviction behaviour of the common cuckoo *Cuculus canorus* chicks. *Journal of Avian Biology* 38, **3**: 385–389 (2007)
- Šicha, V., Procházka, P., Honza, M.: Hopeless solicitation? Host-absent vocalization in the common cuckoo has no effect on feeding rate of reed warblers. *Journal of Ethology* 25, **2**:147–152 (2007)

7 • Section of Social and Economics Sciences

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

Development of Infrastructure for Science and Research; Historical Bibliography of Retrospective: History of Books and Libraries in Bohemia Lands to 1800 • Library

Economics Aspects of EU and EMU Entry • 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 system of law of the member states in the context of an Information Society • Institute of State and Law

1. Digital Library of the Czech Academy of Sciences • Library
2. Bibliography of the Works of J. A. Comenius Printed Before 1800 • Library
3. Credit markets and the propagation of monetary policy shocks • Economics Institute
4. Origin and concentration: corporate ownership, control and performance in firms after privatization • Economics Institute
5. When do female occupations pay more? • Economics Institute
6. Assertive toddler, self-efficacious adult: Child temperament predicts personality over forty years • Institute of Psychology
7. Genetics of language disorders: Clinical conditions, phenotypes, and genes • Institute of Psychology
8. Studying dialogical selves dialogically: Multiple-horizon analysis of critical moments in the working life of theatre actors in two cultures • Institute of Psychology
9. Voters and Elections 2006 • Institute of Sociology
10. 2004 European Parliament Elections • Institute of Sociology
11. Live-in children. Extra-marital fertility in the CR • Institute of Sociology
12. The protection of patient's rights in the health care sector • Institute of State and Law
13. History of thought on the law • Institute of State and Law
14. "Brussels II bis": Its Impact and Application in the Czech Republic • Institute of State and Law

Research objectives

List of studies

Digital Library of the Czech Academy of Sciences • Library

Digital Library of the Czech Academy of Sciences: access to electronic forms of scientific publications produced by the ASCR and its predecessors to scholars and scientific community.

Lhoták, M.: *Das Digitalisierungszentrum und die Digitale Bibliothek an der Akademie der Wissenschaften*, Prag. *Digitalisieren – Internationale Projekte in Bibliotheken und Archiven*. Berlin: BibSpider Info-Networking für Bibliotheken, 2007. pp. 92–101. ISBN 978-3-936960-17-4

Credit markets and the propagation of monetary policy shocks • Economics Institute

This paper analyzes the propagation of monetary policy shocks through the creation of credit in an economy. Contrary to previous research, this analysis is not based on adjustment costs in response to monetary shocks. Rather, it is the occupational choice of economic agents coupled with the differences in access to credit for entrepreneurs of diverse productivity, which drives the result.

Boháček, R., Mendizábal, H. R.: Credit markets and the propagation of monetary policy shocks. *Journal of Money Credit and Banking* 39, 6: 1429–1455 (2007)

Assertive toddler, self-efficacious adult: Child temperament predicts personality over forty years • Institute of Psychology

The study deals with the prediction of adult personality from behaviors observed in the nursing and toddler stages. The sample consisted of 83 participants (35 men and 48 women aged from 38 to 44 years) who had taken part in the longitudinal research of children and agreed to participate in the follow-up study as adults. For a description of child behavior the set of 34 rating scales was used during each testing session. Factor analysis with mean scores of rating scales for the age of 12–30 months yielded three factors: positive affectivity, negative affectivity, and disinhibition. Only child disinhibition proved to be a significant predictor of adult personality characteristics; disinhibition is connected to extraversion and generalized self-efficacy. We suggest that a modest connection between child temperament and adult personality characteristics is due to the fact that personality formation is largely influenced by social factors. The finding that the child disinhibition holds – as the only one – a certain connection with personality traits in adulthood we explain by the fact that this dimension is most purely a temperamental trait, activity being its substantial component.

Blatný, M., Jelínek, M., Osecká T.: Assertive toddler, self-efficacious adult: Child temperament predicts personality over forty years. *Personality and Individual Differences* 43, 8: 2127–2136 (2007).

Lebeda, T., L. Linek, P. Lyons, K. Vlachová: Voters and Elections 2006. Prague • Institute of Sociology

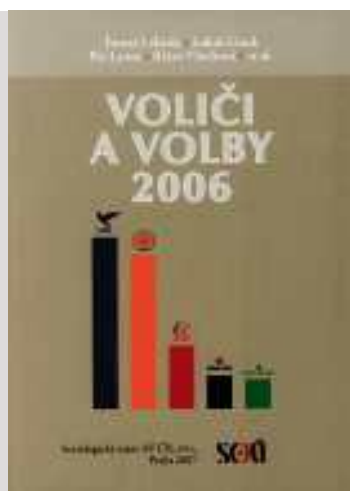
The publication takes a detailed look at the electoral response in the 2006 elections to the Chamber of Deputies. The authors examined which groups of citizens turned out for the elections and why they chose the parties they did. They seek motivational sources and causes of individual electoral decisions. The authorial team built its analyses primarily on unique academic research while using theoretical and methodological tools of contemporary political sciences and sociology. The book offers a view of electoral decisions from the perspective of the role of social class, party identification, election topics and the personalities of party chairmen. It deals with the specificities of undecided voters; maps the impact of the effects of the electoral system, and analyses the role of pre-election voter preference surveys. Some of the basic findings include the small significance of class characteristics in explaining electoral choices and a greater role of the evaluation of chairmen of individual parties and topic-based voting.

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Lebeda, T., L. Linek, P. Lyons, K. Vlachová. *Voliči a volby 2006* [Voters and Elections 2006].

Book published by the Institute of Sociology ASCR

photo by archiv SOÚ

Illustrative
abstract

Lebeda, T., Linek, L., Lyons, P., Vlachová, K.: *Voliči a volby 2006* [Voters and Elections 2006]. Praha, Sociologický ústav AV ČR, v. v. i., 2007, 234 pp.

Doležal, T. – Doležal, A.: The protection of patients' rights in the health care sector • Institute of State and Law

This is the first comprehensive elaboration of patients' rights in the Czech Republic. The book deals with differing patient positions, from an ill person, dependent person to client or consumer, and presents a complex interpretation of private legal protection and public regulation including jurisdiction.

Doležal, T., Doležal, A.: *Ochrana práv pacienta ve zdravotnictví*. Praha, Linde 2007, 144 pp.

Research
objectives

8 • Section of Historical Sciences

The section consists of six institutes whose research objectives are as follows:

Prehistoric and early historical development in Central Europe in view of the latest results of archaeological research in Moravia and Silesia • Institute of Archaeology, Brno

The archaeological potential of Bohemia: theoretical research, methodology and information systems, care for the national cultural heritage • Institute of Archaeology, Prague

The Search for Identity: intellectual and political conceptions of the recent Czech society 1848–1948 • Masaryk Institute and Archives

Research into and protection of the starting place or font for 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 and Archives

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

Research into the History of Czech Visual Arts in terms of integrating the European Community

- Institute of Art History

Analysis of Czechoslovak/Czech contemporary history and history of science

- Institute of Contemporary History

1. The Barbarians in the period of turnover. Contributions on the change of culture and identity in the period of the migration of nations • Institute of Archaeology, Brno
2. On modern human penetration to Northern Eurasia: The multiple advances hypothesis
• Institute of Archaeology, Brno
3. Borotice. Tumular burying ground from Bronze Age • Institute of Archaeology, Brno
4. Archaeology of Prehistoric Bohemia (4 volumes) • Institute of Archaeology, Prague
5. Saint Prokop. From origins of the Czech state and Church • Institute of Archaeology, Prague
6. Castle – Bailey – Suburbia. On the problems of dependency areas of Early Mediaeval Strongholds
• Institute of Archaeology, Prague
7. The German (Charles) University from München Treaty to the End of WWII
• Masaryk Institute and Archives
8. T. G. Masaryk, Road of Democracy II • Masaryk Institute and Archives
9. Correspondence of Tadeusz Kowalski with Jan Rypka and Bedřich Hrozný
• Masaryk Institute and Archives
10. The publication contains political manifestos of the Czech and Slovak agrarian movement from its creation to its termination in 1938 • Institute of History
11. Historical Town Atlas of the Czech Republic Vol. No. 17 – Kladno • Institute of History
12. Great History of Czech Crown Lands, Vol. XVb (period 1941–1945) • Institute of History
13. The History of Czech Visual Arts VII/1–2. Praha, Academia 2007 • Institute of Art History
14. Emil Filla. The monograph of Czech painter Emil Filla • Institute of Art History
15. Baroque Ceiling Painting in Central Europe • Institute of Art History
16. Charter 77: Documents, 1977–89 • Institute of Contemporary History
17. Charter 77: From the Assertion of Human Rights to a Democratic Revolution, 1977–89
• Institute of Contemporary History
18. Social changes in the period of the socialistic experiment. Social history in the years 1945–69
• Institute of Contemporary History

The Barbarians in the period of turnover. Contributions on the change of culture and identity in the period of the migration of nations • Institute of Archaeology, Brno

The book is a collective monograph of a wider scientific team and deals with selected aspects of the research of ethnic identity of populations within continental Europe in the period from the 4th to the 6th centuries A. D., from the fall of the Roman Empire to the emergence of the Langobard tribes in the region of the middle Danube. On the basis of different methodological perspectives many new thoughts come into view. The question of informational value of historical and archaeological sources is also discussed here. However, the greatest contribution is formed by a new perspective on the matter of the origination and development of early medieval tribal formations – gentes (a clan or family connection) – and their culture that is determined not only by an ethnic point of view, but first of all by a social point of view. Individual thematic blocks are dedicated to a historical background and context of a given period, to cultural and power changes in individual regions and of ethnic groups, to period costumes and luxury articles as external symbols of identity and to a more detailed knowledge of the historical development of a settlement in the region of north Danube (*i.e.*, Moravia, Slovakia). Altogether 16 researchers from Czech Republic, France, Hungary, Germany, Poland, Austria, Russia and Slovakia participated as authors.

List of studies

Illustrative abstract



Silver-sheet brooch from female princely grave in Smolín (South Moravia). Such brooches are generally datable to mid of the 5th century AD and are symptomatic for East-Germanic or Gothic costume

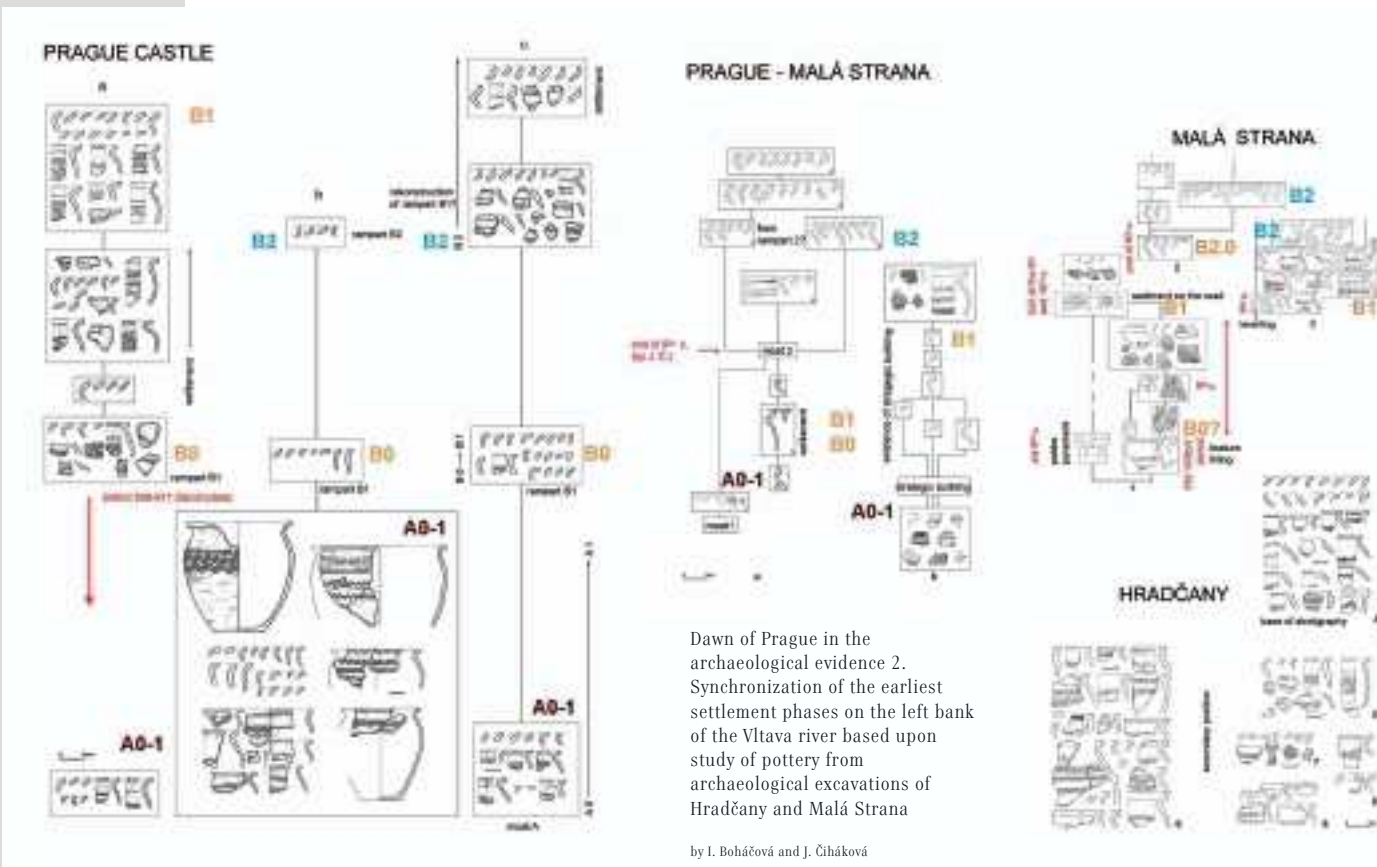
photo by archiv ARÚB



Tejral, J. (Hrsg.): *Barbaren im Wandel. Beiträge zur Kultur- und Identitätsumbildung in der Völkerwanderungszeit*. Brno, Archeologický ústav AV ČR, Brno, v. v. i. 2007, 360 pp.

Archaeology of Prehistoric Bohemia (4 volumes) • Institute of Archaeology, Prague

The publication in eight volumes summarizes recent archaeological research results concerning prehistoric archaeology of Bohemia from the Palaeolithic up to the Migration period. Thus far, it



Dawn of Prague in the archaeological evidence 2. Synchronization of the earliest settlement phases on the left bank of the Vltava river based upon study of pottery from archaeological excavations of Hradčany and Malá Strana

by I. Boháčová and J. Čiháková

represents the most extensive compendium of its kind in Czech archaeology. This compendium is addressed not only to professional archaeologists and other specialists, students and heritage managers, but all other interested readers. The aim was to show the range of possible approaches to the study of Bohemian prehistory and to introduce a new review of the archaeological data, their interpretation and theoretical models to be exploited by the further research. Four volumes were published in 2007: 1. *Prehistoric world and the methods of its recognition*; 2. *Palaeolithic and Mesolithic*; 3. *Neolithic*; 7. *La Tène Period*.

Jiráň, L., Venclová, N. a kol. 2007: *Archeologie pravěkých Čech. 1. Pravěký svět a jeho poznání; 2. Paleolit a mezolit; 3. Neolit; 7. Doba laténská*. Praha Archeologický ústav AV ČR, Praha, v. v. i.

The German (Charles) University from München Treaty to the End of WWII • Masaryk Institute and Archives

A crucial work in German follows a similar work in Czech by the same author, a specialist on the German University in Prague and other German scholarly institutions in the Czech lands. The work is significantly enriched by essential supplements, for example, by lists of teachers and of new established institutes at the university, by lists of those who were expelled from the university for racial reasons, and by lists of remaining professors and docents in 1940–1945, including basic biographical data. The work is primarily focused on issues related to the coming of Nazism.

The author provides information on changes of the professors' group during the World War II, and related influences. She compares the situation with the development at universities in the German Reich after 1933. She is interested in changes of the nature of research and lectures, underscores their orientation on Eastern studies and on racial research. She follows the behaviour of university functionaries and professors, tries to grasp their features, especially of convicted Nazis from earlier times, activists, who willingly adjusted to Nazi times as well as of opponents of the new regime, and those who accepted new rules as a necessary evil of times. The author closes her testimony by claiming that the development of the Prague university in its major aspects during the World War II differed minimally from the situation in the Reich, although its location in Czech environment, related circumstances under which all negative changes took place, contribute to the peculiar character of the overall situation.

Alena Míšková. *Die Deutsche (Karls-) Universität vom Münchener Abkommen bis zum Ende des Zweiten Weltkrieges*. Praha, Karolinum 2007, 346 pp. ISBN 978-80-246-1208-9

Great History of Czech Crown Lands (period 1941-1945) • Institute of History

The first part of the 15th volume covers the 1938–1941 period, mainly the six-month intermezzo of the Second Republic, enforcement of the occupation and protectorate regime in the Protectorate of Bohemia and Moravia, until autumn 1941. Its final chapter attempts to provide a comprehensive view of the role of Czech cultural and societal life and the role of science and school system during the entire period of Nazi occupation, 1939–1945. The second part of the 15th volume covers the period from autumn 1941 till May 1945 and closes with the arrival of a new Košice government in Prague. The book analyses and synthesises the political, economic and cultural evolution of Czech society, the occupation and protectorate policy, activities of the Czechoslovak exile and organising Czech domestic and the Czechoslovak foreign resistance movement in 1938–1945.

Gebhart, J., Kukulík, J.: *Velké dějiny země Koruny české, díl XVb (období let 1941–1945)*. Praha-Litomyšl, Paseka 2007, 743 pp. (sv. XVa vydán 2006)

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abstract

The History of Czech Visual Art • Institute of Art History

The last volume of *The History of Czech Visual Art*, published in two volumes, is the culmination of a huge project which started in the 1980s with the volume on medieval art. The last volume shows the development of Modern Art in the Czech lands from Expo1958 in Brussels, followed by art in the 1960s, when Czech art profited from the political “thaw” before 1968. Chapters on the two decades of “normalization” after 1968 followed as well as the history of art in the radically changed situation after 1989, which is described in the book through the present time. Numerous authors from the Institute of Art History, from universities and other institutions deal with architecture, painting, sculpture and the applied arts as well. Special attention is focused on the rise of new media: conceptual art, body art, land art, video art, etc. There are chapters focusing on Czech artists in exile as well.



The History (of Czech Visual Art), VI.
Zdeněk Sýkora, an eight-color structure, 1969

photo by archiv ÚDU

Švácha, R., Platovská, M.: *Dějiny českého výtvarného umění VI/1–2*. Praha, Academia 2007.

Illustrative
abstract

Charter 77: Documents, 1977–89 • Institute of Contemporary History

This is the first broadly commented edition of Charter 77 documents (1977–1989), complete with a historical study as well as other documents attached. The widespread introduction explains what the Charter 77 documents were, how they have been cast and edited, where they came from, as well as to the principles according to which they have been reprinted. Three chapters are devoted to the explanation of Charter 77, specifically the document as both a Czechoslovak and an international phenomenon by Vilém Prečan, a hitherto unknown study by Václav Havel dating to 1986 which the editors named “The Ten Thesis of the Charter”, plus an essay by Jacques Rupnik titled “The Charter 77 and the Birth of the European Public Space”. The full wording of Charter 77 Documents No. D1–D598 (*i.e.*, 598 documents in all), signed by Charter 77 spokesmen have been reprinted in Volumes I and II of the edition, accompanied by a wide annotation and annex (*i.e.*, footnotes) apparatus as well as with the data on which the individual documents came into existence, on their further fates or on where and how these were edited and/or commented on at the time of their origin: within the domestic samizdat community, in the exile press, or on broadcast stations abroad.

The footnotes provide for a quantity of further source materials as well as manifold pieces of information on the life of the Charter 77, too, as well as on its communication with partners abroad, on the persecution of civic activities, the independent literature and independent art on behalf of repressive party bodies. Notes are quoted referring to articles, essays and studies written in consequence with the individual Charter 77 documents, published mostly individually through samizdat or its periodicals and miscellanies, wherefrom these were transferred to the exile press and to periodicals in foreign languages. Some of these have been included in Volume III of this edition. The third volume, Annexes, contains more than 90 texts, most of them hitherto unpublished. These have been sorted out into several chapters that aim to document and to cast light on the most important circumstances of the Charter 77 origins within both its domestic and international consequences.

For the first time, the first three (rough) drafts of the Charter 77 Declaration have been published here that testify to its development from the original concept of the Committee for Human Rights up to the concept of an open community that presented itself as the Charter 77 at the beginning of January, 1977. Another annex is published which includes the reflections and documents by Jan Patočka as a witness during the prosecution led by the State Security against Charter 77. These documents testify for Patočka's crystal-clear, unbinding and thoroughly resilient approaches. This volume contains also the internal directives, news and pieces of information supplied by CPCz bodies, security bodies, the jurisdictional apparatus or by the Ministry of Foreign Affairs that cast the light on how the communist leaders responded to the origins of Charter 77, on its activities, as well as the reverberations on its presentation abroad.

Prečan, V., Císařovská, B. (eds.): *Charta 77: Dokumenty 1977–1989*. Praha: ÚSD AV ČR, v. v. i. 2007, 1804 pp.

9 • Section of Humanities and Philology

The section incorporates six institutes with the following research objectives:

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

- Institute of Ethnology

Transdisciplinary research into selected key areas of philosophy and related disciplines, in particular, logic, classical and medieval studies, and the theory of science. Editions and publications of corresponding texts and electronic databases

- Institute of Philosophy

Research on the religions, history, languages, literatures, cultures and civilizations of the countries of Asia and Africa

- Oriental Institute

Scientific research and editorial output in the field of comparative Slavonic linguistics, Palaeoslavonic and Byzantine studies, comparative history of Slavonic literatures and the history of Slavonic studies in Czech Lands

- Institute of Slavonic Studies

Research into Czech literature from earliest times to the present, reflecting its historical, theoretical, interpretational and documentary aspects

- Institute of the Czech Literature

Integrated Research of the Czech language and its variants

- Institute of the Czech Language

Creation of a lexical database of the Czech language of the beginning of the 21st century

- Institute of the Czech Language



List of studies

1. Folk Culture. Ethnographic Encyclopedia of Bohemia, Moravia and Silesia • Institute of Ethnology
2. Ethnological atlas of Bohemia, Moravia and Silesia V. Jewish population in Bohemia in the years 1792 to 1794 • Institute of Ethnology
3. Vítězslav Novák and symbolism • Institute of Ethnology
4. Sociological Theory: A Story of Crisis and Fragmentation – A Project of Renewal and Reconstruction • Institute of Philosophy
5. Charles University in the Middle Ages • Centre of Medieval Studies
6. The Prague Belvedere and the Transalpine Renaissance • Department for Classical Studies of the Institute of Philosophy
7. Fichte's Theory of Subjectivity • Institute of Philosophy
8. Reason – Criticism – Openness. The Living Legacy of K. R. Popper • Institute of Philosophy
9. From Yishuv to Israel: The Formation of Israeli political elites, 1919–1949 • Oriental Institute
10. Pharmacology of Classical Chinese Medicine • Oriental Institute
11. Islam in the heart of Europe • Oriental Institute
12. Forty Gospel Homilies by Gregory the Great in Czech Church Slavonic Translation • Institute of Slavonic Studies
13. 20th Century Russian Poetry. Perspectives on Reception, Genealogy and Structural Analysis • Institute of Slavonic Studies
14. Silesia as a Point of Intersection of Different Cultures • Institute of Slavonic Studies
15. Pavel Janoušek and coll.: History of Czech literature 1945–1989; Volume I (1945–1948) and II (1948–1958) • Institute of the Czech Literature
16. Lexicon of Czech literature. The 4th volume (S–Ž and Supplements to LČL 1–3, in 2 volumes) • Institute of the Czech Literature
17. The Czech Electronic Library – Poetry of the 19th Century and beginning of the 20th Century, Internet Application • Institute of the Czech Literature
18. The Possibilities and Limits of Czech Grammar • Institute of the Czech Language
19. The Dictionary of Minor Place-Names in Bohemia III • Institute of the Czech Language
20. Czech in Intergenerational Dialogue • Institute of the Czech Language
21. Creation of a lexical database of the Czech language at the beginning of the 21st century • Institute of the Czech Language

Illustrative abstract

Folk Culture. Ethnographic Encyclopedia of Bohemia, Moravia and Silesia • Institute of Ethnology

This is the first and foremost work of an encyclopaedic nature in the field of the traditional culture in Bohemia, Moravia and Silesia. It focuses on the theory and history of the field, on the problems of ethnographic regions, of folk fine arts, on spiritual and material folk culture, on folklore and folklore studies. The entries are as a rule in the form of longer monographs and contain references to other literature. Comprehensive subjects, nominal and geographical indexes enable a more thorough orientation and deeper search. A part of the publication is 1,200 pictorial and sheet-music supplements. The work was compiled by a team of important specialists in the areas of ethnology, cultural anthropology, ethnography, history, cultural history, art history, literary history, museology and other related disciplines. The body of editors consisted of the employees of the Institute of Ethnology (IE) of the ASCR and of the Department of European Ethnology of the Faculty of Arts of Masaryk University, Brno, the completed work having been implemented by the technical editors of the IE of the ASCR. The encyclopaedia was issued in three volumes by the publisher Mladá fronta in 2007.

Brouček, S., Jeřábek, R. eds. *Lidová kultura. Národopisná encyklopedie Čech, Moravy a Slezska*. Praha, Mladá fronta 2007, věcná část 1298 pp., biografická část 278 s.



Folk Culture. Ethnographic Encyclopaedia of Bohemia, Moravia and Silesia. The first and foremost work of an encyclopaedic nature in the field of the traditional culture in Bohemia, Moravia and Silesia

photo by archiv EÚ

Sociological Theory: A Story of Crisis and Fragmentation – A Project of Renewal and Reconstruction

• Institute of Philosophy

The book attempts to address the question: Is a sociological account of action possible? It concentrates both on a relatively specific selection of authors previously attempting to solve the sociological problem of action and a relatively specific context of a theory of construction. First discussed is a present feeling of an impossibility of a general sociological theory. Then, the discussion moves to an analysis of the concept of action, which is thought to be one of the most contested categories in sociological theory. Historical analysis takes Weber's theories as its point of departure. Most attention is paid to the approach developed by Talcott Parsons, suggesting that theoretical development consists in transformation of categories. The author also discusses the multidimensional theoretical synthesis of Jeffrey C. Alexander, the theory of social systems of Niklas Luhmann, the theory of communicative action of Jürgen Habermas, and the structuration theory of Anthony Giddens, whose aim is to interconnect both the perspective of the systems analysis and the perspective of the action paradigm. As a conclusion it demonstrates that a reconstructive project of a general theory of action is the best and most rewarding way to address the problem of action.

Balon, J.: *Sociologická teorie: Příběh krize a fragmentace – projekt obnovy a rekonstrukce*. Praha, Slon 2007, 165 pp.

The Prague Belvedere and the Transalpine Renaissance

• Institute of Philosophy, Department for Classical Studies

The Prague Belvedere was the biggest architectural project of Czech King and Holy Roman Emperor Ferdinand I (1503–1564). This building is exceptional in the context of European art history, as its architecture is one of the first echoes of the Italian Renaissance in transalpine Europe. The decoration includes over one hundred figure reliefs and as many decorative ones, including an extraordinarily quality frieze. The book analyses the architecture and sculptural decoration of the Prague Belvedere, its aim is to answer the question what Ferdinand wanted to say to Prague and to the world through this building, what he wanted it to reveal to future generations about him and his time.

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Reproduction of the Book from J. Bažant: *The Prague Belvedere and the Transalpine Renaissance*

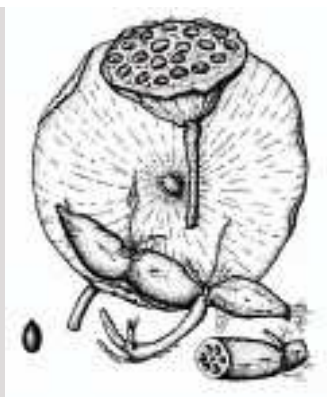
photo by Filozofický ústav



Bažant, J.: *Pražský Belvedér a severská renesance*. Praha, Academia 2007, 382 pp.

Pharmacology of Classical Chinese Medicine • Oriental Institute

The aim of this project is a many-sided and systematic elaboration of basic theory of the traditional Chinese pharmacology which has been so far only incompletely described in specialized literature in our country. For the first time in this country it draws directly and solely on original Chinese sources and consequently introduces much hitherto unpublished knowledge. By systematic classification and synthesis of findings from these sources, it treats completely and in detail the whole system of fundamentals of the traditional Chinese pharmacology, and so provides our specialist with a comprehensive sum of information which would otherwise be available only to those familiar with the Chinese language. The results of this project will be directly applicable in practice, since they can be used as a textbook or also as a basis for study aimed at deepening the understanding of practical methods of Chinese medicine which are all rooted in its basic theories. The project has been published in one volume (2007), including detailed analysis of traditional characteristics of more than 400 of the most important drugs, approximately 1000 quotations from classical works and about 400 illustrations and 400 colour photographs.



Sprouts of the lotus seed (Blue lotus – *Nelumbo nucifera*). They are used as medicine for fever, various types of bleeding, at present day also against headache and unease caused by high blood pressure. The first notices of its usage date from 10th century

Drawings of certain parts of the Blue lotus as a medicinal plant. Leaves, seeds, thalamus as well as several other parts are also used for medicinal purposes photo by Archives of Oriental Institute



Ando, V.: *Farmakologie klasické čínské medicíny*. Hradec Králové, Svítání 2007, 1456 pp.

Forty Gospel Homilies by Gregory the Great in Czech Church Slavonic Translation • Institute of Slavonic Studies

This Church Slavonic translation of the Latin homiletic work by Pope Gregory the Great *XL Homiliarum in Evangelia* was produced in the eleventh century at the Benedictine monastery on the Sázava in

Central Bohemia, and thanks to the cultural, dynastic and monasterial relations between Přemyslid Bohemia and Russia it was preserved even after the demise of Slavonic liturgy in Bohemia. Researchers and other cultural workers now have at their disposal the *editio princeps* of this historic document, which due to its large size has been divided into two volumes. This is the largest early medieval document ever from Přemyslid Bohemia until 11th century. The Cyrillic text of Slavonic origin, the Latin source, the textual critical apparatus from several other manuscripts and the important auxiliary aids for the critical edition (the document has been preserved in a codicologically tangled state) are supplemented by Czech, Latin, English and Russian explanations and a full bibliography. This monumental work has been published both for specialists and (thanks to its aids) for students and other interested readers.

Konzal, V., Čajka, F. (ed.): *Čtyřicet homilií Řehoře Velikého na evangelia v českocírkevněslovanském překladu*. Díl 2. Praha, Slovanský ústav AV ČR 2006, 800 pp.

Pavel Janoušek and coll.: History of Czech literature 1945–1989; Volume I (1945–1948) and II (1948–1958)
• Institute of the Czech Literature

This history of Czech literature 1945–1989 presents a wide-ranging project mapping the fate of Czech literature during the Communist era. It follows the traditional division of literature into poetry, prose and drama; it is written in the form of a literary-historical overview. It focuses on recording the whole range of the period's production, thus not only artistic belles-lettres for adults, but also factographic literature, popular and literature for children and youth. At the same time it emphasises the artistic value of individual works and their ability to speak to today's reader. With regard to the conditions in which Czech literature of the second half of the 20th century emerged and was received, the authors of the history considered it necessary to devote significant attention to the problems of literary life and its cultural and political context as well. In contrast with other handbooks of literary history, an uncommon amount of space is devoted in this volume to the secondary life of literature in the media, in film, radio and television.

History of Czech literature 1945-1989 aspires to become the leading literary-historical text for the given period and a point of departure for further, more detailed study.

Janoušek, P. a kol.: *Dějiny české literatury 1945–1989; Díl I. (1945–1948) a II. (1948–1958)*, Academia, Praha 2007; Díl III. (1958–1969) a IV. (1969–1989) (will be published shortly). Editor in chief: Pavel Janoušek. Editors: Petr Čornej, Blahoslav Dokoupil, Pavel Janáček, Vladimír Křivánek, Michal Jareš, Jiřina Táborská. Objective and language editor: Alena Fialová. Authors: Kateřina Bláhová, Přemysl Blažíček, Věra Brožová, Jan Černý, Petr Čornej, Radka Denemarková, Blahoslav Dokoupil, Alena Fialová, Eva Formánková, Blanka Hemelíková, Petr Hruška, Pavel Janáček, Pavel Janoušek, Michal Jareš, David Kroča, Vladimír Křivánek, Tomáš Kubíček, Marie Langerová, Petr Lyčka, Lubomír Machala, Martin Machovec, Petr Mareš, Jaroslav Med, Vladimír Papoušek, Martin Pilař, Karel Piorecký, Michal Příbáň, Alena Příbáňová, Richard Svoboda, Petr Šámal, Petr Šisler, Alena Štěrbová, Milena Šubrtová, Jiřina Táborská, Dušan Tomášek, Svatava Urbanová, Libor Vodička, Milena Vojtková, Aleš Zach

Czech in Intergenerational Dialogue • Institute of the Czech Language

The publication of this book is a result of research over many years which focused on the specifics of the speech of the members of the oldest generations of the users of Czech. In the book, the members of the research team (predominantly from the Institute of the Czech Language) present interpretations of an extensive collection of narrative interviews and intergenerational dialogues, in which the oldest speakers recount their reminiscences to their younger partners, answer their questions, explain to them obscure expressions.

The authors focused on how the narratives were conveyed (*e.g.*, the proportion of the epic elements and those purely enumerating facts or the manner of reproducing the speech of other people); it covers the

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← Illustrative abstract

temporal dimension of the narration (abundance of temporal expressions, comparison of the past with the present), observes the specifics of an asymmetric dialogue (mutual consideration of the partners, ‘prompting’, etc.). They capture the vocabulary of old narrators, their speaking rate, some pronunciation and prosodic phenomena, syntactic construction of oral expression (*e.g.*, frequent repetition), they analyse common Czech, the proportion of standard and colloquial expressions, expressional stereotypes related to a petrified set of attitudes, values, to generational ethics and lifestyle, and finally they reflect some handicaps linked with the age of the speakers, such as problems with memory.

Apart from narrative interviews, other sources of data were also used complementarily (other types of interviews, written retrospective narratives, questionnaires oriented on generational differences in vocabulary). Methodological inspirations of the entire research include narratology as well as conversation analysis, sociolinguistics as well as ‘gerontological linguistics’, phonetics, grammar as well as stylistics, textual linguistics and discourse analysis. The interpretation of communicational and linguistic phenomena has thus given rise to a portrait of the fate of the generation which lived its life in the 20th century and at the same time into the fates of the Czech language in that period.



Lidové noviny – a poster for the course *Čeština v práci* [Czech at Work]. Which Czech is spoken where (Dialects in the CR – a map)

photo by archiv ÚJČ

Hoffmannová, J., Müllerová, O. (eds.): *Čeština v dialogu generací*. Praha, Academia 2007, 271 pp. ISBN 978-80-200-1549-5

The Establishment of the ASCR for infrastructure of the research and development

The structure of the Academy of Sciences of the Czech Republic is incorporated as *the Centre of Administration and Operations* with the following research objectives:

Research objective

Selected activities

Implementation of research and development infrastructure in the ASCR, a prerequisite of qualitative progress of the ASCR disciplines

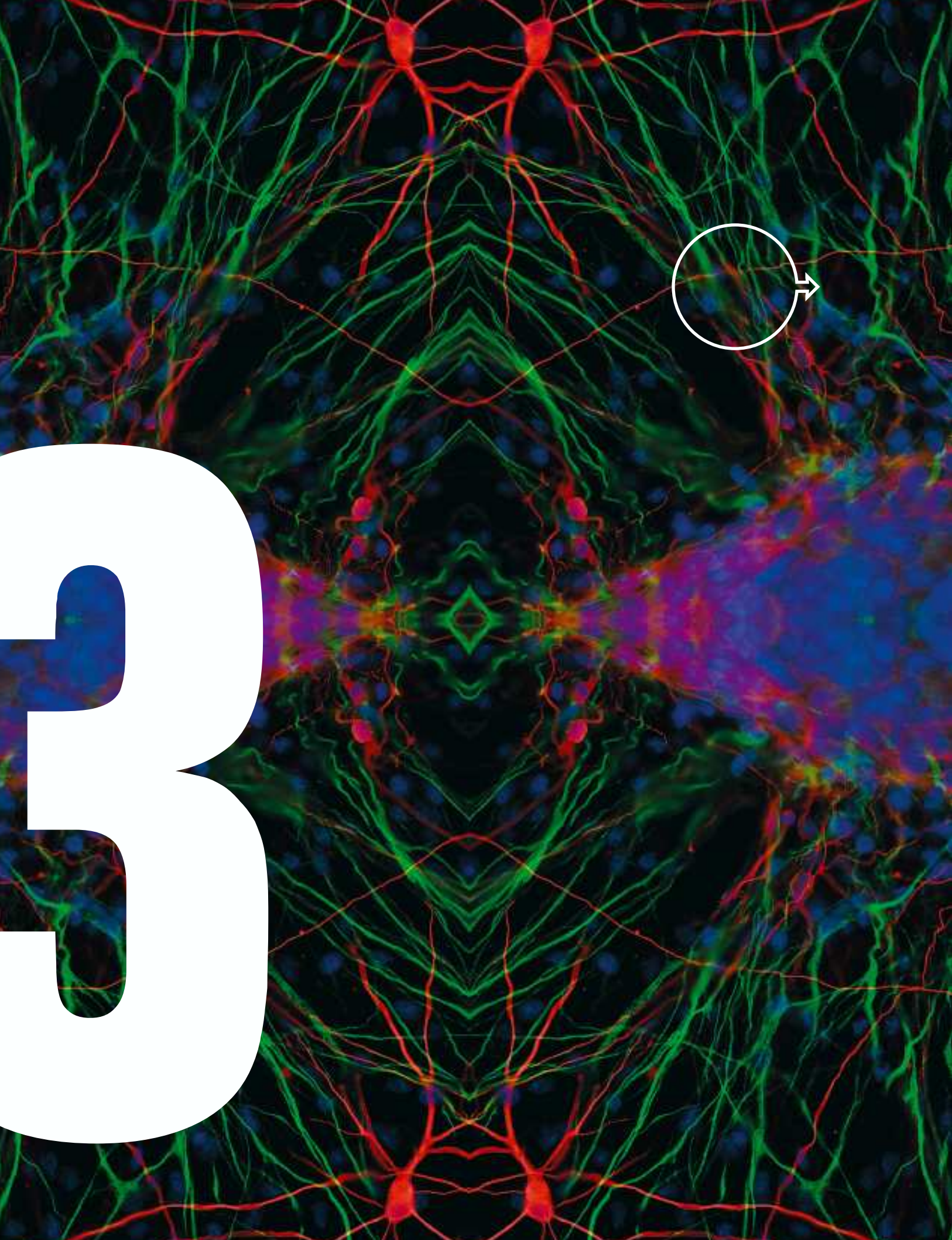
Publishing scientific and technical literature, organizing conferences, workshops, professional seminars and exhibitions, marketing and promotional activities and other works related to research work infrastructure.

Besides that, ASCR's representation in the CESNET and Pasnet associations has been ensured. Building and administration of the ASCR computer network as its basic communication infrastructure was provided. The conference centre of ASCR – Liblice Chateau was connected to the Pasnet, including the installation of a security gate. The EduRoam system was put into operation in the ASCR building. The Institute of Information Theory and Automation has taken over the administration and development of an all-academic (academy-wide) economic information system. Over the period of a year, the system was extended by a Verso system upgrade to provide economic information reporting.

The full wording of all shown annotations of scientific work results and their applications as well as the entire *Annual Report of the ASCR* are available in electronic form on the ASCR server <http://www.cas.cz>. The final text of the Annual Report on ASCR activities will be complete with pictures.

A detailed survey of the publication activities of ASCR institutes and staff in 2007 can be found at <http://www.lib.cas.cz> in the ASEP database.

3



3

Cooperation with Universities, Graduate and Post-Graduate Studies

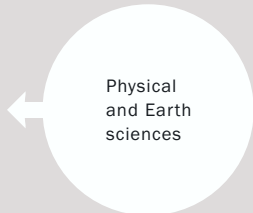
One of the goals of the Academy of Sciences of the Czech Republic (ASCR) is developing scientific training and participation in university bachelor or master programmes and particularly in Doctoral Study Programmes (DSP), with joint accreditation with universities. Under the authority of the Ministry of Education, Youth and Sports of the Czech Republic, the current accredited study programmes are extended and new ones are established every year. For a summary of the accredited DSPs launched by the ASCR in cooperation with universities, see the ASCR website. Several parameters guide the cooperation between ASCR and universities in the area of education. In 2007, 2154 DSP students were educated in ASCR institutions in full-time, combined or extramural studies. During the previous year, 431 DSP-students were admitted. This is an increase compared with previous years in the number of DSP-students whose tutors are from ASCR institutes, suggesting increased interest in this kind of study carried out at ASCR institutes. The studies were completed by and the degrees were given to 256 students (see Table 1). Moreover, foreign students who are motivated to work also attend our institutes; the number of such students educated in ASCR institutions was 289 last year.

Continually increasing numbers of lessons provided by ASCR lecturers at universities and term cycles of lectures, tutorials and seminars lead by ASCR employees at universities show evidence of the cooperation between the institutes (see Table 1).

The universities and ASCR institutes jointly took part in solving 845 research projects and grants having been or being supported by the Czech Science Foundation and the Grant Agency of ASCR.

The common goals of cooperation between universities and the ASCR to intensify the effectiveness of science, research and education of university and ASCR students are formally guaranteed by general contracts and agreements on mutual cooperation (with 22 agreements on cooperation at present). Moreover, the cooperation is carried out by 53 joined research centres. The cooperation between ASCR institutes in research centres and centres of basic research (a programme of the Ministry of Education, Youth and Sports), with their current number of 59, also contributed to the results achieved. The joint research activities resulted, among other things, in the following significant outcomes:

In **physical and Earth sciences** the *Institute of Physics* with the Faculty of Mathematics and Physics of Charles University in Prague, submitted a patent application in anisotropy of ferromagnetic semiconductor micro-components. The cooperation with the Faculty of Medicine of Charles University resulted in a common project dealing with finding out a significant effect of atomic end points and microscopic roughness of nanocrystalline



Physical
and Earth
sciences



Representatives of ASCR and Charles University in Prague signing the Frame Agreement on co-operation in the execution of doctoral studies and Agreement on the association of ASCR with Charles University on March 13, 2007 at Villa Lanna

photo by M. Hužvárová, archiv SSC

diamond layers on the adhesion and proliferation of osteocytes. The results achieved are promising for the application of bone implants. The cooperation between the *Institute of Mathematics* and Palacký University in Olomouc brought an important monograph dealing with a wide range of problems related to singular boundary-value problems for common difference equations and presents a complete theory of existence.

The *Institute of Computer Science* along with Technical University in Ostrava and the *Institute of Geonics* developed computing methods of numerical linear algebra for solving the problems in the application of the mechanics of construction, flow, transport safety and Electromagnetic Phenomena. The *Nuclear Physics Institute* and the Institute of Chemical Technology (ICT), Prague, concerned with the study of adhesion and proliferation of human MG 63 cells on carbon-nanoparticle-modified biomaterials. The results observed are promising for tissue engineering.

The *Institute of Information Theory and Automation* with the Second Faculty of Medicine of Charles University cooperated on a project focused on the probability of the estimation of absorbed doses during thyroid cancer therapy. The outcome is an advisory system for an individual recommendation of therapeutic activity. The *Institute of Photonics and Electronics* and the Faculty of Civil Engineering of the Czech Technical University (CTU), Prague, developed an optical element enabling chlorine detection in water with the sensitivity of 0.25 ppm and a determination of the quality of swimming pool water so that it complies with European and American norms.

The *Institute of Physics of Materials* and the Faculty of Mechanical Engineering of Technical University in Brno carried out a theoretical calculation of the hardening of the composite formed from brittle glass

matrix with Nicalon-type fibres. The calculation facilitates plotting a theoretical curve of the resistance to crack propagation. The outcome of the cooperation of the *Institute of Scientific Instruments* and Faculty of Electrical Engineering and Communication Technologies of the Technical University was the submission of a patent application dealing with an optimised detector configuration.

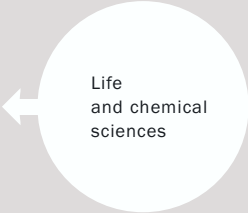
The *Institute of Theoretical and Applied Mechanics* and the Faculty of Transportation Sciences of CTU concerned with deformation and damage of the human skull in extreme loading. The institute joined the University of Economics, Prague, participating in the proposal, field research and assessment of the study of the use of cultural and natural sites in cities, isolated objects and natural reserves. The *Institute of Geophysics* and Palacký University in Olomouc were concerned with magnetic properties of firm atmospheric fall-out particles and their effect on environmental pollution.

The *Institute of Geophysics* and the Faculty of Science of Charles University participated in solving the first boreal and Mediterranean correlation of the Jurassic-Cretaceous border interval by magnetostratigraphy. The *Institute of Atmospheric Physics*, Mendel University of Agriculture and Forestry in Brno and University of Nebraska in Lincoln jointly participated in mathematical modelling of the processes connected with underground storage of radioactive waste. In the framework of the common education of DSP-students, the *Institute of Rock Structure and Mechanics* along with the Faculty of Sciences of Charles University carried out a project focused on the reconstruction of the palaeo-environment and indigenous vegetation of the lower Radnice coal seam in the locality of Štílec.

In **life and chemical sciences**, the *Institute of Analytical Chemistry* and the ICT developed a new way to manufacture TiO₂- and caolinite-based photocatalytic pigments. In cooperation with the same university, the *J. Heyrovský Institute of Physical Chemistry* prepared pyrrole clusters, representing models for the study of photochemical and radiation processes in biological systems. The *Institute of Chemical Process Fundamentals* along with J. E. Purkyně University in Ústí nad Labem, Charles University and ICT worked on optimization of micro-electrical engineering photocatalysts preparation. The cooperation of the *Institute of Macromolecular Chemistry*, the 1st Faculty of Medicine in Prague and the Faculty of Sciences of Charles University brought a new and quick method of sampling, isolation and quantification of UHMWPE (Ultra-High Molecular Weight Polyethylene) abrasion resistance particles *in vivo*, used for independent checkups in the analysis of the failure of UHMWPE-based joint replacements.

The *Institute of Organic Chemistry and Biochemistry* and the Institute of Technical and Experimental Physics of CTU developed a sensitive method of low contrast small subject X-ray image. This method enables an *in vivo* image and will be brought into practical use mainly in medicine, biology, anatomy, physiology diagnostics and study. The joint project supported by the Czech Science Foundation helped implement the new DSP “Evolutionary Genetics of Plants”, carried out in cooperation with the *Institute of Biophysics* and Masaryk University. Scientists from the *Institute of Physiology* along with the 3rd Faculty of Medicine discovered that the development of intestinal inflammation is connected with the reduction of the degradation of anti-inflammatory glucocorticoids in the inflamed tissue and with the increase in their local synthesis by means of the reduction of inactive 11-oxo steroids to biologically active glucocorticoids in human plasma, *i.e.*, the development of the inflammation can be locally suppressed by immunosuppressive signals. Multi-source funding enabled solving a project of the *Institute of Microbiology* and the 2nd Faculty of Medicine of Charles University.

This was a clinical study in children having proved a clinical effect of *Lactobacillus acidophilus* and *reuteri* on the diarrhoea caused by rotavirus infection. A project of the *Institute of Biophysics* and Czech University of Agriculture in Prague concerned with changes in glutamate kinase (GK) activities in spinach plants with increased cadmium or zinc concentrations in soil. The obtained values suggested possible application of GK for adaptation of plants to stress caused by heavy metals and proposed possible use of the enzyme as a stress biomarker. The *Institute of Experimental Medicine* and the 1st



Life
and chemical
sciences

Faculty of Medicine of Charles University participated in the project dealing with a hepatic disease; the results contributed to understanding the mechanism of hepatic diseases and their therapy.

The *Institute of Molecular Genetics* and the 1st Faculty of Medicine of Charles University cooperated on the introduction and elaboration of a new experimental model of cornea transplantation in the minipig; the model will be used for practical studies of new immunosuppressive procedures. The cooperation between the *Institute of Animal Physiology and Genetics* and University of Veterinary and Pharmaceutical Sciences in Brno in tuition and education brought, for example, a didactic text *Physiology I* and multimedia didactic programmes *Physiology I* and *II*. The Academia publishing house published a textbook as a supplement to the basic lectures for bachelor studies – *Vertebrate Zoology*. This textbook was published in cooperation with the *Institute of Vertebrate Biology* and the Faculty of Sciences Masaryk University and Faculty of Sciences Charles University in Prague.

The *Institute of Systems Biology and Ecology* along with University of South Bohemia in České Budějovice studied the effect of the structure of zooplankton on the effectiveness of fish production. The joint research team of the *Centre of Biology*, Faculty of Sciences of University of South Bohemia in České Budějovice and Faculty of Sciences of Charles University (in a field research station in Papua New Guinea) found out that the difference in the constitution of insect population is not significant, neither with the mutual distance of the localities of several hundred kilometres; this finding resulted in a revision of current opinions about the degree of endemism of tropical species. It has been shown that a number of tropical herbivore insect species are capable of surviving on plants with very low population density including a majority of tropical forest species.



Giant caterpillar of the hercules moth (*Coscinocera* sp.) feeding on leaves of *Homalantus* trees is only one of many hundreds of caterpillars co-existing in the tropical rainforest ecosystem in Papua-New Guinea

photo by V. Novotný, archiv BC

In **humanities and social sciences**, successful cooperation is being developed in the framework of numerous DSP-study programmes organised with universities (e.g., DSP of the joint research centre of the *Economics Institute* and Charles University, CERGE-EI). The *Institute of Psychology* and the Faculty of Philosophy of Charles University are proceeding with the research of a burnout syndrome and risk factors for cardiovascular diseases; the Institute joined the Faculty of Economics and Administration of Masaryk University in the project dealing with the satisfaction of citizens with public services. The *Institute of Sociology* participated in solving five projects of scientific research evaluating transformation, differences and regional development of Czech society, all of this in cooperation with the Faculty of Social Studies of Charles University, the Faculty of Business Administration of University of Economics, Masaryk University, Czech University of Agriculture in Prague and the Faculty of Sciences of Charles University.

The *Institute of State and Law* and the Faculty of Computer Science of Masaryk University and the *Institute of the Czech Language* created a *Law Electronic Dictionary*. The *Institute of Archaeology, Brno* and the Faculty of Humanitarian Studies of the University of West Bohemia in Plzeň and the Faculty of Sciences of Charles University prepared a study dealing with motoric apparatus injuries in Great Moravian population from the Castle of Mikulčice. The Institute of Egyptology of the Faculty of Philosophy of Charles University, the *Institute of Archaeology, Prague* organised a conference; the presentations have been used in an international brochure.

The *Institute of Archaeology, Prague* and the Faculty of Pedagogy of Charles University participated in publishing a learning text within the framework of the EU project “Education and its Relation to Culture and Historical Heritage”. The *Institute of History*, the *Institute of Philosophy*, the Catholic Faculty of Theology and the Faculty of Philosophy of Charles University prepared an edition of Gumpold’s *Legend of St. Wenceslas* and related texts. *Masaryk Institute and Archives* and the Faculty of Philosophy of Charles University organised an international conference on Karel Kramář.

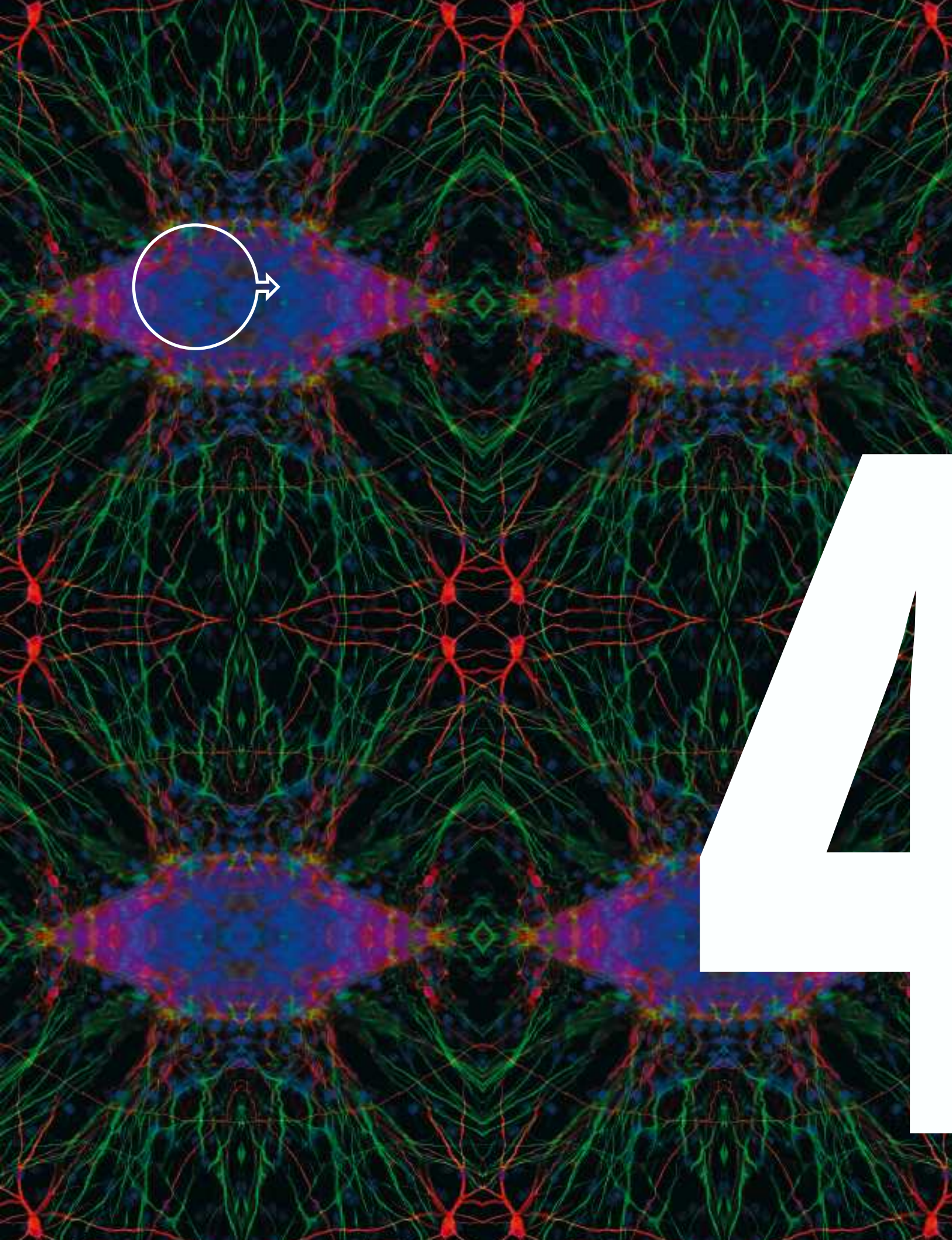
The *Institute of Art History* with the participation of the Faculty of Philosophy of Charles University and Academy of Arts, Architecture and Design in Prague published the sixth volume of the *History of Czech Fine Arts*. The *Institute of Contemporary History* and the Faculty of Pedagogy and the Faculty of Philosophy of Charles University participated in creating teaching tools for history teachers at basic and secondary schools and an elaboration of textbooks for history students.

The outcome of the joint project of the *Institute of Philosophy* and the Faculty of Philosophy of Masaryk University and the Faculty of Philosophy of Charles University is an electronic database for the study and research of Greek and Latin authors of ancient, medieval and early modern history texts. The *Institute of Slavonic Studies* and the Faculty of Philosophy of Charles University guaranteed and coordinated the preparation of parallel corpuses for the Slovenian and Croatian languages. In cooperation with the *Institute of Czech Literature*, the Faculty of Philosophy of University of Ostrava in Ostrava, the Faculty of Philosophy and the Faculty of Pedagogy of Masaryk University and Academy of Literature in Prague, the publishing house Academia is preparing *The History of Czech Literature 1945–1989* (two volumes in 2007).

In 2007, a one-week Course of the Basics of Scientific Work was organised for DSP-students. The students became acquainted with the basics and principles of presentation and publication of scientific work results, the basics of scientific methodology, ethics in research and science, intellectual property principles, research funding and other aspects of scientific work. The course was conducted eight times; six times and twice in Prague and Brno, respectively. The total number of participants was 220 with 30 percent having a supervisor from an ASCR institute. Students from animate nature sciences prevailed, nevertheless, as distinct from the year 2006, there was an increase in the interest of inanimate nature sciences’ students from 20 percent to 33 percent.

An overview
of key activities
of cooperation
with universities

	2003	2004	2005	2006	2007
DSP-students trained at Institutes	1 786	1 939	2 079	2 072	2 154
Undergraduates trained at Institutes	959	1 097	1 143	1 238	1 366
Students newly enrolled in DSPs	420	421	391	366	431
Number of DSP graduates trained at Institutes	161	204	220	259	256
Undergraduates at Institutes	691	691	763	787	822
Number of semester lectures, seminars and tutorials given by ASCR staff members at universities	2 316	2 292	2 666	2 824	3 195
Teaching by ASCR staff members at universities (in hours)	56 392	60 329	66 006	68 429	71 739



Cooperation with the Business Sphere and Other Institutions

4

Searching for the ways of transferring research results from its institutes to the business and social spheres is one of the key roles of Academy of Sciences of the Czech Republic (ASCR). ‘Transferring’ results to practice is one of the priorities formulated in the basic documents. The Academy targets the reinforcing of current contacts and making new ones between its institutes and potential clients. This goal is being supported by the project “Information Centre of Innovations of Academy of Sciences” initiated at *Centre of Administration and Operations* in 2007.

Cooperation with organisations like the Engineering Academy of the Czech Republic, o. s. contributed to reinforcing contacts between the scientific and business spheres at the level of institutions and individual subjects. Cooperation continued between the ASCR and CKTO (Czech Knowledge Transfer Office), a research and consulting office of the Engineering Academy of the Czech Republic for supporting the commercial use of research results in international cooperation and innovations. The educational project Centre of Innovation Education, Liblice, implemented by *Centre of Administration and Operations* was carried out in cooperation with partners, including the Association of Innovation Enterprise of the Czech Republic, Czech Innovation Ltd., and the Swedish Governmental Agency for Innovation Systems (VINNOVA). Within the framework of regional cooperation, ASCR representatives contributed to the expansion of a study for the management of activities in research, development and innovations in the region of Vysočina. The study is a base for implementing the project of the Scientific-Technical Park, Jihlava, including a business incubator, technological park and a centre of transferring technologies. The developing cooperation with the Region of Pardubice, the Association of Orlice Municipalities and especially with the South-Moravian Innovation Centre continued successfully. The projects of this cooperation were presented and evaluated at several meetings of ASCR representatives and relevant autonomous units. The information on the alternatives of the cooperation with the ASCR in technology transferring and innovation activities were provided to foreign partners, too, *e.g.*, within the framework of Czech-Japanese, Czech-Taiwan and Czech-Korean Days of Science and Technology 2007. As last year, the company L’ORÉAL CR concluded a contract on the cooperation with the ASCR and the Czech Commission for UNESCO in granting a scholarship “L’ORÉAL CR for Women in Science”.

The ASCR staff also solved a number of grants in conjunction with the partners of the business and application sphere. Cooperation in innovation activities was a goal of more than a third of the programmes on “Support for the Projects of Targeted Research” and “Information Society” and emphasis on direct use of the pieces of knowledge obtained is also inseparable from the programme “Nanotechnology for



Ceremonial announcement of the winners of the first stipend programme "L'Oréal ČR for Women in Science" at the Academy's Library

photo by Dorothea Bylica, archiv SSC

the Present". The process of transferring technologies and knowledge is significantly enhanced by agreements with business subjects and ASCR institutes with important contributions by business contracts to transferring research outcomes to the application sphere.

The research results achieved by the ASCR institutes are often put into effect in industrial plants, agriculture, environmental and cultural values protection, the health care system and survey of the current state of the Czech Society. Application of the research results is documented in the following examples of achievements and projects:

Trajectory Analysis of the satellite TEASER; within the framework of the project "TEASER/TANDEM"
• **the Astronomical Institute and Aeronautical Research and Test Institute, Letňany** (funded by the Ministry of Industry and Commerce of the Czech Republic)

Research and development of a type of cross section and low flow blood vessel replacements which has not existed so far; within the framework of "Research and Development of Blood Vessel Replacement"
• **the Institute of Physics and "Výzkumný ústav pleťářský", Clinic of Cardiovascular surgery of 1st Faculty of Medicine of Charles University and General Teaching Hospital Prague, St. Anna Hospital, Brno** (funded by the Ministry of Industry and Commerce of the Czech Republic)

Determination of XUV ablation limit of materials relevant to direct nanostructuring by coherent beams of soft X-radiation; within the framework of the project "Creating and Characterising of Nanostructures by X-Ray Lasers"
• **the Institute of Physics and the Institute of Plasma Physics, the Institute of Scientific Instruments, Faculty of Biomedicine Engineering of Czech Technical University, Reflex, Ltd.** (funded by the ASCR)

Creating of new mathematical models of bone tissue; within the framework of "Complex Research of Biomechanical Conditions of Application of Skeletal Replacements, Interactions of the Replacements with the Organism, Evaluation of the causes of Failure and Proposal of the Conditions to Enhance their

Examples of application of the research results

Stability in the Human Organism” • **the Institute of Computer Science and Walter, Inc.** (funded by the Ministry of Industry and Trade of the Czech Republic)

Development of new drugs for radionuclide therapy; within the framework of the project “New Generation Targeted Super Anti-Cancer Therapies for the Treatment of Leukaemia”

• **the Nuclear Physics Institute and Azacycles, Ltd.** (funded by the Ministry of Industry and Trade of the Czech Republic)

Detailed model of the building of Veletržní Palace within the framework of the project “Automatic Acquiring of Virtual Reality Models from Measured Data”

• **Institute of Information Theory and Automation and National Gallery in Prague** (funded by the Ministry of Industry and Trade of the Czech Republic)

Implementation of new types of optical sensors with surface plasmons for simultaneous observing of a large number of molecular interactions; within the framework of the project “Biosensors with Surface Plasmons and Protein Chips for Medical Diagnostics”

• **the Institute of Photonics and Electronics, the Institute of Macromolecular Chemistry, the Institute of Haematology and Blood Transfusion, VIDIA, Ltd.** (funded by the ASCR)

Implementation of original sensor with surface plasmons

• **the Institute of Photonics and Electronics for Phenogenomics, USA** (Licence Contract prepared)

Development of special fireproof ceramic pipes • **the Institute of Plasma Physics for Kavalier, Inc.** (transferred into manufacture)

Methods for estimating concentrations of a risk agent in the surroundings of an industrial plant in the event of an accidental leak; within the framework of the project “Method Preparation of Model Research of Accidental Leaks of Risk Gases into the Atmosphere”

• **the Institute of Hydrodynamics and Synthesia, Inc., Pardubice-Semtín** (funded by the Regional Authority of the Region of Pardubice)

Development of a device for the dielectric analysis of binders in composites and adhesive foils; within the framework of the project “New and Very Tough Epoxide Systems for Composites and Adhesives”

• **the Institute of Rock Structure and Mechanics, 5M, Ltd., Kunovice and Reflex, Ltd., Prague** (funded by the Ministry of Industry and Trade of the Czech Republic)

Construction and manufacture of electron welding machine MEBW-60/2 prototype

• **the Institute of Scientific Instruments and Focus, Germany** (licensed manufacturer)

New ways of processing of ammonia alum to aluminium oxide precursors and production of photocatalytic pigments; within the framework of the project “New Glass-Fibre and Ceramic Materials and Advanced Procedures of their Preparation and Manufacture”

• **the Institute of Inorganic Chemistry and ČLUZ, Inc., Nové Strašecí** (funded by the Ministry of Industry and Trade of the Czech Republic)

Synthesis of new annex membrane for cheap hydrogen-air fuel cells and development of a positive electrode based on manganese oxide; within the framework of the project “Accumulation of Energy from Renewable Sources”

• **Institute of Inorganic Chemistry and Solartech, Ltd., Rožnov pod Radhoštěm** (funded by the Ministry of the Environment of the Czech Republic)



Prototype of the electron beam welder MEBW-60/2 designed and produced in the Institute of Scientific Instruments.

The welder is intended for joining of components for precise instrumentation and vacuum technique including welding of parts made from dissimilar metals. The device has volume of the working chamber 7 litres. Its electron gun operates at 60 kV with continuously modulated beam power up to 2 kW. Work-piece manipulation is secured by two axis motorized stage. A user can control all functions using hand-panel with LCD display or from PC software

photo by archiv ÚPT

Titanium oxide based photocatalysts applied in the development of the equipment for disinfection and photocatalytic purification of water used in whirlpools, development of self-cleaning surface treatment of ovens, development of photocatalyst based on nanocrystalline anatase as photoactive additive of self-cleaning coating compositions (patent); within the framework of the project “Research Centre of Nanosurface Engineering”

• **the J. Heyrovsky Institute of Physical Chemistry and ATG, Ltd.** (funded by the Ministry of Education, Youth and Sports of the Czech Republic)

Development of new cytostatic nucleosides

• **the Institute of Organic Chemistry and Biochemistry for Gilead Science, USA** (patent application)

Mechanism of the action of omega 3-polyunsaturated fat acids in adipose tissue and its therapeutic use

• **the Institute of Physiology and Pronova Biocare, Norway** (3 patent applications, funded by the ASCR)

Development of Innovation Centre of Biomedicine, the *Institute of Experimental Medicine*, SUSS consulting, Ltd., WEBCOM, Inc., MEBIS Ltd., Projects 2 Business, Ltd., Business Angels Czech, Czech National Committee of Francophone Forum, *Technology Centre*, Masaryk Hospital in Ústí nad Labem, Teaching Hospital Na Bulovce

• **the Institute of Clinical and Experimental Medicine, Prague, and Charles University, Prague** (funded by ERDF structural funds, the capital Prague)

Preparation of functional antibodies recognising neurotransmitter receptors within the framework of the project “A set of antibodies recognising functionally and genetically related neurotransmission regulating proteins” • **the Institute of Molecular Genetics and Biotest, Ltd.** (programme Eureka)

New genomic and biotechnological procedures in molecular oncology: A way to early diagnosis and targeted therapy (VPV II, project “Oncogen”)

- **the Institute of Molecular Genetics and the Institute of Applied Biotechnologies, Inc.** (funded by the Ministry of Education, Youth and Sports of the Czech Republic)


Joint proteome laboratory (certificate of the Education Centre of Beckman Coulter)

- **the Institute of Animal Physiology and Genetics and Immunotech, Inc.**

Collection of SCAR markers for identification or distinguishing of new Czech strains of Begonia TBH; within the framework of the project “Use of Well-Established DNA-Marker Technology for Legal Protection of the Four Prepared Czech Strains of Begonia TBH” • **Biology Centre and Sempra Holice, Ltd.** (funded by the ASCR)

Monitoring of innovation processes in the region of Prague and “coaching of innovation companies supporting innovative behaviour and success in innovations on European market”, within the framework of the project “Support of Regional Innovation Enterprise” (BCI)

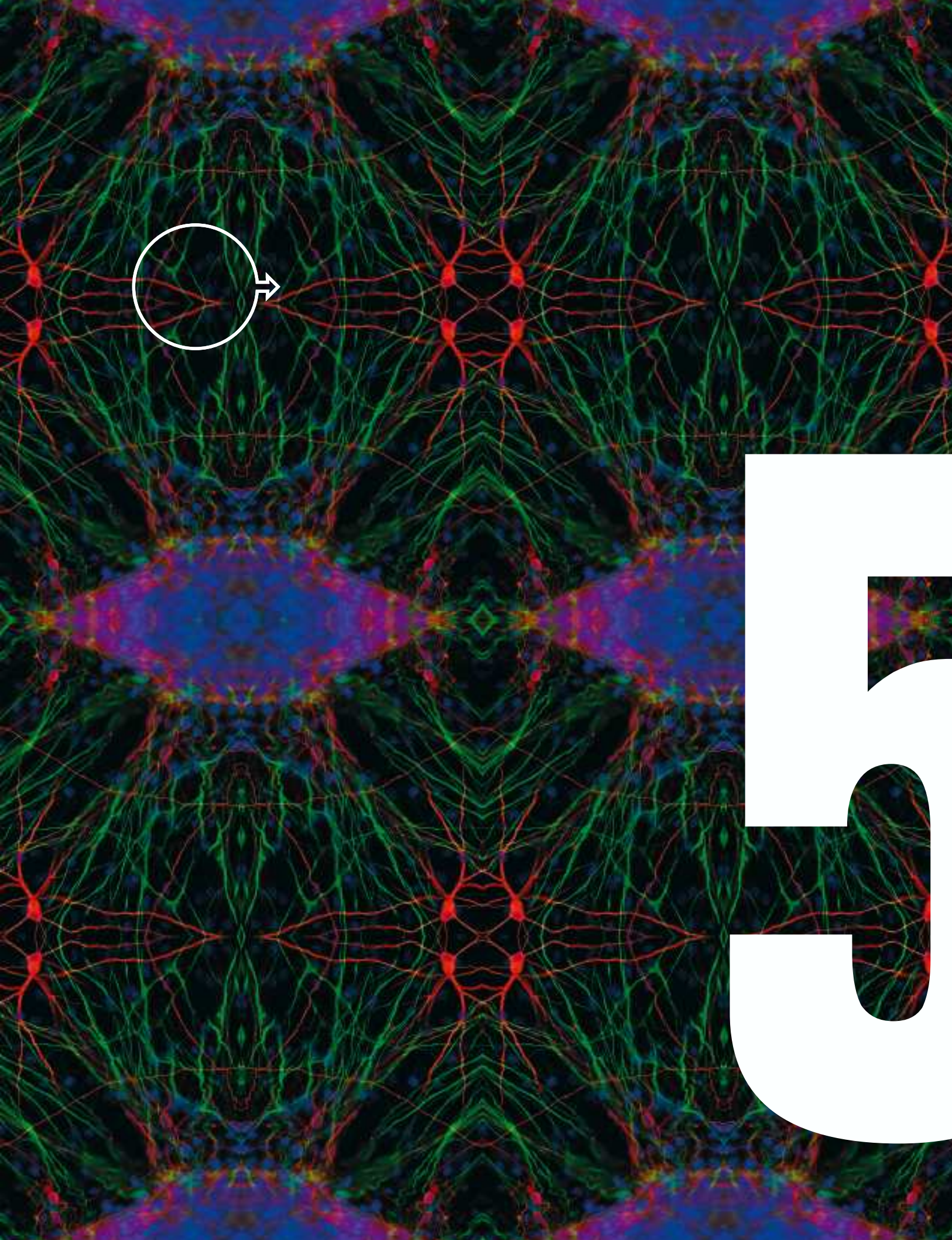
- **the Institute of Philosophy and Association of Research Organisations, Chamber of Commerce of the capital city Prague, University of West Bohemia in Plzeň, Cheval, Ltd.** (funded by ESF structural funds)



Expertises,
judgements
and analyses

Research workers augmented hundreds of **expertises, judgements and analyses** and provided consultations to subject from the application sphere including state administration, self-administration, EU, World Bank or OSN organs. For example, the *Institute of Archaeology, Brno*, the *Institute of Archaeology, Prague* and the *Institute of State and Law* elaborated 630, 256 and 72 expertises in 2007, respectively. Besides the above-mentioned projects and ways of transferring research results to practice, the research teams as well as individual ASCR employees cooperated on elaboration of a number of technical norms, methods, measurements, laboratory tests and diagnostic methods; for example, the *Institute of Archaeology, Prague* expanded upon more than 4000 viewpoints to the documents on building and territorial proceedings within the framework of the department of archaeological monument preservation. A review study analysing the effect of energetic shocks on Czech economy was formed in the *Economics Institute*. The Public Opinion Research Centre of the *Institute of Sociology* carried out and processed public opinion research in the localities considered for the establishment of radioactive waste dumping grounds for the Radioactive Waste Dumping Ground Authority. The *Institute of State and Law* cooperated successfully with the company Plzeňský Prazdroj, Inc. in systematic monitoring of the EU legislation. A wide application output is also presented with daily forecasts of geomagnetic and solar activities for Czech Television and the state of ionosphere for the Army of the Czech Republic, provided by the *Institute of Geophysics*. Within the framework of the project, the *Centre of Administration and Operations* participated in processing of expertises in the area of intellectual property protection for *the Technology Centre*.

At present, the ASCR research centres own and keep the total of 487 **patents** and 186 **patents** applicable in and out of the Czech Republic, particularly in EU countries, USA, Canada or Japan, respectively. Other patent applications are being considered by Industrial Property Office of the Czech Republic and patent offices in other countries. In 2007, 37 existing and 18 new patent applications for **inventions** were submitted in and out of the Czech Republic, respectively. The economic effect of research activities is also reflected in **licence contracts**. The most extensive activity in this respect is shown by the *Institute of Experimental Botany*, the *Institute of Macromolecular Chemistry* and the *Institute of Organic Chemistry and Biochemistry*. The *Centre of Administration and Operations* provided continuous patent applications of inventions, utility and industrial designs and trademarks from the ASCR research centres and representation at Industrial Property Office to a number of workplaces.



5

International Cooperation

5

Cooperation within EU structures

For the Academy of Sciences, the year 2007 was very important from the perspective of the continuous integration into the **European Research Area**. The bodies, institutes and individual researchers from the ASCR were actively involved in public consultation **of the Green Paper, a strategic document of the European Union on perspectives of the European Research Area**. The comprehensive position of the ASCR was positively welcomed by the Commissioner responsible for Science and Research Janez Potočnik and the ASCR is monitoring how these contributions are put into practice in the future structuring of European research and **development** policy.

One great challenge was the launching of preparations for the **Czech Presidency of the Council of the EU in the first half of 2009**. The ASCR representatives get actively involved in advisory and auxiliary bodies for this Presidency. The priority here is to create the European Research Area without barriers, hampering the mobility of the researchers, sharing of the knowledge and research, infrastructures. **In the interest of integrating the western Balkans into European structures, the ASCR is preparing a meeting of the Organisation Forum of the western Balkan countries as part of the Czech Presidency.**

Legislative
amendments →

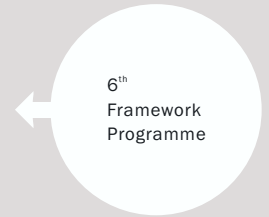
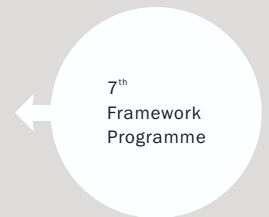
The ASCR also actively monitored the **process of legislative amendments concerning research and development**. An amendment to the Aliens Act came into force with the assistance of the ASCR. One result of this amendment is that it simplifies the acceptance of foreign researchers in the ASCR institutes. The ASCR also cooperated in **eliminating legislative obstacles which complicate participation in European projects**. A long-sought amendment to Act No. 235/2004 Coll. on Value Added Tax was implemented through Act No. 261/2007 Coll., meaning that funds from European Union sources intended to finance research and development projects will be exempt from this tax in the future. The adoption of Act No. 171/2007 Coll. and implementation provisions of the Government of the Czech Republic, to whose creation the ASCR also contributed, allows the Ministry of Education, Youth and Sports to pay the requested co-financing to international research projects using institutional funds at the request of applicants. The ASCR also commented on various governmental materials concerning research, development and **innovation** within the EU, and responded to the stimulus of the European Commission and participated in the preparation of opinions for the needs of Czech negotiations within the EU, particularly in the area of clarifying procedures towards the European Charter for Researchers and the Code of Conduct for the Recruitment of Researchers.

The ASCR included among the priorities the extensive administration related to preparation of Operational Programmes (OP) and other fundamental documents of **the EU structural funds for research and development**, in particular the OP “Research and Development for Innovation”, the OP “Education for Competitiveness” and the OPs “Prague – Adaptability” and “Prague – Competitiveness”. The ASCR invested maximum effort to create the best conditions for the broadest participation in these projects at its institutes. The ASCR participated in comment procedure for the OP “Education for Competitiveness” and provided support for the recruitment of project evaluators. Given the unsatisfactory state of preparations, particular attention was sought for the OP “Research and Development for Innovation”. The ASCR invested extraordinary efforts in the preparation of this operational programme, which is of key importance to major research infrastructure projects.

The ASCR concentrated a great deal of attention on the launching of the **Seventh Framework Programme for Research and Technological Development in the European Union (FP7)**. ASCR activity focused on ensuring the maximum support for applicants so that the funds invested from the state budget and from other funding for the participation of Czech teams in the FP7 could be used as effectively as possible. Within the framework of the **NICER II project – the National Information Centre for European Research**, the *Technology Centre* ensured the activities related to the FP7 via its network of National Contact Points. The ASCR progressed its cooperation with the **Czech Liaison Office for Research and Development in Brussels (CZELO)**, that facilitated preliminary hearing of the project proposals with relevant EC officers, ensured potential partners for research consortia and organised various presentations and information events. In several cases the **Czech Mobility Centre** contributed to the solving of the problems connected with visiting researchers in the institutes of the ASCR. The internal network of contacts was improved and information on members of the programme committees of the FP7 thematic areas was made available in order to ensure the effective transfer of up-to-date information, all with the aim of providing effective help and consultation to beneficiaries of the FP7 and projects supported by structural funds.

During 2007, the overall participation of ASCR institutes in the Sixth Framework Programme (FP6) was successful. There was only a slight increase in numbers to around 200 projects in comparison with 2006, but the total amount of contractually arranged funds rose substantially from 5.6 million euro to 7.6 million euro. This agreeable fact has its logical connotations; the research teams in our institutes have become more and more involved in financially more demanding projects (the average contract amount for one project was almost 1 million CZK). Institutes working on the largest numbers of projects were the *Institute of Physics* (20), the *Institute of Plasma Physics* and the *Institute of Experimental Medicine* (13 each) and the *Institute of Macromolecular Chemistry* (10). Results from the first call of the FP7 have anticipated that ASCR institutes have successfully built on their previous results in the FP6. The ASCR is entering more than 60 new projects that begin in 2008.

Similarly, ASCR institutes have become actively involved in other programmes. The number of participation rose in 2007 for projects financed by structural funds and community programmes but also by the European Science Foundation (ESF). Getting 14 projects as part of the COST programme – European Cooperation in the field of Scientific and Technical Research – has also been very stimulating. In total, the institutes became involved in more than 50 projects funded from other programmes supporting cooperation.



Participation
in the main
instruments
of the FP6

Type of instrument	Total number of projects	
	2006	2007
STREP (Specific Targeted Research Projects)	41	48
IP (Integrated Projects)	40	47
Marie Curie Actions	22	32
NoE (Network of Excellence)	17	22
SSA (Specific Support Actions)	15	12
CA (Coordinating Action)	7	8
Other instruments of the FP6 – SME, I3, INTAS	18	16
EUROATOM	5	14

The Visegrad
Four Forum

The Visegrad Four Forum, a traditional meeting of representatives of the academies of sciences of the V4 countries, was held last year in Smolenice in Slovakia. Among the main topics of discussion were questions that concern the ESF, the FP7 and the “Frontiers of Science” conference organised in association with British partners. The ASCR set up a joint website for the academies of sciences of the V4 countries at the beginning of the year. See: <http://v4.avcr.cz/>.

CERN

International inter-governmental organisations

The planned objectives of cooperation between the Czech Republic and **CERN** (Conceil Européen pour la Recherche Nucléaire) were achieved in 2007. Cooperation provided by ASCR institutes involved basic research into particle physics, the development of new technology and materials and their use in practice, primarily in medicine and in building the GRID computer network, the most up-to-date information and computer network in the world. Cooperation with CERN also helped young Czech researchers and technicians/engineers improve their qualifications.



The installation of pixel subdetector into ATLAS. Michal Tomášek supervises the installation of inner pixel subdetector into the ATLAS detector at CERN

photo by archiv FZÚ

Dubna

Working contacts continued between certain ASCR institutes and the **Joint Institute for Nuclear Research in Dubna**, particularly in the field of experimental, theoretical, and mathematical physics, ion physics, the chemistry of transuranium and medical physics, in the application of methods of neutron physics, in the physics of the solid state, in research into polymers and in the development of sensors and other test equipment. ASCR institutes participated in 24 (of 42) targeted projects and were also represented in the management of the Joint Institute for Nuclear Research (prom. fyz. Richard Lednický, DrSc. from

the *Institute of Physics* is one of three assistant laboratory directors). The authorised government representative of the Czech Republic for coordinating cooperation with the Joint Institute for Nuclear Research in Dubna is also from the ASCR.

The Czech Republic became, in 2007, the 13th member state of the **European Southern Observatory** (ESO). The entry process was completed in April, when the ratification certificate was deposited at the Ministry of Foreign Affairs of France in Paris. The ASCR has taken on the role of expert guarantor in relation to the ESO and also has representatives in ESO bodies. The ASCR organised an “Industry Day” for potential contractors in June 2007 at which it was possible to obtain information regarding forthcoming contracts for the ESO. The Czech Liaison Office (CLO) was then set up in November with the task of providing information about future contracts. Already in 2007, scientific papers based on observation with ESO telescopes were published.

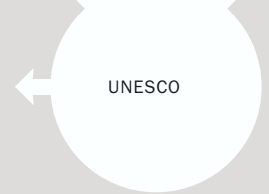
A number of ASCR institutes were involved in research projects at the **European Space Agency** (ESA) as part of the PECS programme (*i.e.*, government agreement on cooperation with the ESA). A total of 28 PECS projects are underway in the Czech Republic, 11 of these at ASCR institutes. Besides research projects there are activities involving industry and remote surveys of the Earth. ASCR institutes therefore contribute almost 40 percent to cosmic projects handled as part of the cooperation with the ESA. The PECS programme is important because it is preparing the Czech Republic for full membership in the ESA, which is currently at the negotiation stage.

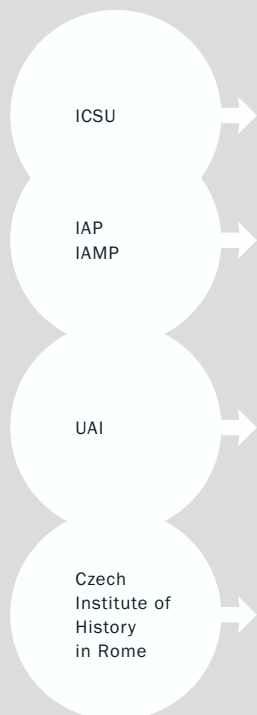
The ASCR and the Czech Science Foundation are joint members of the **European Science Foundation** (ESF) and staff from both organisations are involved in its steering committees and other foundation panels. Czech teams took part in a total of 21 Research Networking Programmes in 2007. Two ESF conferences were held in Prague in 2007.

Representatives of the ASCR are also active in the Czech Commission for Cooperation with UNESCO, Prof. RNDr. Helena Illnerová, DrSc. having been elected to the head of this advisory board of the Czech government along with other members of staff at the ASCR who are commission members. Every year ASCR employees organise UNESCO postgraduate courses intended for scientists from developing countries. The Czech National Committee for the **Man and the Biosphere UNESCO programme** also organised two seminars and an international course, and representatives of the committee also took an active part in a number of international conferences.

International non-governmental science institutions

The ASCR is a member of **ALLEA** (All European Academies), which brings together 53 academies of sciences from 40 European countries, and is represented in its bodies. Representatives of the ASCR also attended the “Emerging Regional Co-operation,” and the “Southeast European Academies of Sciences and Humanities in the ERA” conferences in October 2007. As with the national academies of sciences of most EU member states, the ASCR is represented in the council of the **EASAC** (European Academies Science Advisory Council), whose main aim is to prepare expert studies and provide objective information from various fields of science dealt with by European and national political institutions (*e.g.*, the European Parliament) on an ongoing basis. Staff of the ASCR also contributed to the work of expert groups. The EASAC is currently dealing with issues such as “The sustainability of sources of underground water”, “Resistant tuberculosis” and “Diseases transmitted from animals to people”. The next meeting of the EASAC will take place in Prague in 2008.





The ASCR is the umbrella organisation of national science committees of International Scientific Unions (currently 35 in operation in the Czech Republic) and is in continuous contact with them via its Council for Foreign Relations. It also deals with situations whose very nature exceeds the competence of the committees and contributes to some of their activities. The Chairman of the Council for Foreign Relations appoints and dismisses members of committees. As a consequence, the ASCR is the Czech member of the **ICSU** (International Council for Science), which draws together 111 states and international science unions. Representatives of the ASCR attended a meeting of European members of the ICSU, “The 5th European ICSU members meeting”, in October 2007.

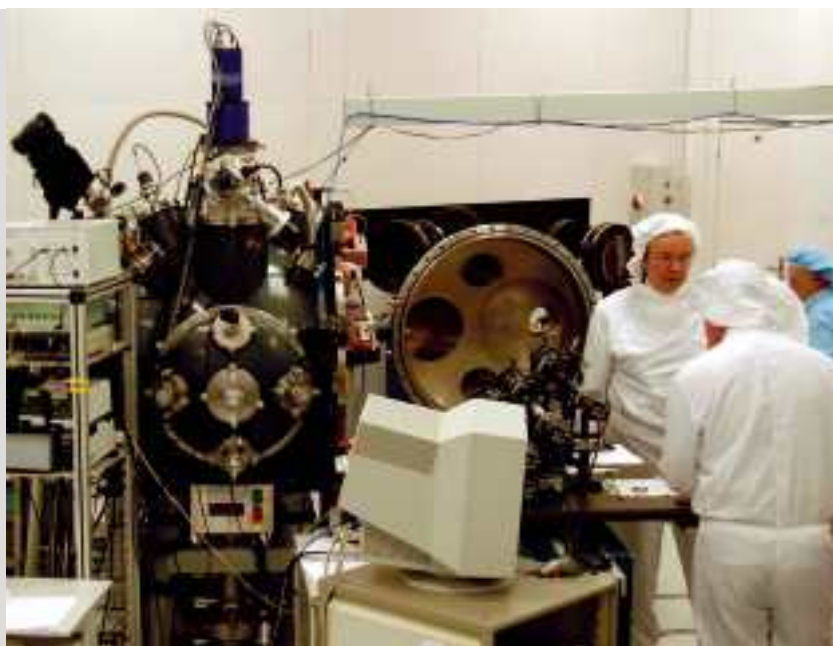
The **IAP** (InterAcademy Panel) and **IAMP** (InterAcademy Medical Panel) is global network of the world’s science academies. Between the General Meetings of both organisations, the secretariats of the IAP/IAMP turn to member academies with requests to complete special questionnaires and requests for expert opinions and statements on appeals, with which these organisations turn to the global scientific public.

The **UAI** (Union Académique Internationale) unites 61 national academies from throughout the world and which is responsible for coordinating and in certain cases providing financial support to cooperation on exceptionally significant projects from the humanities that stretch beyond the borders of any single country. ASCR institutes take part in a number of these projects and ASCR representatives participated in evaluating other projects.

The **Czech Institute of History in Rome (Istituto Storico Ceco di Roma)**, together with ASCR institutes and the Faculty of Philosophy at Charles University, is a member of the Association of Archaeology, History and Art History Institutes in Rome. It concentrates on systematic source research of Bohemian material in Roman (and particularly Vatican) archives and libraries, as well as other archives and libraries in Italy. Its results are 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 drawn up. The Czech Institute of History in Rome was represented by one of the main papers at an international conference entitled “Facciamo l’Europa”, which took place in Rome to mark the 50th anniversary of the conclusion of the so-called Treaties of Rome, which became one of the foundations of the European Union.

International bilateral agreements

Bilateral agreements between the Academy and foreign science institutions played an important role in specific scientific cooperation in 2007. In 2007 the ASCR registers 63 agreements with partners from 46 countries (agreements were newly signed regarding cooperation with partners in Pakistan, Georgia and South Africa). Agreements signed earlier were updated on an ongoing basis, whereby emphasis was placed on new forms of international cooperation (and mainly on joint projects). Some 614 people were sent abroad for a total of 6515 person days as part of these bilateral agreements. Meanwhile, some 549 foreign scientists came from abroad for a total of 5075 person days. The ASCR also made use of contacts generated at governmental level, in particular in those countries in which it does not have an actual partner. The development of bilateral contacts over the past five years is shown in the attached table.



The Nobel Prize winner for Physics in 2005 Theodor Hänsch during a visit to the PALS laboratory, the joint place of work of the Institute of Plasma Physics and the Institute of Physics

photo by Dorothea Bylica, archiv SSC

Year	Countries	Agreements	People arriving	Days	People sent	Days
2003	45	59	426	4 442	529	6 042
2004	45	60	533	5 397	658	8 053
2005	45	60	631	5 334	730	8 964
2006	45	59	571	5 151	711	7 898
2007	46	63	549	5 075	614	6 515

Statistical overview of the development of bilateral exchanges as a part of inter-academy agreements

In addition to bilateral agreements, scientific fellows also develop international cooperation based on individual contacts and agreements, with institutes abroad. Involvement in international programmes and projects is shown in a table in the appendix to this chapter.

Other activity as part of international relations

The ASCR was intensively involved in the activity of the **International Human Rights Network of academies and scientific societies** in 2007. Here the Academy is represented by President Václav Pačes. The principal aim of this network is to consistently search out cases of injustice committed against people of science and to protest against these. The ASCR intervened in a number of serious cases, for example in the case of a teacher of Persian language and literature at Princeton University who was imprisoned and accused of espionage when visiting her mother in Tehran or in the case of Burmese doctors. The President of the ASCR appended his signature to a declaration of the International Human Rights Network of academy and scientific societies in the case of the boycott of Israeli scientific and university institutions by Palestinian organisations.

International Human Rights Network

Selection of prominent international conferences organised by ASCR institutes in the year 2007

The organisation of international science congresses and conferences in the Czech Republic and active participation of Czech scientists in science meetings abroad is a very important form of international cooperation. It brings scientific contacts and allows the presentation of new results. The summary below presents examples of the most significant conferences with international involvement organised by ASCR institutes during the past year.

Calice/Calice Meeting • organiser: the *Institute of Physics*; 70 participants, 60 of these from abroad

6th Multimat Spring Meeting (Marie Curie Research Training Network) • organiser: the *Institute of Physics*; 55 participants, 42 of these from abroad

6th International Workshop on Synthesis and Orbital Magnetism of Core-Shell Nanoparticles • organiser: the *Institute of Physics*; 55 participants, 27 of these from abroad

Topical Workshop on Electronics for Particle Physics (TWEPP) • organiser: the *Nuclear Physics Institute*, joint organisers: the *Institute of Physics*, the Faculty of Mathematics and Physics at Charles University, the Faculty of Nuclear Sciences and Physical Engineering at the Czech Technical University; 170 participants, 155 of these from abroad.

4th International Workshop on Neutron Measurements, Evaluations and Applications (NEMEA 4) • organiser: the *Nuclear Physics Institute*; 80 participants, 70 of these from abroad

Boundary Value Problems and Related Topics • organiser: the *Institute of Mathematics*; 50 participants, 22 of these from abroad

Workshop on Fluid-structure Interaction Problem • organiser: the *Institute of Mathematics*; 48 participants, 25 of these from abroad

Current Trends in the Theory and Practice of Computer Science • organiser: the Institute of Computer Science; 127 participants, 71 of these from abroad

International Symposium on Computational Methods with Applications • organiser: the *Institute of Computer Science*; 136 participants, 93 of these from abroad

5th International Symposium on Imprecise Probability: Theory and Applications • organiser: the *Institute of Information Theory and Automation*; 69 participants, most of these from abroad

Workshop on Advances in Physics and Technology in Photonic Crystals • organiser: the *Institute of Photonics and Electronics* in association with the Faculty of Nuclear Sciences and Physical Engineering of the Czech Technical University; 40 participants, 35 of these from abroad

PREMECCY M18 meeting • organiser: the *Institute of Physics of Materials*; 20 participants, most of these from abroad

XXVIII International Conference on Phenomena in Ionized Gases • organiser: the *Institute of Plasma Physics*; 639 participants, 557 of these from abroad

XV European Fusion Physics Workshop • organiser: the *Institute of Plasma Physics*; 86 participants, 83 of these from abroad

Engineering Mechanics 2007 • organiser: the *Institute of Thermomechanics* in association with the *Institute of Theoretical and Applied Mechanics*, the Institute of Solid Mechanics at the Faculty of Mechanical Engineering of Brno University of Technology, ŽĎAS, a. s., Žďár nad Sázavou, the Engineering Academy of the Czech Republic, the Czech Society for Mechanics and the Association for Engineering Mechanics; 200 participants, 19 of these from abroad

22nd Colloquium on “Electromagnetic Depth Research” • organiser: the *Institute of Geophysics*; 82 participants, most of these from abroad

XXXI Czech-Polish-Slovakian Symposium on Mining and Environmental Geophysics • organiser: the *Institute of Geology*; 45 participants, 28 of these from abroad

IRI-COST Ionosphere – Modelling, Forcing and Telecommunications • organiser: the *Institute of Atmospheric Physics*; 103 participants, 95 of these from abroad

7th International Geographical Conference ConGeo (Conservation Geography) '07 • organiser: the *Institute of Geonics*; 52 participants, 30 of these from abroad

Alkali Activated Materials – Research, Production and Utilization • organiser: the *Institute of Rock Structure and Mechanics* in association with the Czech Development Agency; 200 participants, 52 of these from abroad

8th Czech-Polish Workshop on “Recent Geodynamics of the Sudety” • organiser: the *Institute of Rock Structure and Mechanics* in association with the Institute of Geodesics and Computer Science at Wrocław University; 55 participants, 31 of these from abroad

Synchrotron Facilities for the Development of Science and Technology in Central and Eastern Europe • organiser: the *Institute of Biophysics*; 230 participants, 40 of these from abroad

9th International Seminar: Mathematical Modelling of Furnace Design and Operation • joint organiser: the *Institute of Inorganic Chemistry*; 200 participants, 120 of these from abroad

3rd ECHEMS Meeting – Electrochemistry in Nanosystems and Molecules at Work • organiser: the *J. Heyrovsky Institute of Physical Chemistry*; 54 participants, 47 of these from abroad

Nanostructured Polymers and Polymer Nanocomposites (46th micro-symposium, Prague Meetings on Macromolecules) • organiser: the *Institute of Macromolecular Chemistry*; 137 participants, 111 of these from abroad

8th Multinational Congress on Microscopy • joint organisers: the *Institute of Physiology* and the *Institute of Molecular Genetics*; 350 participants, 300 of these from abroad

24th Congress of the Czechoslovak Society for Microbiology • joint organiser: the *Institute of Microbiology*; 400 participants, 200 of these from abroad

Fish Stock Assessment Methods for Lakes and Reservoirs: Toward a true picture • organiser: the *Biology Centre*; 110 participants, 92 of these from abroad

Aquafluo • joint organiser: the *Institute of Systems Biology and Ecology*; 112 participants, most of these from abroad

2007 Annual Meeting of the Society for Economic Dynamics (SED) • joint organiser: the *Economics Institute (CERGE-EI)*; 409 participants, 402 of these from abroad

X European Congress of Psychology • joint organiser: the *Institute of Psychology*; 2200 participants, 2000 of these from abroad



President of the Academy of Sciences of the Czech Republic prof. Václav Pačes at the Xth European Congress of Psychology in Prague

Social Inequality and Mobility in the Process of Social Transformation • organiser: the *Institute of Sociology*; 152 participants, 135 of these from abroad

The Labour Codes of Russia and the Czech Republic • joint organiser: the *Institute of State and Law*; 28 participants, 25 of these from abroad

The 3rd Protohistorical Conference, “Celtic, German and Early Slavic Settlements” (Late La Tène, Roman, Great Migration and Early Slavic Periods); Theme: Settlements, settlement objects and finds and their importance for the chronology of protohistorical development • organiser: the *Institute of Archaeology, Brno*; 60 participants, 22 of these from abroad

Archaeological Working Team of East Bavaria/Upper Austria/West and South Bohemia • joint organiser: the *Institute of Archaeology, Prague*; 44 participants, 26 of these from abroad

The 19th Century in ourselves, or “Myths, Symbolism, Institutions, Idols, Behaviour and Thinking which outlived us” • organiser: the *Institute of History*; 112 participants, 25 of these from abroad

Karel Kramář (1860–1937) • joint organiser: the *Masaryk Institute and Archives*; 43 participants, 6 of these from abroad



The Prime Minister Mirek Topolánek at the festive presentation of the conference and exhibition Karel Kramář (1860–1967) in CEVRO Institute

photo by archiv MSÚ-A

Hans Rottenhammer und der Prager Kaiserhof Rudolfs II. • joint organiser: the *Institute of Art History*; 30 participants, 27 of these from abroad

Charter 77: From the Assertion of Human Rights to a Democratic Revolution, 1977–89 • organiser: the *Institute of Contemporary History*; 213 participants, 25 of these from abroad

The Slavonic World in the Eyes of Research Workers and Publicists in the 19th and 20th Century • organiser: the *Institute of Ethnology*; 23 participants, 16 of these from abroad

The Legacy of J. A. Comenius to the Culture of Education • joint organiser: the *Institute of Philosophy*; 310 participants, 200 of these from abroad

Foreign, other, exotic in Czech Culture of the 19th Century • organiser: the *Institute of Czech Literature*; 88 participants, 5 of these from abroad

Grammar and Corpora • organiser: the *Institute of the Czech Language*; 80 participants, 25 of these from abroad

The 6th EU
Framework
Programme

Selection of international projects carried out at ASCR institutes in 2007

Integrated Multiscale Process Units with Locally Structured Elements – IMPULSE • coordinator: The Centre National de la Recherche Scientifique (National Center for Scientific Research) CNRS Nancy, France; participants: the *Institute of Chemical Process Fundamentals* and 19 other research institutions from 8 countries

Mutant p53 as a Target for Improved Cancer Treatment • coordinator: the Karolinska Institute, Sweden; participant: the *Institute of Biophysics*

Mucosal Vaccines for Poverty Related Diseases • coordinator: Chiron SpA, Siena, Italy; participants: the *Institute of Microbiology* and 20 other institutions from Italy

DAISIE, Global change and ecosystems • coordinator: NERC, U.K.; participants: the *Institute of Botany* and 17 other research institutions from 14 countries

Eurosphere: Diversity and the European Public Sphere: Towards a Citizens' Europe • coordinator: University of Bergen, Norway; participants: the *Institute of Psychology* and 15 other European research establishments and universities

Central European Centre for Women and Youth in Science • coordinator: the *Institute of Sociology*, participants: research institutions from new EU member states

PEACE-COM – Peace Processes in Community Conflicts: From Understanding the Roots of Conflicts to Conflict Resolution • coordinator: Université catholique de Louvain, Belgium; participants: the *Institute of Ethnology* and research institutions from 8 European countries

ProAct (Practical Regional Innovation Policy in Action: the Efficient Tools for Regional Catching-up in New Member States) • coordinator: GKI Economic Research Co., Budapest, Hungary; participants: the *Institute of Philosophy* and 16 other European establishments

Phylogeography of the Orkney vole, *Microtus arvalis orcadensis* (Phylomicrotus), Marie Curie Intra-European Fellowship • coordinator: University of York, U. K., participants: the *Institute of Vertebrate Biology*

Constellation: The Origin of Stellar Masses, Marie Curie Research Training Networks • coordinator: University of Exeter, U. K.; participants: the *Astronomical Institute* and 12 British, French, Portuguese and German institutions

Integrated Design of Catalytic Nanomaterials for a Sustainable Production (IDECAT) • coordinator: Consorzio Interuniversitario Nazionale per la Scienza e Tecnologia dei Materiali, Italy; participants: the *J. Heyrovsky Institute of Physical Chemistry* and 16 other establishments from 11 countries

Consumption, Household Welfare and the Dynamics of Property Prices • coordinator: the *Economics Institute*

Knowledge, Institutions and Gender: an East-West Comparative Study • coordinator: the *Institute of Sociology*

EU –
Marie Curie

EC –
Network of
excellence

EU – STREP

Expressions of Risky Geomorphologic Processes in Deformations of Rock Structures at Machu Picchu (International Consortium on Landslides) • participants: the *Institute of Rock Structure and Mechanics*, the Faculty of Science at Charles University and six other foreign establishments

UNESCO/IUPAC Postgraduate Course in Polymer Science • coordinator: the *Institute of Macromolecular Chemistry*; participants from 10 European and non-European countries

Linguistic Atlas of Europe • coordinator: the Romanian Academy of Sciences; participants: the *Institute of the Czech Language* and institutions from other European countries

Physics of Linear, Nonlinear and Active Photonic Crystals • coordinator: Università La Sapienza, Rome, Italy; participants: the *Institute of Photonics and Electronics* and research organisations from 25 European countries

Multiscale Modelling of Materials • coordinator: Universita Lappeenranta, Finland; participants: the *Institute of Physics of Materials*, the *Institute of Plasma Physics* and research organisations from 12 EU countries

Urban Canopy: Data set Collection and Development • coordinator: the *Institute of Thermodynamics*; participants: science establishments from 22 EU countries

Mitigation of Ionospheric Effects on Radio Systems • coordinator: Université de Rennes, France; participant: the *Institute of Atmospheric Physics*

Control of Stress and Interferon Regulated Gene Expression by Transcription Factors, Histone Modification and Nuclear Compartmentalization, Eurodyna (ESF) • coordinator: Universität Wien, Austria; joint participant: the *Institute of Molecular Genetics*

National Histories in Europe; Overlapping National Histories: Confrontations and (re-)conciliations • coordinator: University of Oxford, U. K., ESF; participants: the *Institute of History* and partners from Poland and Germany

Greek-Old Church Slavonic Lexicon-Index • coordinator: the *Institute of Slavonic Studies*; participants: 4 departments from European countries

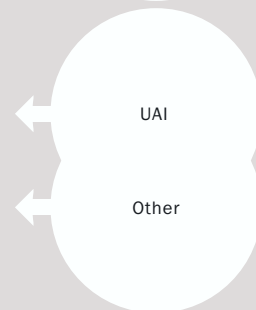
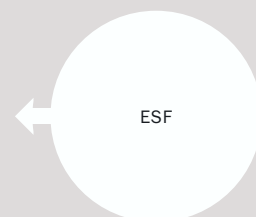
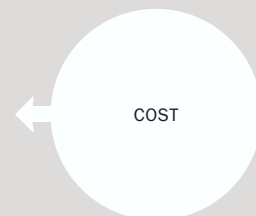
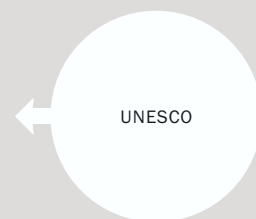
Urban Problems of Historic Cities • coordinator: Regional Ministry of Wallonia, the University of Liege; participants: the *Institute of Theoretical and Applied Mechanics* and institutions in Belgium

Functional Optimization and Nonlinear Approximation by a Neural Network • participants: the *Institute of Computer Science* and research establishments in Italy

Secondary Conic Crack Formation during Biaxial Bend Test of Ceramics (AktION/KONTAKT programme) • participants: the *Institute of Physics of Materials*, the *Institute of Plasma Physics* and Austrian institutions

The Use of Nuclear Analytical Methods for the Studies of Khmer Monuments in Angkor, Cambodia (as part of the European Consortium for Asian Field Study) • coordinator: Ecole Française d'Extrême Orient, France; participants: the *Nuclear Physics Institute* and research establishments from 7 European countries

Geoscience in the Service of Society (program IGCP): Devonian Land-Sea Interaction: Evolution of Ecosystems and Climate in the Devonian • participants: the *Institute of Geology*, the Faculty of Science at Charles University in Prague and research organisations from 30 countries



Semiconductor Nanospintronics (program NANOSPIN) • coordinator: the University of Würzburg, Germany; participants: the *Institute of Physics* and other research organisations from 4 European countries

Polar Earth Observing Network (POLENET/LAPNET programme) • coordinator: Universita Oulu, Finland; participants: the *Institute of Geophysics* and institutions from 24 EU countries

Passive seismic experiment in the sphere of trans-European suture (PASSEQ programme) • coordinator: the University of Warsaw, Poland; participants: the *Institute of Rock Structure and Mechanics*, the *Institute of Geophysics* and institutions from 11 European countries and the USA

Fogarty International Research Collaboration Award (Fogarty International Center and National Institute of Environmental Health Sciences) • coordinator: University of North Carolina and U. S. EPA, Research Triangle Park, North Carolina, USA; participant: the *Institute of Analytical Chemistry*

Synthesis of weakly nucleophilic Anions of $[CB_nH_{n+1}]^-$ Type in the Series of Deltahedral Carbaborate Anions (NSF programme) • coordinator: University of Colorado at Boulder, USA; participant: the *Institute of Inorganic Chemistry*

Collaboration in Energy and Nanoscience (KONTAKT programme) • coordinator: the *Institute of Organic Chemistry and Biochemistry*; participants: research establishments in the Czech Republic and USA

Genetics of Risk Factor Clustering in Hypertension, Genetic and Receptor Mechanisms in Hypertension (NIH programme) • coordinator: University of California, San Francisco, USA; participants: the *Institute of Physiology* and two other research establishments from the USA and U. K.

Inducible Protein Expression in Soybean Seed, Missouri–Illinois Soybean Board, USA • coordinator: Donald Danforth Plant Science Center, St. Louis, Missouri, USA; participant: the *Institute of Experimental Botany*

Model of Huntington Disease in Pigs (High Q Foundation, New York, New York, USA) • coordinator: the *Institute of Animal Physiology and Genetics*; participants: 4 research establishments from the USA and Italy

Development of a Genetic Sexing System in the Codling Moth, Improvement of Codling Moth SIT to Facilitate Expansion of Field Application (IAEA) • coordinator: IAEA, Vienna, Austria; participants: the *Biology Centre* and 12 institutions from 9 countries

Stability and Foreign Banks: Friends or Foes? • umbrella organisation: the World Bank; participant: the *Economics Institute*

The Influence of EU Law on the Legal Orders of Central European Countries • umbrella organisation: the Austrian Federal Ministry for Education, Science and Culture; coordinator: the *Institute of State and Law*; participants: another 6 European institutions

Corpus of Roman Findings on the Territory of Moravia • coordinator: the *Institute of Archaeology, Brno*; participants: 20 research establishments from Europe

Early Agricultural Remnants and Technical Heritage • coordinator: Centre d'Etudes Préhistoire Antiquité et Moyen-Age, Valbonne, France; participants: the *Institute of Archaeology, Prague*, and 50 other institutions from 22 countries

Around 68: Activism, Networks, Trajectories • coordinator: University of Oxford; participants: the *Institute of Contemporary History* and other institutions from 8 European countries

Philosophy and Social Science • coordinator: the *Institute of Philosophy*; participants: 6 establishments from European and non-European countries

Christianisation and the Rise of the Christian Monarchy: Scandinavia, Central Europe and Russia ca. 900–1200 • coordinator: University of Cambridge, U. K.; participants: the *Institute of Philosophy* and 13 partners from 7 countries

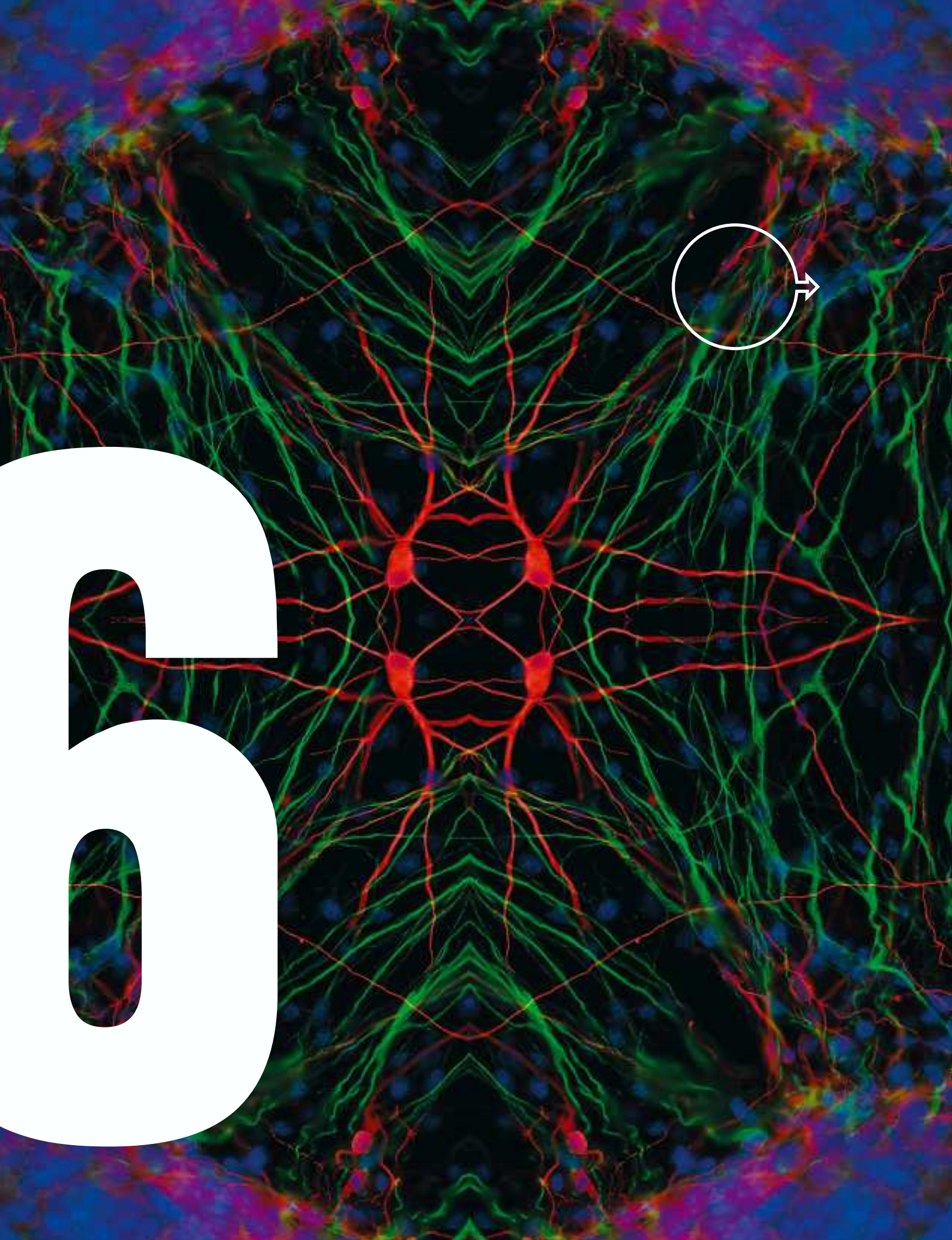
Dynamic Structure: Language as an Open System • umbrella organisation: the Centre for Theoretical Studies at Charles University, Collegium Helveticum, Zürich; participants: the *Institute of Czech Literature* and other establishments from 2 European countries

	1	2	2a	3a	3b	3c	4	5	6	7	8	8a
Section 1	32	2 505	2 382	743	202	402	19	125	133	203	61	41
Section 2	25	822	603	399	101	183	26	62	89	47	38	40
Section 3	15	574	484	353	51	237	8	54	77	35	35	6
Total	72	3 901	3 469	1 495	354	822	53	241	299	285	134	87
Section 4	34	1 403	1 352	354	106	697	23	89	86	98	58	39
Section 5	40	1 463	1 037	403	160	731	18	142	88	132	88	50
Section 6	19	719	636	284	88	392	15	112	88	54	51	29
Total	93	3 585	3 025	1 041	354	1 820	56	343	262	284	197	118
Section 7	24	331	336	335	139	12	14	15	36	77	25	17
Section 8	42	405	324	269	182	13	6	33	66	33	24	4
Section 9	37	327	250	286	149	9	20	85	47	129	12	8
Total	103	1 063	910	890	470	34	40	133	149	239	61	29
Total other	0	13	13	0	0	0	0	0	0	0	1	1
ASCR total	268	8 562	7 417	3 426	1 178	2 676	149	717	710	808	393	235

Overview of international scientific cooperation activities at ASCR institutes

1. Number of conferences attended by scientists from other countries (organised or jointly organised by an institute)
2. Number of journeys abroad undertaken by staff members of institutes
- 2a. number of these without bilateral agreements
- 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 the bodies of international governmental and non-governmental science organisations (societies, committees)
7. Number of lectures given by foreign guests at institutes
8. Number of grants and projects financed from abroad
- 8a. number of these from EU programmes

60



6

Public Tenders in Research and Development

The year 2007 was no different from other years in that the ASCR and the Grant Agency of the ASCR (GA AS) organised public tenders in the sphere of research and development for the allocation of funds for programme and grant projects. The basic difference between programme and grant projects lies in the fact that the content of programme projects must meet the objectives of the programme specified during the announcement process itself, whereas grant projects draw on the work of individual researchers. Funding for individual projects was provided exclusively based on the results of public tenders. Specific financial resources allocated from the budget chapter of the ASCR were used to fund projects that successfully passed through the tender process. A total of 542.7 million CZK was used in 2007 to fund programme projects and 345.4 million CZK to fund grant projects.

Programmes announced by the ASCR

Work continued on projects of the **Information Society** programme (a thematic programme) and on **Support of Targeted Research Projects** (a sub-programme of the sectional programme entitled "Integrated Research") classified under the National Research Programme I (NRP I). Funding provided for work on 70 continuing projects in the Information Society programme in 2007 amounted to 171.3 million CZK. A total of 53 projects continued as part of the Support of Targeted Research Projects programme, with funding totalling 72.7 million CZK. Work on the first 6 projects of the Information Society programme was completed by 31st December 2006, with the Programme Council having deemed one project completed with outstanding results. Contracts for using results of research and development were signed with the persons responsible for completing the projects, with performance to be monitored every year for three years following completion.

There were 29 projects in the **Nanotechnologies for Society** programme: 15 projects in 2006 and 14 started during 2007. A total of 298.7 million CZK was invested in these projects in the year 2007. The ASCR announced another public tender for projects in this programme in May 2007, scheduled to begin 1st January 2008. Seventeen proposed projects were submitted; the Programme Council recommended that nine be funded. The Council had around 67 percent of the requirements of these projects and entered into negotiations with the project applicants to shift some of the funds for the purchase of investments from the first to the second year of project solution. That leaves 95.8 million CZK in 2008 for the 9 funded projects after these modifications.

Projects of the Grant Agency of the ASCR

Special funding from the ASCR budget totalling 346 million CZK was used for the GA AS in 2007, including funds for the acquisition of investment equipment. This total was divided as follows: 162 million CZK for funding implementation of newly-initiated grant projects and 184 million CZK for continuing projects.

Funding for newly-initiated grant projects

Work on 157 standard research grant projects which began on January 1st 2007 totalled 113.6 million CZK. A separate category of “inter-disciplinary” projects was set up for the first time in 2007 to supplement specialisation-oriented projects. Such projects are designed to improve cooperation between ASCR departments and universities. Four projects were allocated 5.4 million CZK. One hundred junior projects were allocated 41.3 million CZK. Meanwhile, 1.5 million CZK funded 8 supplementary publication grant projects. (Detailed information on the success of individual disciplines and on the financial resources allocated is found in tables 1 and 2.)

Standard research grant projects initiated on 1st January 2007

	Discipline	Number of proposals	Number of projects financed	Percentage of projects financed	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	6 574
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	113 596
X	Inter-disciplinary projects	15	4	26,7	5 398

Junior research grant projects initiated on 1st January 2007

	Discipline	Number of proposals	Number of projects financed	Percentage of projects financed	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	11	36,4	5 281
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	2 768
	Total	266	100	38,0	41 300

Assessment of completed and continuing grant projects

At the beginning of 2007, the Departmental Councils of the GA AS evaluated the standard of project work, the quality of results of grant projects completed by December 31st 2006 and the progress of grant projects continuing in 2007. The evaluation was based on investigators' reports of these projects, supplemented with offprints of the most significant work.

A total of 83 standard research grant projects covering 2 up to 5 years were completed to the end of 2006. The results of 38 projects were evaluated as outstanding, whilst the aims of 5 projects were not met. An average of 8.7 publications per project was issued, the majority of publications in prestigious, reviewed periodicals. Forty-four junior research grant projects were completed after 1 up to 3 years. The results of 13 of these were deemed outstanding. The number of published results per project was 3.4.

The Departmental Councils also assessed the progress of 253 standard and 118 junior research grant projects and in all cases recommended continuation in 2007. All 9 supplementary publication grant projects were successfully completed.

The progress and results of public tenders in the year 2007

The Grant Agency of the ASCR organised the XVIII round of tenders for funding new grant projects in 2007. The Agency focused on standard (including inter-disciplinary) and junior research projects. No public tender for supplementary publication grant projects was announced consistent with a resolution of the Czech government on the proposed expenditure of the state budget in 2008 with regard to 2009 and 2010. An Extended Board of Directors of the GA AS decided on the results of public tenders in accordance with the relevant Statutes of the GA AS. These decisions were based on waiting lists of Departmental Councils, which mainly drew on evaluations of submitted project proposals by external evaluators and on their own assessments of proposals conducted even before the results of external evaluations were known.

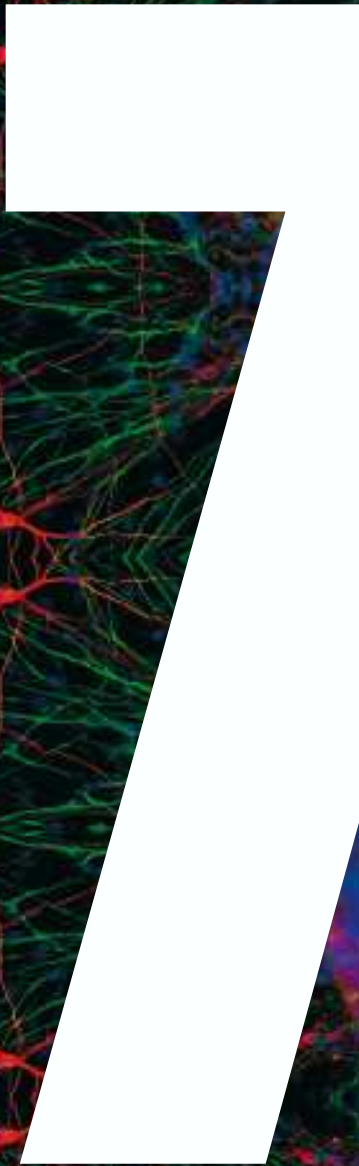
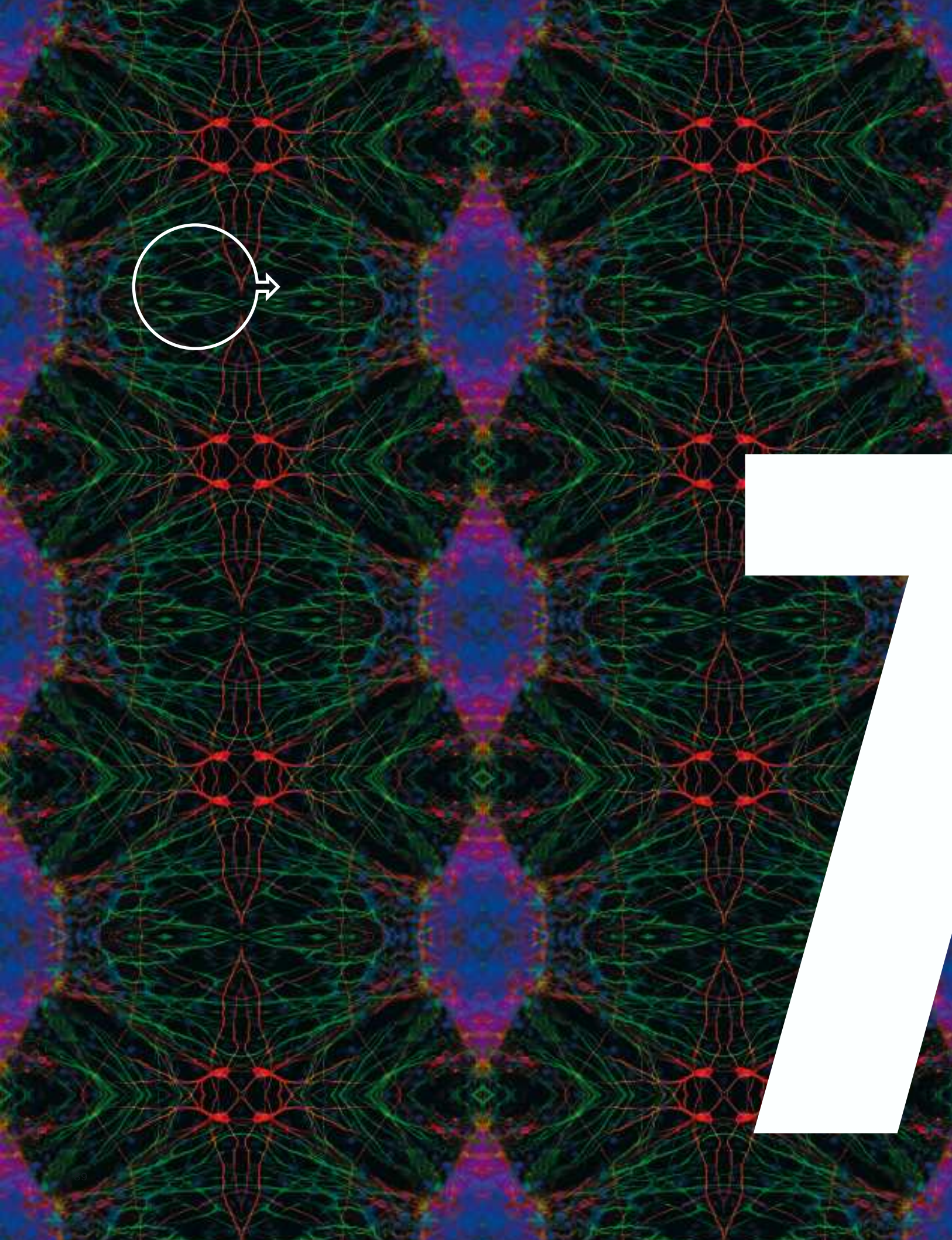
A total of 467 proposals were submitted to public tender for standard research grant projects (one 1 project submitter withdrew his proposal). A separate category of inter-disciplinary projects was again set up and the 15 proposals accepted. A total of 356 proposals were received under the tender for junior research grant projects.

A total of 6700 evaluators (2840 from the Czech Republic and 3860 from abroad) were contacted to evaluate 837 proposed research grant projects received as part of tenders; Reports totalling 1454 were received from evaluators in the Czech Republic and 1378 reports from foreign evaluators, *i.e.*, an average of around 3.4 reports for each proposed project. Unfortunately we are obliged to say that the willingness of the experts contacted to prepare an evaluation has fallen in recent years, not only for the GA AS but for other grant agencies in the Czech Republic, too.

The Extended Board of Directors of the GA AS decided to fund 121 standard projects (26 percent of the proposals received), 6 inter-disciplinary projects (40 percent of the proposals received), and 76 junior research grant programmes (21 percent of the proposals received), all as part of the tender.

Interest in receiving funding from the GA AS for both types of grant research project has risen every year since 2004. The success rate for this type of grant project was relatively high for public tenders

announced in 2006 at around 37 percent thanks to the overall amount of funds which the GA AS had at its disposal for 2007. The success rate in public tenders announced in 2007 fell to 24 percent mainly as a result of the higher number of proposed projects submitted and the financial demands of the bidders. This situation cannot be regarded as satisfactory. A new method of calculation was adopted in 2007 for dividing funds among Departmental Councils which takes into consideration the total financial demands of proposals submitted to a given Departmental Council during a public tender and the volume of funding provided to this Council over the previous three years. This method of calculation is simpler and more transparent than the algorithm used over the past few years, mainly because it does not take into account the “implementation capacity”, which information was rather too virtual.



Communication and Public Relations

7

The results of activity at ASCR Institutes were again presented to experts and the general public of all age groups during the year 2007. The breadth, span and intensity of communications activities is borne out by regular monitoring of the press – 7974 reports were published in 2007 featuring the key phrase ASCR and its forms, *i.e.*, an average of 660 articles a month or 22 a day.

To publicise its activities, ASCR Institutes used a range of tried-and-trusted joint events, such as the regular Science and Technology Week or Open Days, and organised specific events which draw on the particular focus of their activities, for example, “Intellectual Olympics” for pupils at primary schools or specialised seminars for specific target groups of specialists in a given discipline (for example, colloquia on the theory of circuits, systems and signals, at the *Institute of Photonics and Electronics*).

Some 100 lectures (40 in Prague) and a range of other events, such as conferences, exhibitions, seminars, presentations, etc., took place as part of the seventh **Science and Technology Week**, which was held between 1st and 11th November 2007 in Prague, Brno, Ostrava, České Budějovice and Olomouc. **Open Days** took place at 50 ASCR Institutes and were visited by 26 500 people (the corresponding figure in the year 2006 was 17 000 visitors).



Not every light is the same, in other words, how plants see it. Presentation prepared by the Institute of Experimental Botany during the 7th year of the Science and Technology Week

photo by
Dorothea Bylica,
archiv SSC



The presentation, "Coded Fotometric Stereo," a description of a surface in three dimensions, aroused the interest of participants of the 7th year of the Science and Technology Week

photo by P. Velek, archiv KAV

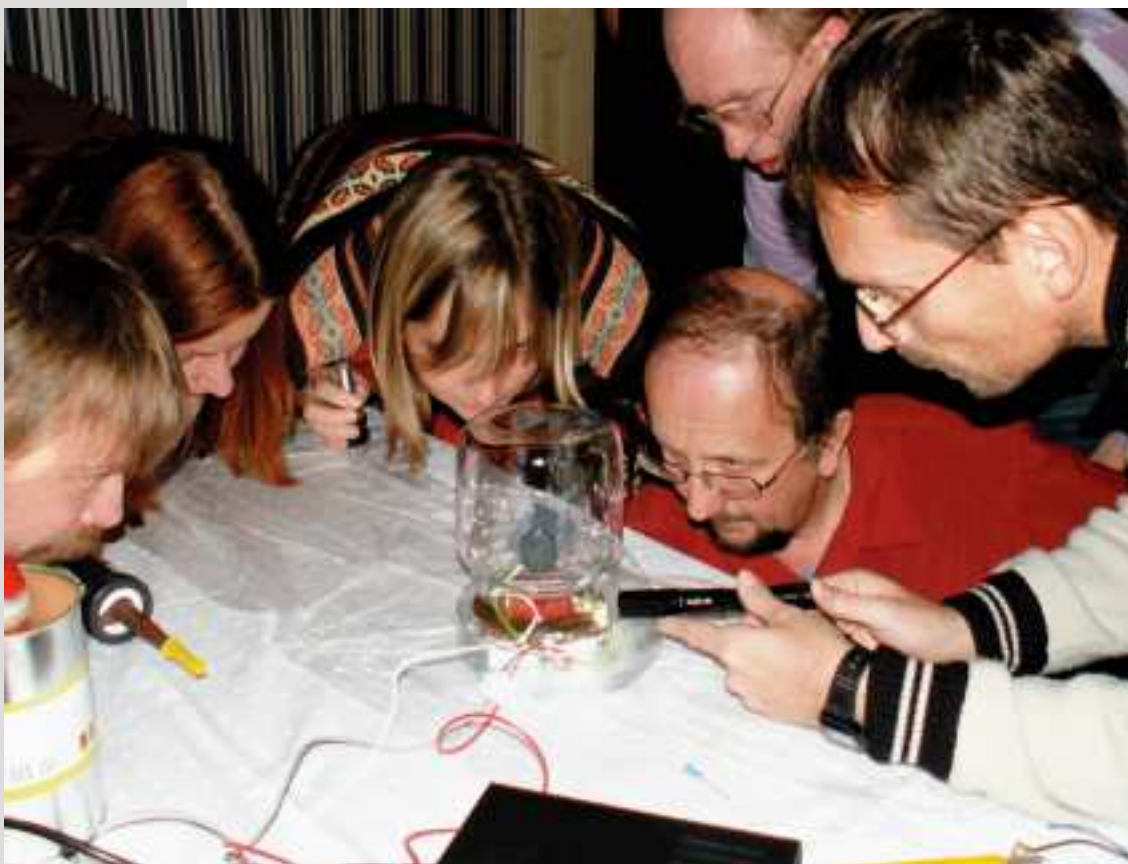
Another regular activity was the 9th Annual **European Brain Week** in March 2007, which this year involved 11 lectures attended by 1500 students and the general public.

The ASCR hosted a total of 30 **press conferences** in 2007. Among the most successful was the conference with a holder of the Nobel Prize for Physics, Professor James W. Cronin and the conferences on European Brain Week, International Heliophysical Year, Czech Archaeology Abroad and 50 Years of the Space Age. A round table meeting was held in association with the Czech Christian Academy on the topic of "What Science Today Offers Theology and What Theology Offers Science" as part of the "Science and Faith" cycle. It was attended by more than 100 people. Some 132 **press releases** were issued on a wide range of disciplines at the ASCR, 10 **lectures** were organised in continuance of the **Academic Prague** cycle (in cooperation with Charles University) and 10 lectures were staged as part of the **Don't Be Afraid of Science** cycle for secondary school pupils.

As part of a continuing project entitled **Open Science**, the Academy of Sciences of the Czech Republic together with the Faculty of Science of Charles University, the Faculty of Electrical Engineering of the Czech Technical University in Prague, the Czech Society of Biochemistry and Molecular Biology, and Krátký film Praha, a. s. (Short Film Prague) organised practical courses and multidisciplinary seminars for more than 300 secondary school teachers. 150 selected secondary school students could participate in scholarships on different scientific institutes. Indeed many of these students successfully presented their research at 2nd international science festivals and in international science competitions. An **interactive instructional DVDs** in biology, physics and chemistry were also created based on communication between research workers and target groups. This DVD can be used for teaching purposes or self-study.

Press conferences

Open Science



Open Science in Regions.
Practical physics courses for teachers in Nové Hradý

photo by T. Palatý,
archiv KAV

The **Open Science to Regions**, which is intended for secondary school teachers from around the Czech Republic (with the exception of Prague), was a continuation of this project. Practical courses for teachers were offered in Nové Hradý and a multidisciplinary seminar in Třešř.

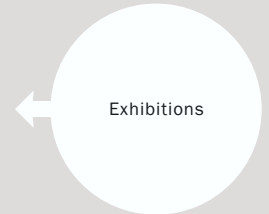


Open Science in Regions.
Practical biology courses for teachers in Nové Hradý

photo by A. Martinková, archiv KAV

Both projects were very effectively promoted by the following media partners: Český rozhlas 1 – Radiožurnál (Czech Radio 1 – Radio Journal), Český rozhlas Leonardo (Czech Radio – Leonardo) and the magazines *Živa* and *21. století* (21st Century).

Eleven **exhibitions** were organised at the head office building of the ASCR, five of these in cooperation with ASCR Institutes with five staged by renowned artists. A collection of projects whose central topic was Fascination of Light was prepared for Science and Technology Week 2007. Among the most successful events were an exhibition by the *Institute of Archaeology, Brno* entitled “The First Common Culture in Europe – the Roman Province from the Atlantic to the Black Sea” and an exhibition of a “Quartet of Czech Astronomers and their Discoveries in Comet Research”, which was prepared by the Society for the History of Science and Technology. Of the art exhibitions, the greatest acclaim was reserved for the Graphic Art of Alena Antonová, pupil of Emil Filla (one of the exhibitions to mark the 125th anniversary of Filla’s birth), an exhibition of the “Photographic Work of Miroslav Jodas” to mark his 75th birthday and an Advent-time exhibition of “The Tapestries, Ceramics and Jewellery of Marie Jiříčková”. One exhibition was dedicated to work done by people with autism.



ASCR building’s exhibition hall on Národní Street was the site of the exhibition “Quartet of Czech astronomers and their discoveries in Comet research”

photo by Dorothea Bylica, archiv SSČ

Individual Institutes at the ASCR also contributed to the communication of results through their own activities. The work of the *Astronomical Institute*, for example, commemorated the anniversary of 40 years of the two-metre telescope and International Heliophysical Year. This Institute took part in **European Scientists’ Night** sponsored by the EU and **Science on the Streets**. Meanwhile the *Institute of*





Academic
cafés

Philosophy was joint organiser of the **European Festival of Philosophy**, “Change and Constancy – Philosophy and the Modern World”, in the town of Velké Meziříčí.

Academic cafés and **launches of new books** published by ASCR Institutes as organised at sales outlets of the Academia, the Academy’s publishing firm, and the Centre for Joint Activity were also used for public relations and communications activities. Two Academic cafés were staged in 2007, with discussions dedicated to the past, present and future of forests and bio-economics as a popular, prospective and essential phenomenon of today. Around 120 other communication and public relations events were organised. One of the most successful was the launch of the publication entitled “Paměti I.–III. E. Beneše” (Eduard Beneš – Memoirs I–III).

ASCR staff members organised lectures for experts and the general public and prepared exhibitions (*Codex Gigas: the Devil’s Bible* – a joint participation of the *Institute of Philosophy*), “Romans and Germans in the Region beneath Pálava”, *Institute of Archaeology, Brno*, and “The Story of Prague Castle”, *Institute of Archaeology, Prague*. A number of lectures and exhibitions originated at the invitation of cultural, scholastic, educational, civic and religious institutions; for example, the “Beginnings of the Medieval Skuteč Area”, the Town Museum in Skuteč (*Institute of Archaeology, Prague*); the archaeology of the Chrudim Region, the Regional Museum in Chrudim (*Institute of Archaeology, Prague*); and training for the administrators of rocks of the Republic High Commission of the Czech Mountaineering Association (*Institute of Geology*).



Specific
events

A number of **specific events** were also staged with the participation of staff at the ASCR, for example, Science Day at Prague universities (*Institute of Information Theory and Automation*), Summer School, the development and application of the SBRA (structural) method (*Institute of Theoretical and Applied Mechanics*) and Innovation in atom absorption and fluorescent spectroscopy (*Institute of Analytical Chemistry*). The Mendel Lectures, given by world experts, also continued in 2007 (*Institute of Molecular Genetics*).

The number of seminars increased in 2007 including the “Fundamentals of Electron Microscopy” (*Institute of Scientific Instruments*) and “Current Problems with the Physics of Low Temperatures” (*Institute of Inorganic Chemistry*). The *Institute of Microbiology* offered lectures, talks with patients featuring the testing of blood sera of family members for the Association of Patients with Celiac Disease. The *Institute of Atmospheric Physics* provided expert consultancy for Czech Television or the public hearing of “What Should the Future Policy of the Czech Republic and the EU be in the Sphere of Global Climate Change?” at the Senate of the Parliament.

Some public relations events focused directly on the **pupils at primary and secondary schools**, for example excursions to the observatory of the *Institute of Atmospheric Physics* at Panská Ves, running biology clubs (*Institute of Microbiology*), or a week-long study residence at departments of the *Institute of Physics*. The *Institute of Geonics* and *Institute of Archaeology, Prague* took part in the **University in the Third Age** programme. Meanwhile the *Institute of Ethnology* is conducting an eight-semester cycle of lectures scheduled from 2004 to 2008 as part of the **University of Free Time**.

The **Language Advice Centre** of the *Institute of the Czech Language* fulfils a specific function. Its staff dealt with more than 9500 e-mails in 2007 and replied to an average of 40 telephone calls daily. They also prepared 20 lessons of a Czech language course entitled Czech at Work for *Lidové noviny* newspaper, worked on the “O češtině” (About Czech) programme for Czech Television, worked on language courses for Český rozhlas Plzeň (Czech Radio, Pilsen), and so on.

In addition to lectures, articles in the daily press and popular/educational magazines and appearances on radio or television, staff at the ASCR personally took part in the preparation of radio, television and

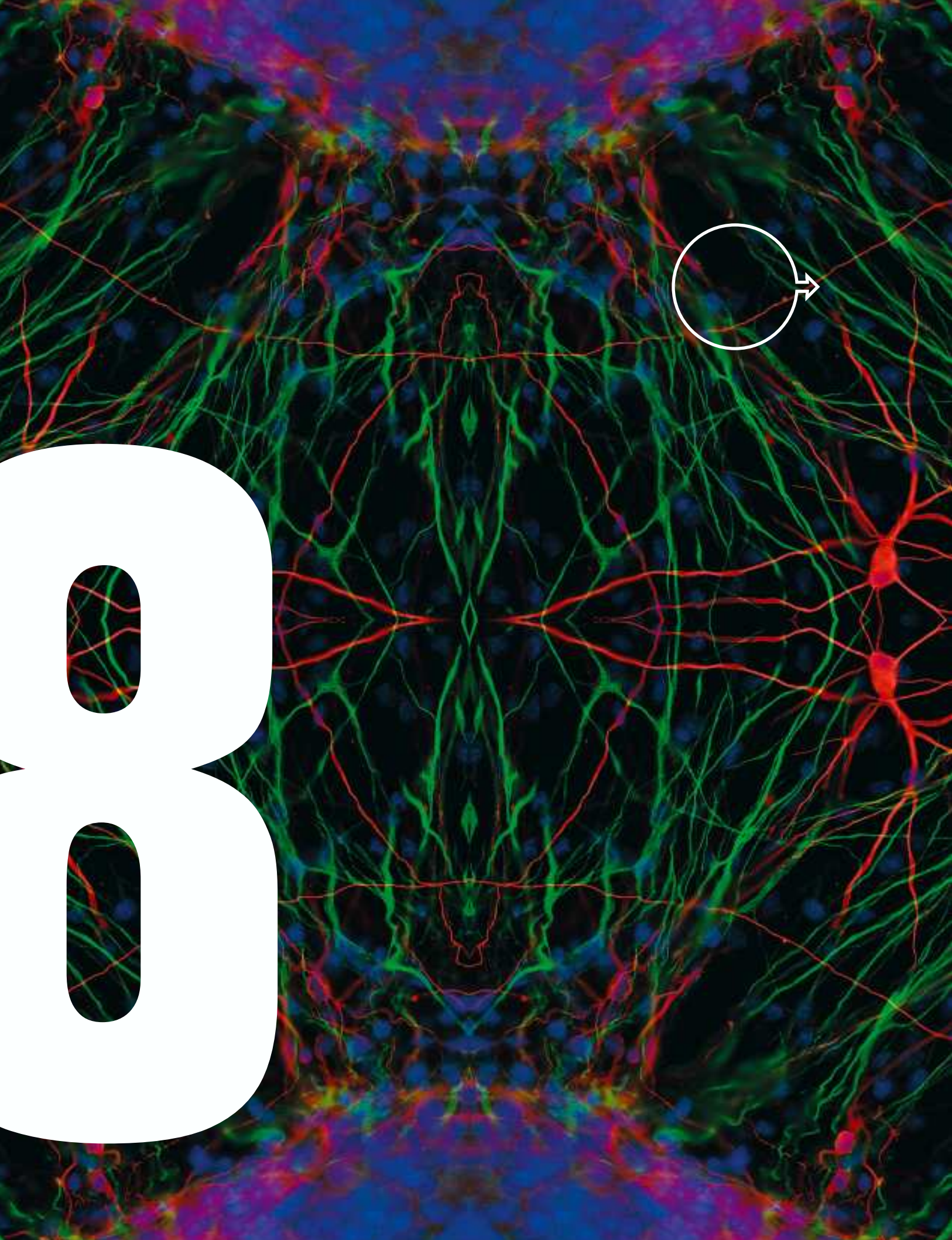


20 rules how to use correct written Czech

photo by archiv ÚJČ

documentary programmes or films, for example *Dvojí život knížete Václava* (The Dual Life of Prince Wenceslas) (*Institute of Archaeology, Prague*); *Historie.cs, Svědci a světci* (Witnesses and Saints), *Bílá místa v českých dějinách* (White Places in Czech History) (*Institute of History*); *Kam vedou aleje* (Where the avenues lead) (*Institute of Geology*); and *Kritický klub stanice Český rozhlas 3 – Vltava* (Czech Radio 3 – Vltava Critics Club) (*Institute of Czech Literature*) and wrote scripts, supplied expert consultancy and provided expert opinion, analyses and evaluations. The *Institute of Hydrodynamics* took part in the production of a short documentary video on the multidisciplinary cooperation of the ASCR with the Regional Authority of the Pardubice Region.

DVDs were also a common part of communication efforts, for example, *Vaccine Against Cervical Cancer* (*Institute of Microbiology*), a DVD on teaching modern directions in physics (*Institute of Physics*) and *Pictures from Czech History from 1914 to 2004* (*Institute of History*).



8

Summary of the Use of Financial Resources

After seven long years in which the relative level of funding for research and development from the state budget fluctuated between 0.52 and 0.57 percent of gross domestic product, this value finally rose to 0.61 percent for the year 2007 (according to the current estimate of GDP).

This was also reflected in the total expenditure of the budget chapter at the ASCR, which rose by 19.3 percent year-on-year. A major share in this takes the form of special funds intended for public tenders in research and development. It was important for the institutes at the Academy of Sciences that following the stagnation of previous years the amount of money for research and the evidence of activity at the ASCR also rose. Although the information for 2007 is certainly pleasing, it is also important to impartially point out that the considerably uneven development of funding for research and development from public sources in recent years has undoubtedly not aided the effective utilisation of these funds.

All institutes of the ASCR functioned as public research institutes for the first time in 2007. Thanks to thorough previous preparation and the major efforts of new steering committees at institutes and their economic management, this fundamental change proceeded without any major problems. By and large the institutes coped well with the new rules and conditions and are to be commended. The smooth development of the institutes was not disrupted and essential changes and modifications had no negative influence on the quality and scale of scientific performance or on the results of economic activity.

The ASCR operated with a total of 9012.6 million CZK in the year 2007, 5707.7 million of which came from the organisation's own budget chapter.

The institutional funds provided for research objectives and for the assurance of the research infrastructure was 83.6 percent of the total budget. The total volume of specific resources obtained in public tenders for research and development rose by more than one-third in comparison with 2006. A total of 1425,1 million CZK was directly transferred to ASCR institutes from other budget chapters in this manner without budget measures pursuant to Act No. 130/2002 Coll. on Funding Research and Development.

The non-investment funds of the ASCR in 2007 were generated as follows: 56.3 percent resources of its own state budget chapter, 18.3 percent transfers from other state budget chapters and 25.4 percent from its own revenues and extra-budgetary funds. The share of the final two elements here rose considerably in comparison with the previous year.



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
2007	0.61

The investment funds of the ASCR were generated as follows: 95.1 percent resources from its own state budget chapter and 4.9 percent transfers from other state budget chapters.

5 666,5	4 133,7	1 532,8	
1	2	3	ASCR chapter budget
1 433,6	1 352,4	81,2	
1	2	3	Subsidies from other budget chapters
1 871,3	1 871,3		
1	2	3	Own resources of research and service departments
The structure of ASCR's financial resources in 2007 (in million CZK)			
1	2	3	Total
			Non-investment funds
			Investment funds

The structure of financial resources (in million CZK)		Non-investment	Investment
		funds	funds
Approved chapter budget		4 270.2	1 347.0
Amended ASCR chapter budget		4 133.7	1 532.8
of this amount, subsidies to public research institutions		3 708.7	1 380.9
subsidies to the ASCR Head Office		425.0	151.9
Subsidies from other budget chapters		8.5	
Sources of the ASCR chapter reserve fund		12.9	28.3
Subsidies from other budget chapters (pursuant to Act No. 130/2002 Coll.)		1 343.9	81.2
of this amount, Czech Science Foundation grants		522.3	28.4
projects of other departments		821.6	52.8
Own resources of public research institutions		1 871.3	
of this amount, main activity orders		114.5	
sales of publications		150.3	
Sales of goods and services		192.4	
Licences		951.9	
Conference fees		20.0	
Foreign grants and donations		208.1	
Rental		48.8	
Own fund resources		89.3	
Other		96.0	
Total resources		7 370.3	1 642.3

The public research institutions of the ASCR used a total of 6479.2 million CZK to cover their own costs. This sum they took from overall yields of 6936.4 million CZK. In addition to covering any losses incurred in previous years, improved trading income of a total of 457.2 million CZK will primarily be used for the supplementation and renewal of instruments and equipment essential for the scientific pursuits of institutes.

Structure of the costs of public research institutions	%	million CZK
Employees' salaries and other payments for work done	41.18	2 668.1
Mandatory insurance paid by the employer	14.12	914.9
The purchase of material	15.30	991.6
The purchase of energy, water and fuels	3.12	202.4
The purchase of services	12.81	829.9
Repairs and maintenance	3.84	249.0
Travel expenses	3.29	213.1
Depreciation of fixed assets	0.29	18.5
The creation of targeted support fund	1.35	87.4
Other costs	4.7	304.3
The institutes of the ASCR used in total	100.00	6 479.2

The structure of the costs of public research institutions (classed as state contributory organisations until 2006) is stable and has remained unchanged for a number of years.

The creation of investment resources and their use

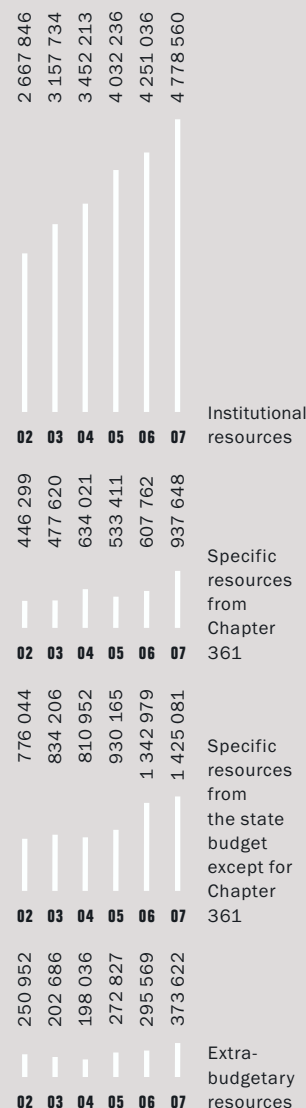
Sources of investment resources are primarily created through institutional and specific subsidies from the state budget. The data for the Academy of Sciences as a whole can be summarised as follows:

Total investment resources (in million CZK)		1 952.5
of this amount,	Depreciation	31.8
	Allocation of profit	87.5
	Recipients, joint recipients (pursuant to Act No. 130/2002 Coll.)	81.2
	Foreign grants and donations	190.9
	Subsidies from the state budget	1 391.5
	institutional	1 391.5
	specific	169.6
These resources were used to fund:		
	Buildings	985.2
	The acquisition of land	77.5
	The acquisition of instruments and equipment	760.2
	Maintenance and repairs	16.7
	Other	115.0
Total used on the acquisition of long-term assets		1 954.6
of this amount,	use of the Fund of Property Reproduction	2.1
Sum returned to the state budget		0.0

Given the stagnation of institutional financing expected according to the medium-term forecast, the ASCR used the relatively large increase in institutional expenditure in 2007 to ensure the significant strengthening of investment funds for building operations.

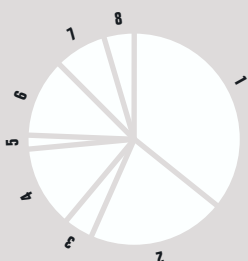
Analysis of employment and the drawing of wage funds

The total average monthly earnings in public research institutions in 2007 was 28 691 CZK, which represents a year-on-year growth of 7.33 percent.



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

The average monthly earnings in classification by category of employees in public research institutions are shown in the following table:



The structure of employees in public research institutions (in %)

- 1 Research workers 33,8
- 2 Other university-educated Research division workers 22,8
- 3 Specialist workers with university education 4,5
- 4 Specialist workers with secondary education and technical college 12,4
- 5 Specialist R&D workers with secondary education and technical college 2,1
- 6 Technical and financial employees 11,9
- 7 Manual workers 7,9
- 8 Operators 4,6

Category	Average adjusted number of employees	Average monthly earnings in CZK
Research workers	2 541	40 483
Other university-educated Research division workers	1 714	26 525
Specialist workers with university education	335	24 387
Specialist workers with secondary education and technical college	928	19 575
Specialist R&D workers with secondary education and technical college	161	21 692
Technical and financial employees	895	26 330
Manual workers	592	15 218
Operators	345	13 788
Total	7 511	28 691

An analysis of wage resources demonstrates that 68.4 percent of all payroll costs were paid from the institutional resources of public research institutions in 2007.

Inspection activity

The aim of inspection activity is primarily to ensure that legislation and the internal measures adopted is/are observed in the management of public funds and to make sure that public funds are protected from risk.

The inspection department undertakes internal audits of the accounting of projects from the 6th EU Framework Programme based on the approval of the competent body of the EU. The volume of verified financial resources last year stood at 78.7 million CZK. Twenty-seven certificates on audits performed were issued.



Appendices

Survey of Information Placed on ASCR Web Site

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1

- Basic characteristics of the ASCR** • <http://www.cas.cz/zinfo.php>
- ASCR History** • <http://www.cas.cz/historie.php>
- ASCR Annual Reports** • http://www.cas.cz/vyr_zpr.php
- Concept of Research and Development in the ASCR (updating for 2004–2008)** • http://www.cas.cz/koncepce_vav.php
- Act on Public Research Institutions** • http://www.avcr.cz/data/zinfo/neofic_uplne_zneni341.pdf
- Act on the ASCR** • http://www.cas.cz/zakon_avcr.php
- Statutes of the ASCR** • http://www.cas.cz/stanovy_avcr.php
- Code of Ethics for Researchers in the ASCR** • http://www.cas.cz/eticky_kodex.php
- Career Rules of University – Educated Employees of the ASCR** • <http://www.avcr.cz/karierni-rad-vysokoskolsky-vzdelanych-pracovniku-avcr.html>
- ASCR Structure** • <http://www.cas.cz/struktura.php>
- Academy Assembly** • http://www.cas.cz/akademicky_snem.php
- Academy Council** • http://www.avcr.cz/akademicka_rada.php?m=3
- Council for Sciences** • http://www.avcr.cz/vedecka_rada.php?m=3
- Advisory and Auxiliary Bodies of the ASCR** • <http://www.cas.cz/ostatni.php?m=3&ID=88>
- Register of Public Research Institutions** • <http://rvvi.msmt.cz/>
- ASCR Head Office** • http://www.kav.cas.cz/gen.php?page=o_nas
- Grant Agency of the ASCR** • <http://www.gaav.cz/>
- Prizes and Distinctions** • <http://www.avcr.cz/ostatni.php?m=4-10&ID=4-10-01-00>
- Awarding the scientific Degree “Doctor of Science”** • <http://www.avcr.cz/ostatni.php?m=5&ID=5-03-00-00>
- Doctoral Study Programmes Conducted at ASCR Institutes in cooperation with Institutions of Higher Education** • <http://www.cas.cz/ostatni.php?m=5&ID=5-01-00-00>
- Research plans solved in 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 activity of ASCR Institutes** • <http://library.sk/aRL/main.php?language=czech&ictx=cav>
- Journal published by the ASCR** • <http://www.lib.cas.cz/vydano-avcr/Vydano-v-Akademii-ved-CR/casopisy-vydavane-v-akademii-ved-cr/>
- List of experts from ASCR Institutes** • <http://www.cas.cz/experti.php>
- List of ASCR Institutes qualified for expert activities** • http://www.cas.cz/pracoviste_pro_znaleckou_cinnost.php
- The Learned Society** • <http://www.learned.cz/>
- Council of Scientific Societies** • <http://www.cas.cz/rvs>

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Number of ASCR Institutes and Employees by Section

	Number of institutes in 2006	Average adjusted number of employees in 2006				Average adjusted number of employees in 2007			
		of research and development with university education		of research and development with university education					
		total	total	total	total				
		number	%	number	%	number	%	number	%
1. Mathematics, physics, and computer science section	6	1 322.8	17.8	735.1	18.3	1 335.1	17.5	795.5	18.7
2. Applied physics section	7	831.5	11.2	436.4	10.9	823.7	10.8	450.5	10.6
3. Earth sciences section	5	477.3	6.4	260.7	6.5	464.4	6.1	276.4	6.5
4. Chemical sciences section	6	1 062.2	14.3	684.6	17.1	1 100.4	14.5	705.9	16.6
5. Biological and medical sciences section	7	1 490.9	20.0	832.9	20.8	1 555.8	20.4	908.0	21.3
6. Biological and ecological sciences section	4	781.7	10.5	392.0	9.8	797.0	10.5	405.8	9.6
7. Social sciences and economics section	5	227.9	3.0	130.1	3.2	315.5	4.2	132.9	3.1
8. Historical sciences section	6	393.1	5.3	211.0	5.3	396.7	5.2	217.6	5.1
9. Humanitarian sciences and philology section	6	449.2	6.0	322.2	8.0	465.8	6.1	362.2	8.5
Service departments (including the Head Office of the ASCR)	2	411.2	5.5	3.5	0.1	361.0	4.7	0.0	0.0
ASCR total	54	7 447.6	100.0	4 008.4	100.0	7 615.3	100.0	4 254.9	100.0

Overall Publication Results at the ASCR

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Type of publication	Publication results			
	Year of issue 2006		Year of issue 2007*)	
	Czech foreign languages		Czech foreign languages	
Books	225	52	186	48
Essays in books	967	319	887	308
Articles in science magazines	1434	3188	1242	2921
Proceedings from conferences	51	54	40	43
Papers in Proceedings	957	1655	623	1309
Translations		44		33
Reviews		332		329
Special articles in the daily press		241		206
Research reports		260		258

*) 2007 data are 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 are 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.

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ASCR Awards

Praemium Academiae 2007 was awarded to:

RNDr. Eduard FEIREISL, DrSc. – *Institute of Mathematics*

RNDr. Václav PETŘÍČEK, CSc. – *Institute of Physics*

Prof. MUDr. Jiří FOREJT, DrSc. – *Institute of Molecular Genetics*

Prof. Ing. Pavel HOBZA, DrSc. – *Institute of Organic Chemistry and Biochemistry*



Presentation of the
Praemium Academiae
2007.

V. Petříček of the
Institute of Physics
(left), commendation
speech is read by
A. Šimůnek

photo by Dorothea Bylica,
archiv SSC

ASCR
Awards

ASCR awards for outstanding scientific results of major significance were given to:

Team of authors from the *Institute of Information Theory and Automation* made up of: Prof. Ing. Jan FLUSSER, DrSc., Ing. Filip ŠROUBEK, Ph.D., RNDr. Barbara ZITOVÁ, Ph.D., Ing. Tomáš SUK, CSc., for scientific result: **Recognition of objects through fusion of images from different sources;**

Team of authors from the *Biology Centre* up of: Prof. RNDr. Julius LUKEŠ, CSc. – team leader, RNDr. Milan JIRKŮ, Silvie FOLDYNOVÁ-TRANTÍRKOVÁ, Ph.D., Mgr. Eva VONDROŠKOVÁ-HORÁKOVÁ, Ph.D., Mgr. Eva ZEMANOVÁ-CHOCHOLOVÁ, Ph.D., RNDr. Alena ZÍKOVÁ, Ph.D., for scientific result: **Function genomics, genotypization and molecular diagnostics of *Kinetoplas tida*, an order of flagellate protozoa, pathogenic human parasites.**

ASCR awards for Young researchers for outstanding achievements in scientific work were given to:

Ing. Petr CINTULA, Ph.D. (*Institute of Computer Science*) for scientific result: **Set of works on formal fuzzy logic and mathematics;**

Doc. Mgr. Luděk BLÁHA, Ph.D. (*Institute of Botany*) for scientific result: **Cyanobacteria blooms and cyanotoxins in reservoirs in the CR – trends and new toxicity mechanisms;**

PhDr. Jan ZOUPĽNA, Ph.D. (*Oriental Institute*) for scientific result: **From Jishuv to Israel. Forming of Israel power elites 1919–1949.** The following Czech and foreign scientists were awarded ASCR medals:



Presentation
of the ASCR
Awards at Villa
Lanna

photo by
Dorothea Bylica,
archiv SSC

The ASCR Honorary Medal “De scientia et humanitate optime meritis“:

Prof. RNDr. Helena ILLNEROVÁ, DrSc. – *Institute of Physiology*,
Prof. MUDr. Pavel KLENER, DrSc. – Internal Clinic of 1st Faculty of Medicine of the Charles University and
General Teaching Hospital,
Prof. Ing. Pavel KRATOCHVÍL, DrSc., Dr. h. c. – *Institute of Macromolecular Chemistry*,
Prof. RNDr. Josef PALDUS, DrSc., F.R.S.C. – University of Waterloo, Canada,
RNDr. Jiří VELEMÍNSKÝ, DrSc. – *Institute of Experimental Botany*.

Bernado Bolzano Honorary Medal for Merit in the Mathematical Sciences:

Doc. Ing. Jiří V. OUTRATA, DrSc. – *Institute of Information Theory and Automation*,
Prof. Dr. Pekka NEITTAANMÄKI – Jyväskylä University, Finland,
Prof. Dr. David PREISS – University College London, United Kingdom.

**František Křižík Honorary Medal for Merit in the Technical Sciences and for Implementation
of Scientific Research Results:**

Ing. Jiří NÁPRSTEK, DrSc. – *Institute of Theoretical and Applied Mechanics*,
Dr. Nicole JAFFREZIC-RENAULT – Claude Bernard Université, Lyon, France,
RNDr. Ivan ŠOLC, CSc. – *Institute of Plasma Physics*.

Gregor Johann Mendel Honorary Medal for Merit in the Biological Sciences:

Prof. RNDr. Jiří KOMÁREK, DrSc. – *Institute of Botany*,
RNDr. Ivana MACHÁČKOVÁ, CSc. – *Institute of Experimental Botany*.



J. Drahoš, vice-president of the ASCR, congratulates I. Macháčková of the Institute of Experimental Botany, who was given the G. J. Mendel Honorary Medal for Merit in Biological Sciences

photo by G. Stefániková, archiv SSČ

Jan Evangelista Purkyně Honorary Medal for Merit in the Bio-medicine Sciences:

Solomon L. MOSHÉ, M.D. – Albert Einstein College of Medicine, USA.

Karel Engliš Honorary Medal for Merit in the Social and Economic Sciences:

Prof. Orley C. ASHENFELTER, BA, PhD. – Princeton University, USA.

Josef Dobrovský Honorary Medal for Merit in the Philological and Philosophical Sciences:

Prof. PhDr. Ladislav MATĚJKA, Ph.D. – University of Michigan, USA.

František Palacký Honorary Medal for Merit in the Historical Sciences:

PhDr. Dušan KOVÁČ, DrSc. – Slovak Academy of Sciences, SR,
emerit. Prof. JUDr. Radomír V. LUŽA, Ph.D. – Tulane University, New Orleans, USA,
Prof. PhDr. Vojtěch MASTNÝ, Ph.D. – The George Washington University, USA.



Thomas DaCosta Kaufmann, professor of Art History at Princeton University (New Jersey, USA) receives the F. Palacký Honorary Medal for Merit in Social Sciences from J. Pánek, vice-president of the ASCR, on April 6, 2007

photo by Dorothea Bylica,
archiv SSC

Vojtěch Náprstek Honorary Medal for Merit in Science Popularization:

Mgr. Miroslav BOBEK – Czech Radio,
Mgr. Vladimír KOŘEN – Czech TV,
Doc. Ing. Jan KREKULE, DrSc. – *Institute of Experimental Botany*,
Mgr. Antonín VÍTEK, CSc. – *Library of the ASCR*,
PhDr. Dušan TŘEŠTÍK, CSc. – *Institute of History*.



V. Pačes, president of the ASCR, presents the V. Náprstek Honorary Medal for Merit in Science Communication to V. Kořen, editor of Czech Television

photo by Dorothea Bylica, archiv SSČ

Honorary Medal for Meritorious Services to the ASCR:

PhDr. Ivana KADLECOVÁ – *Library of the ASCR.*

Jan Patočka Memorial Medal:

PhDr. Ivan DUBSKÝ, CSc. – *Institute of Philosophy,*
Dr. Klaus NELLEN – *Institut für die Wissenschaften vom Menschen, Vienna, Austria,*
PhDr. RNDr. Jiří POLÍVKA – *Faculty of Philosophy and Arts, Charles University.*

On the other hand, the Academy Council annulled in 2007 the 2000 decision to award the J. Patočka Memorial Medal to PhDr. Th.Lic. František J. Holeček, O.M., and removed his name from the list of medallists.

Support of the “**J. E. Purkyně Fellowship**” for outstanding and promising scientists was awarded to:

Igor V. BARTISH, Ph.D. – *Institute of Botany,*
Ing. Filip LANKAŠ, CSc. – *Institute of Organic Chemistry and Biochemistry,*
Ing. Tomáš VOMASTEK, Ph.D. – *Institute of Microbiology,*
Mgr. Jindřich ZAPLETAL, Ph.D., DSc. – *Institute of Mathematics.*

The Otto Wichterle Award for young ASCR scientists was given to twenty young scientists. In the non-life sciences, the award was given to seven workers, in life and chemical sciences to nine and in humanities and social sciences to four persons.

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Activities of the Learned Society of the Czech Republic

The Learned Society of the Czech Republic (civic association), is a prestigious selective association of prominent scientists. Its mission is to contribute to the free, self-directed advancement of science in the Czech Republic and represents it to similar foreign scientific institutions.

In 2007, the Learned Society of the Czech Republic was managed by its Council, consisting of:

RNDr. Jiří Grygar, CSc. (President),

Prof. RNDr. Blanka Říhová, DrSc. (Vice-President),

Prof. Ing. Karel Štulík, DrSc. (Scientific Secretary and Chairperson of the Section of Chemical Science),

Prof. PhDr. Ivan Hlaváček, CSc. (Chairperson of the Section of Social Science and Humanities),

Doc. RNDr. Jan Konvalinka, CSc. (Chairperson of the Section of Biology and Medicine),

Prof. RNDr. Emil Paleček, DrSc.,

and Prof. RNDr. Aleš Pultr, DrSc. (Chairpersons of the Section of Mathematics and Physics).

As of the end of the year, the Learned Society had 101 Fellows and 39 Honorary Fellows.

In 2007, the Learned Society:

Organized 20 lectures and discussions on current issues of science, education, etc. The special lectures and medallions honouring personalities of Czech and world science were delivered at plenary meetings, lectures at the XIII General Meeting and two public lectures on current topics (Prof. RNDr. Josef Humlíček, DrSc. – “Microelectronic Nanoworld”, Prof. Ing. Karel Ulbrich, DrSc. – “Possibilities of Use of Synthetic Polymers in Medicine Development: from Anti-tumour to Gene Therapy”).

Organized 7 working sessions that took place in Prague, an extramural session that took place at scientific workplaces in Třeboň and Nové Hradky in October, and the XIII General Meeting held in May.

Appraised scientific works of non-fellows by awarding 13 prestigious awards in the categories “scientist” (1), “junior scientist” (2) and “grammar school student” (10).

Awarded the Medal for Merit in Scientific Development to notable personalities of Czech science. The Medals were presented during the festive part of the XIII General Meeting to

RNDr. Vladimír HANUŠ, DrSc.
Prof. Ing. Pavel KRATOCHVÍL, DrSc., Dr.h.c.
RNDr. Svatopluk KRUPIČKA, CSc.
Prof. MUDr. Oldřich NEČAS, DrSc.



J. Grygar, president of the Learned Society of the CR, presenting an Award of the Learned Society of the Czech Republic to O. Nečas during the XIIIth General Assembly, May 14, 2007 held in the Great Auditorium of the Carolinum of Charles University

photo by Z. Tichý,
archiv US CR

Developed, on the basis of a previously signed declaration, collaboration with Czech Radio (particularly with broadcasting stations Praha, Vltava and Leonardo) and with Radio Classic FM.

Prepared for issue in the Academia publishing house the book, “Scholars as Seen by Colleagues, Disciples, and Followers”.

On invitation by foreign learned societies, members of the Learned Society attended the meeting of Berlin-Brandenburgische Akademie der Wissenschaften (Doc. RNDr. Jan Konvalinka, CSc.) and the meeting of European Academies in Paris organized by the Institut de France (Prof. PhDr. František Šmahel, DrSc.). At an August press meeting, the honorary fellow of the Learned Society and Nobel-prize winner in physics, Prof. Jim Cronin (University of Chicago) acquainted Czech scientific journalists with the first results of cosmic radiation research at the newly completed giant international Pierre Auger Observatory built at his initiative in Argentina and in building the scientific operation of which Czech experts have taken a significant part.

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6

The Council of Scientific Societies of the Czech Republic

In 2007, the Council of Scientific Societies was associated with 71 scientific societies representing sciences from astronomy to zoology and having more than 33 thousand members. It reviewed and approved in opposition proceedings in total 112 applications for grants from the ASCR for various scientific societies' projects.

Scientific societies in 2007

Organized and co-organized with the support or direct participation of the Council of Scientific Societies 63 international congresses or conferences and seminars. Society members took an active part in an additional 116 events of this type, of which 11 were joint Czech-Slovak events. Of the significant conferences, the following must be mentioned: "Biosorption and Bioremediation Conference", "Central European Workshop on Soil Zoology", "X European Congress of Psychology", "8th Multinational Congress on Microscopy" and "Mechanics of Variscan Orogeny".

Organized or engaged in the organization of 152 nationwide conferences, large seminars or national congresses, and a large number of lectures and workshops.

Actively supported education at primary and secondary schools and universities, in total 52 events such as mathematics, chemistry, physics and astronomy Olympiads, field courses for secondary and university students, doctoral seminars and preparatory lessons, various competitions, etc. Actively participated in the creation of educational materials, textbooks and legal rules.

Awarded 21 prizes and distinctions to distinguished public figures in branches of science or promising young researchers (predominantly postgraduate students) as recognition of their outstanding activities, *e.g.*, the Nušl prize and the Prof. Babuška prize.

Issued or shared the issuing of 20 internationally significant journals, such as *Preslia* (with IF 2.12), and the of *GEOSciences*; issued 32 national journals and bulletins (*e.g.*, *Kosmické rozhledy* (Cosmic Views), *Imunologický zpravodaj* (Immunology Bulletin), *Dějiny věd a techniky* (History of Sciences and Technology), *Pokroky matematiky, fyziky a astronomie* (Progress in Mathematics, Physics and Astronomy), currently conveying the results of research to the general expert public, provided information on activities



M. Křížek, member of the Learned Society of the Czech Republic, addressing the XIIIth General Assembly of the Learned Society on the subject: "What Mathematics is Hidden Behind the Astronomical Clock of Prague?"

photo by Z. Tichý, archiv US ČR

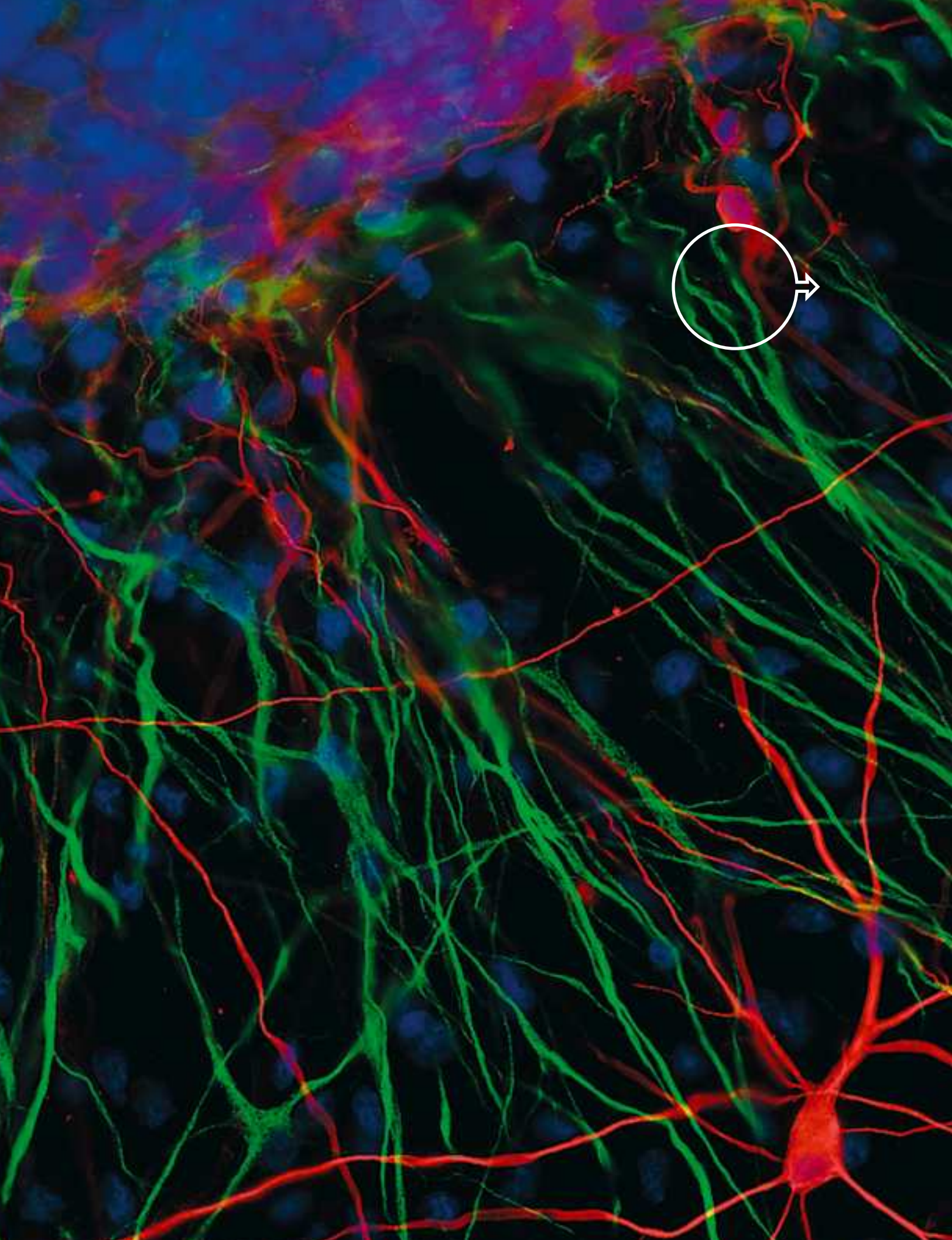
of societies and interesting domestic and foreign events. They also issued 44 proceedings from conferences, books and other non-periodic publications;

Organized 1096 lectures, field trips and smaller seminars both deeply specialized and popularizing. This massive transmission of results of basic and applied research to the expert and amateur public was yet amplified by an additional almost 200 media appearances and broadcasts, in which *e.g.*, the Czech Astronomical Society and the Union of Czech Mathematicians and Physicists were very active.

Significantly represented Czech science in the international sphere in the activities of more than 150 international unions, federations, associations, and organizations and were represented in the managing bodies of a number of such associations.



THE ACADEMY
OF SCIENCES
OF THE CZECH
REPUBLIC



**Section of Mathematics,
Physics and Computer Science**

1

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

**Section of Chemical
Sciences**

4

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

**Section of Social and
Economic Sciences**

7

Library of the ASCR
Economics Institute
Institute of Psychology
Institute of Sociology
Institute of State and Law

Section of Applied Physics

2

Institute of Photonics and Electronics
Institute of Physics of Materials
Institute of Plasma Physics
Institute of Hydrodynamics
Institute of Scientific Instruments
Institute of Theoretical and Applied Mechanics
Institute of Thermomechanics

**Section of Biological and
Medical Sciences**

5

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

**Section of Historical
Sciences**

8

Institute of Archaeology, Brno
Institute of Archaeology, Prague
Institute of History
Masaryk Institute and Archives
Institute of Art History
Institute for Contemporary History

Section of Earth Sciences

3

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

**Section of Bio-Ecological
Sciences**

6

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

**Section of Humanities
and Philology**

9

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

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