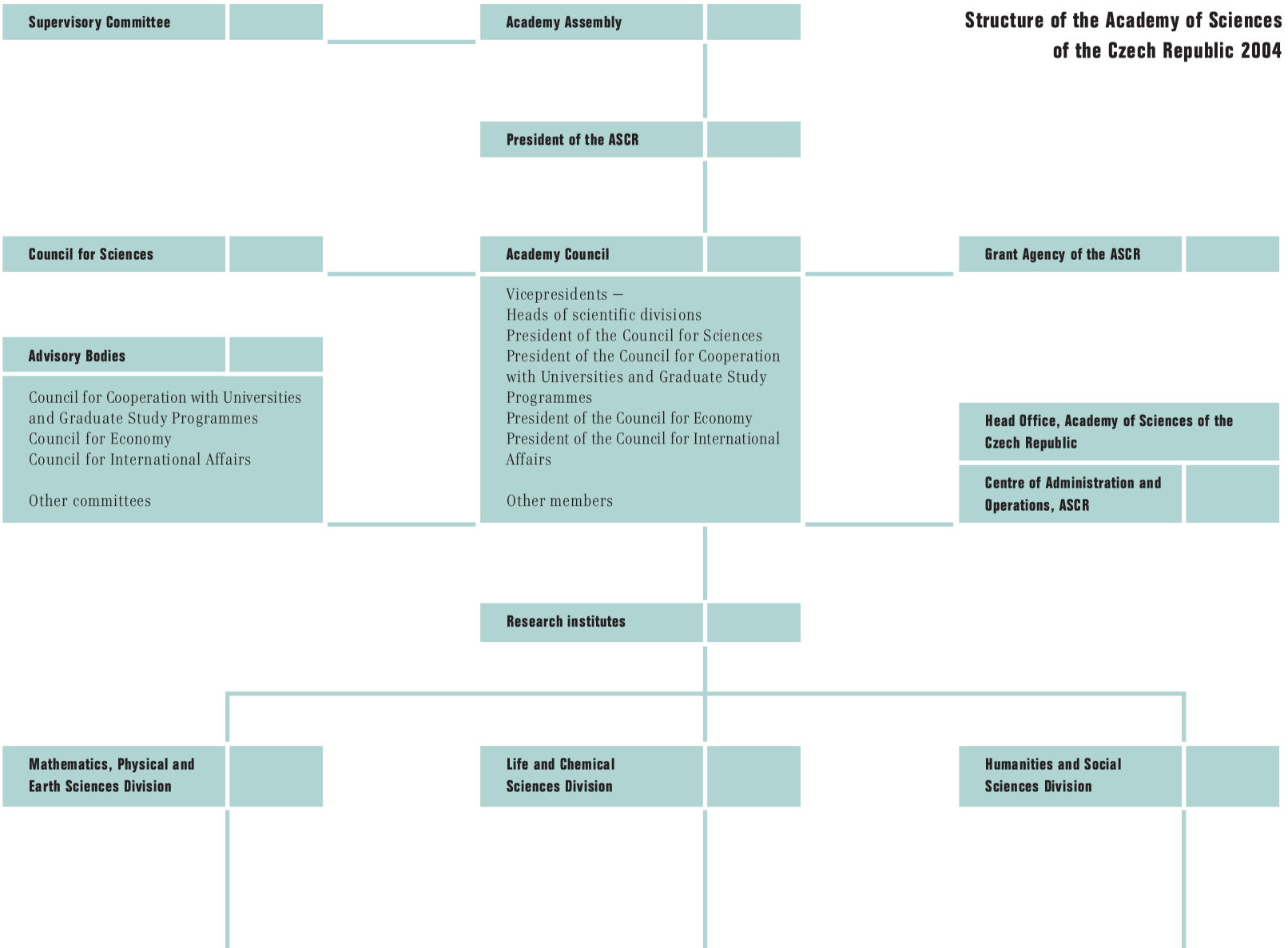
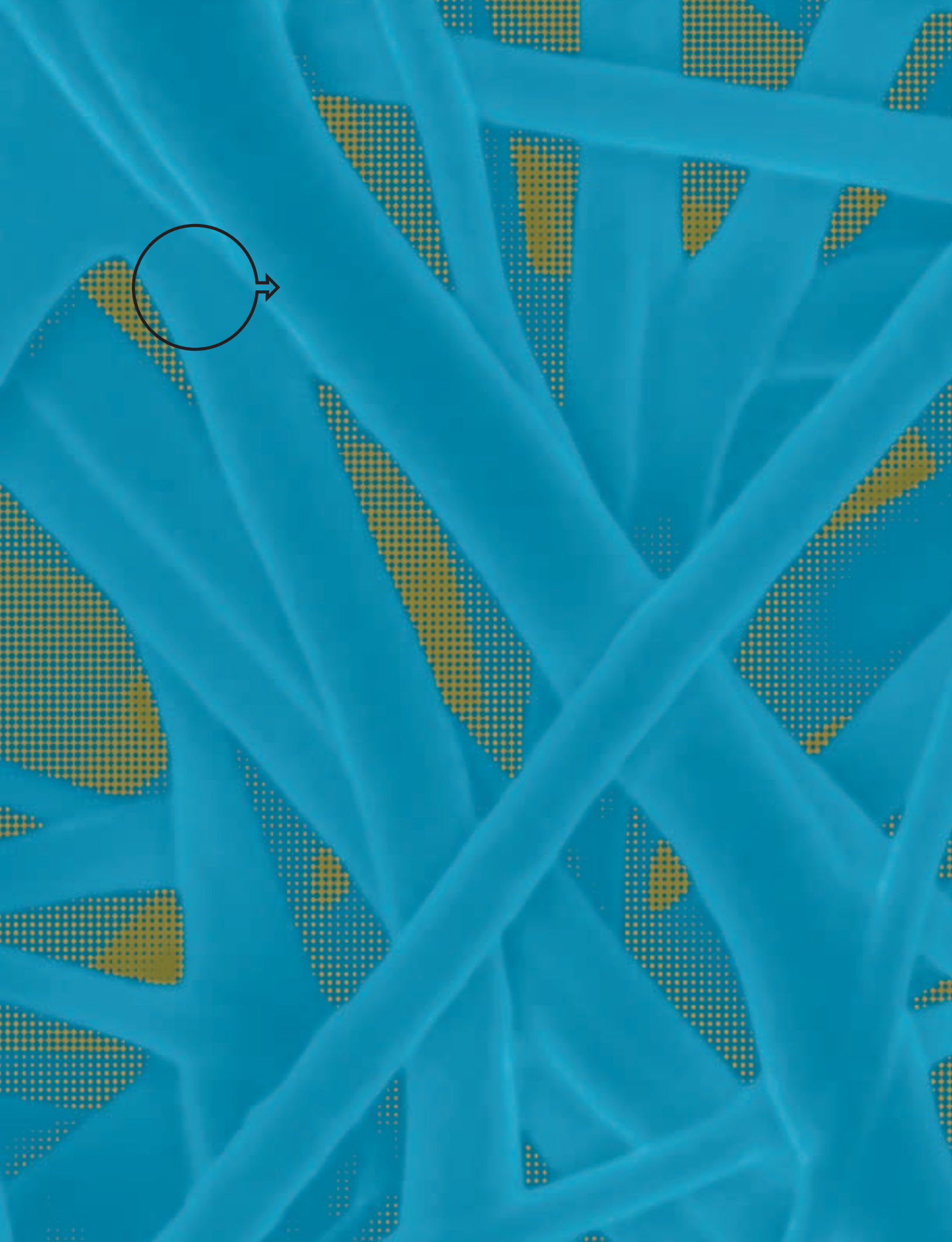
2004

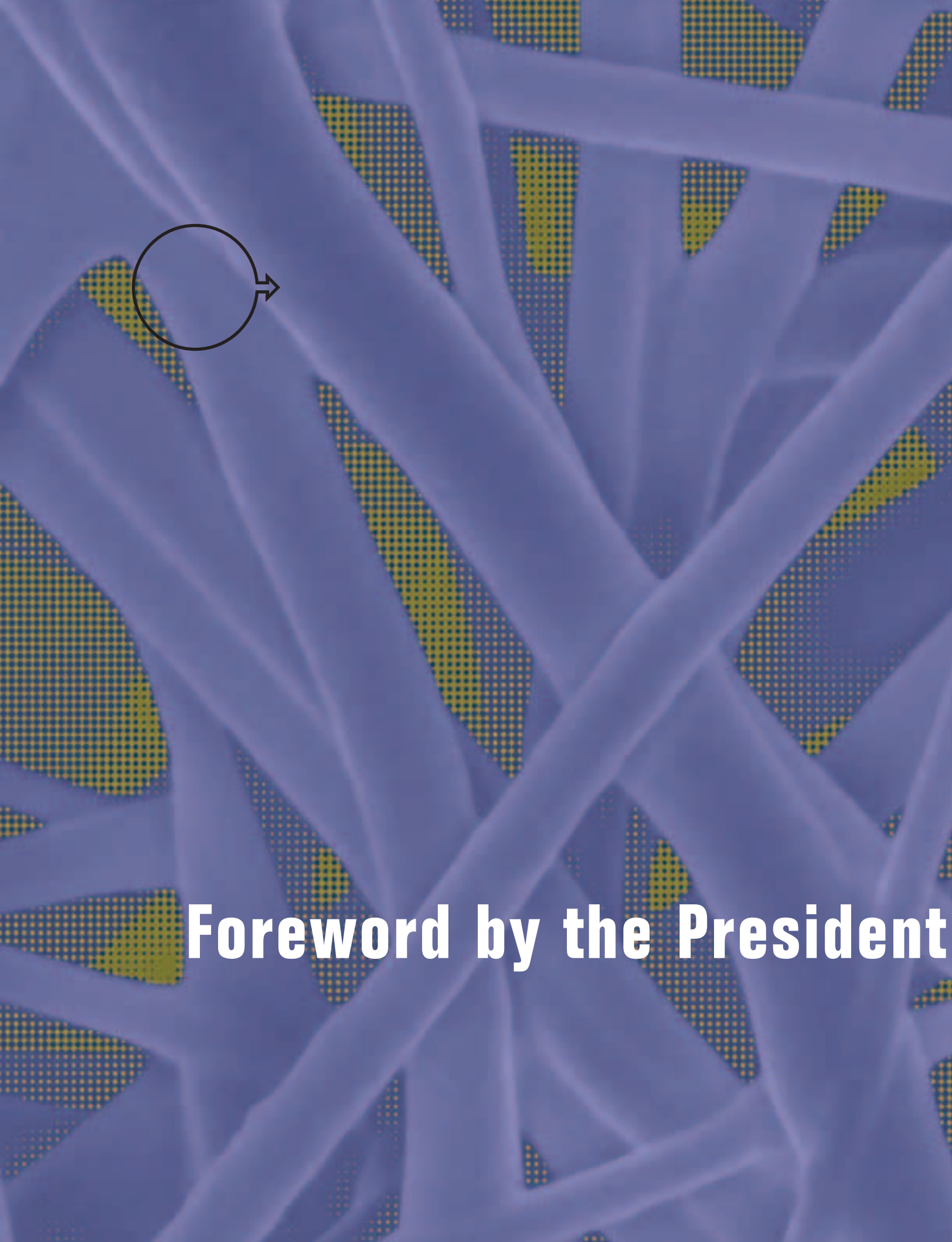
ACADEMY OF SCIENCES OF THE CZECH REPUBLIC — ANNUAL REPORT

Structure of the Academy of Sciences of the Czech Republic 2004





THE ACADEMY
OF SCIENCES
OF THE CZECH
REPUBLIC



Foreword by the President

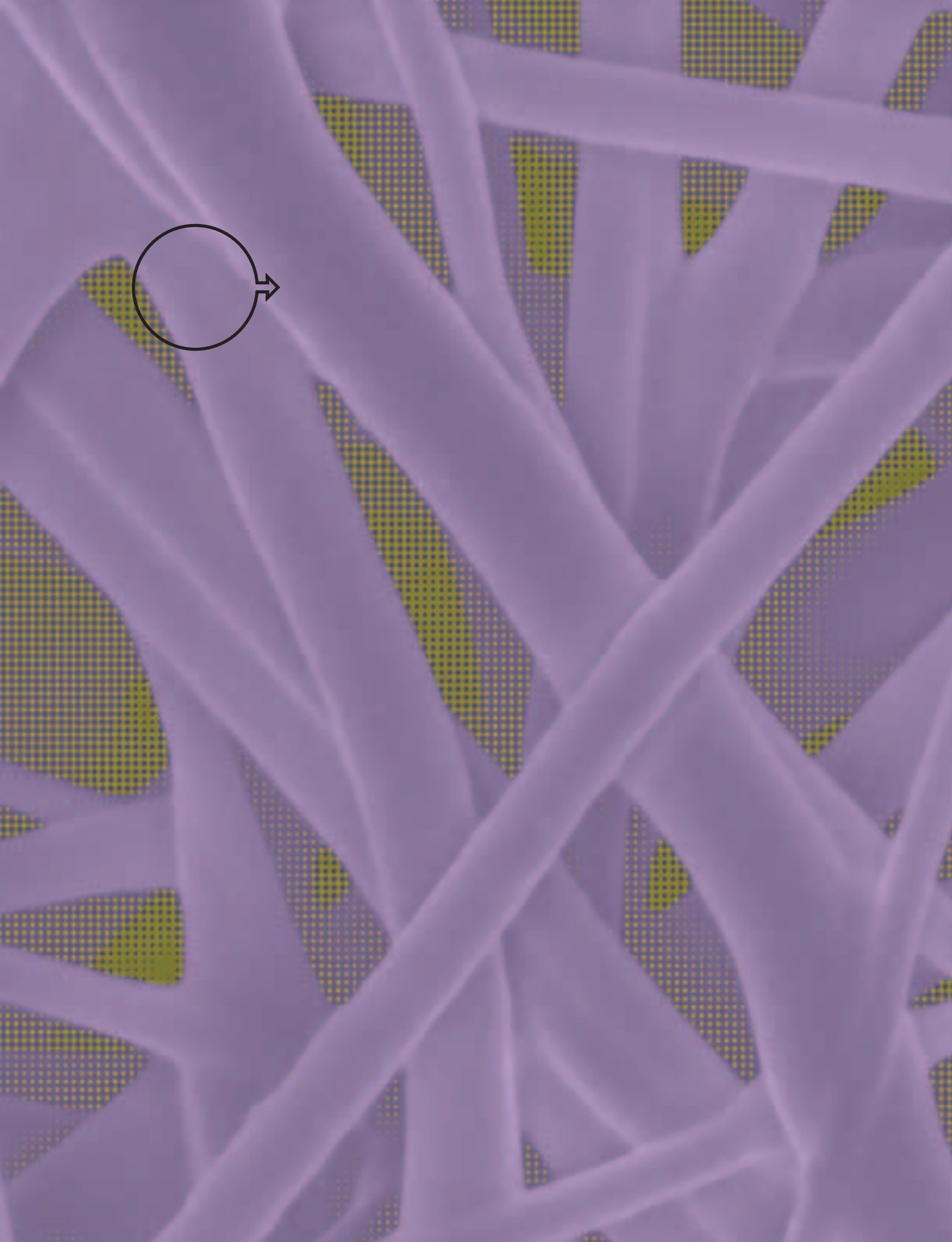
Dear Readers,

In this Annual Report of the Academy of Sciences of the Czech Republic you will find the range of research and experimentation on which its Institutes worked during 2004, plus abstracts of exploratory and targeted studies. You will learn about the Institutes' cooperation with universities on joint research projects, with joint departments and centres, and their involvement in teaching master's level courses and educating graduate students. Included as well is information on how the Institutes cooperated with commerce and industry, and carefully expended funds budgeted for them, how they became integrated into the European Research Area and other international cooperative programmes. However, all this is but a fraction of what the Institutes actually accomplished in 2004.

Such a brief report cannot describe for you the remarkable results of hundreds of research projects ongoing and completed by ASCR Institutes, nor disclose the long nights scientists spent in conducting experiments or searching for answers to penetrating, at times puzzling questions. Nor can it describe either the joy of a ground-breaking finding or the frustration over a failed experiment let alone pursuing a goal that eluded attainment. Research involves not only patience and the courage to carry on despite failure, but the challenge to discover and cultivate potential sources of funding from private and public agencies which are favourably disposed to science and its contribution to society. But more than anything is our full commitment to our respective disciplines.

The achievements of the scientists at the 57 Institutes of the Academy are considerable, and merely expressing “thanks” at this point would not adequately convey our debt of gratitude for what they've accomplished.

Helena Illnerová



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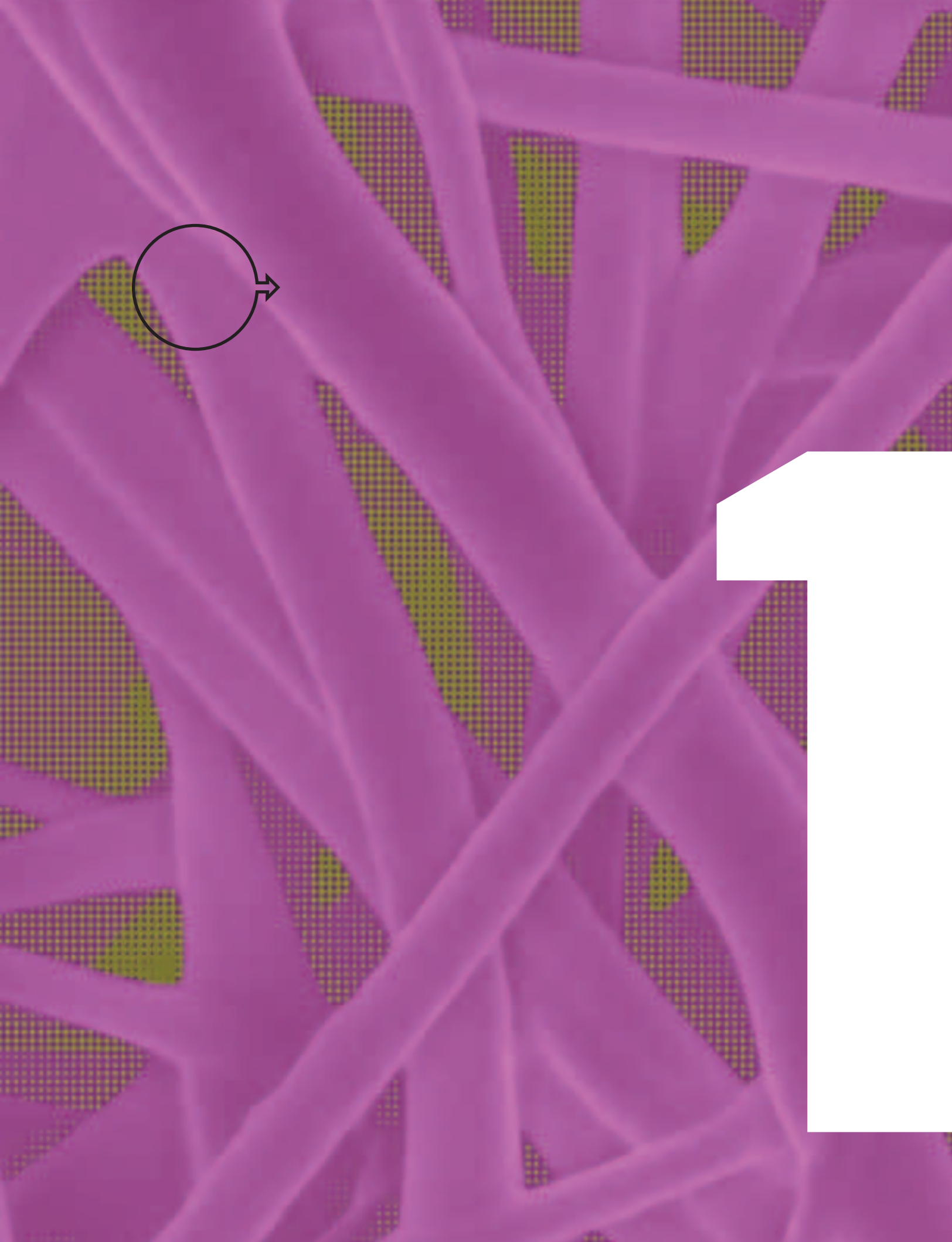


1 Introduction

The Academy of Sciences of the Czech Republic (hereinafter referred to as the ASCR) continued its in- and extensive research, educational, promotion of science and cultural activities in 2004 in carrying out its long-term conceptual plan.

The main area of involvement at the ASCR, **the field of research activity**, was one in which ASCR institutes concentrated on bringing the research objectives of 1999—2004 to as successful a conclusion as possible. In the principal activity, research, the ASCR institutes focused on achieving their objectives of 1999—2004 successfully. The most significant results are catalogued in the second chapter of this Annual Report.

An analysis and evaluation of the results of research activity achieved by our institutes between 1999 and 2003 and their new research objectives for the time frame 2005—2010 was undertaken throughout the year 2004. The results achieved between 1999 and 2003 and the institutes' new research objectives during 2005—2010 were analysed and evaluated in 2004. This process began with the establishment of three evaluation committees and came to a conclusion with the approval of the final results and their input into the differentiated institutional funding of new research objectives at ASCR institutes, beginning with a determination of the budget for 2005.

The principal parameters of evaluation consisted of the quality, efficiency, and prospects of individual institutes, features which were appraised by a minimum of at least four evaluators for each objective. At least three of these evaluators came from scientific research institutes abroad. One compulsory aspect of this process involved presenting the evaluation at the institutes in question in the presence of the Czech-based and foreign evaluators.

In 2004, ASCR institutes were working on a growing number of **targeted research projects**. The ASCR also became a provider of targeted funds from the state budget for the national research programme entitled "The Information Society" and for the "Support of Targeted Research Projects" programme. The Grant Agency of the ASCR assessed the results of the XIVth round of the public tender for the acquisition of research grants from the targeted funds of the ASCR and set about organising the XVth round, this time in the standard and junior research project categories and in the supplementary publication grant project category.

Positive development was also registered in terms of research and educational cooperation between the ASCR and universities, in collaboration with applied research

and the sphere of commerce, in popularisation of and publicising science, public relations, and in making contact with young people and the general public. The broadening of international scientific cooperation was also of topical significance and included the establishment and development of completely new activities aimed at creating a European Research Area. The main consequence of is presented in more detail in the chapters and appendices to this Annual Report that follow.

In 2004, the Council for Sciences at the ASCR awarded for the first time the degree **Doctor of Science (DSc.)**, which previously had been awarded by universities. Eleven doctorates were awarded on the basis of proposals by departmental committees, and another 16 applications are under consideration. The first presentation of diplomas to new Doctors of Science was held in November 2004.

The ASCR also placed heavy stress on encouraging and mentoring the young generation of scientists and continued in its work of carrying out the individual components that make up the internal Junior Programme, which got underway in 2002. Another 24 outstanding young research workers were awarded the **Otto Wichterle Award** in 2004 as part of this programme. The new Academy Council of the ASCR announced the award of the **"J. E. Purkyně Fellowship"** for extremely promising researchers. The aim of this extra support is to obtain outstanding creative scientists from abroad to work at ASCR institutes. This entails the acquisition of scientists of Czech origin who have worked abroad for a long time, as well as highly quality foreign scientists, younger than 40 years of age. The intention is to make sure that they are appropriately rewarded at our institutes. It is anticipated that these younger scientists will become leading personalities in newly-formed creative teams or in teams already in existence at ASCR institutes. This form of support was awarded to four scientists in 2004.

In cooperation with the Council of Sciences, the Academy Council was responsible for preparing the **Conceptual Plan for the Development of Research and Development at the Academy of Sciences (updated version for the years 2005—2008)**, which was approved by the Academy Assembly at its XXVth session in December 2004. This plan was drafted in accordance with Resolution No. 5 of the Government of the Czech Republic dated 7 January 2004, through which the National Policy of Research and Development in the Czech Republic for the years 2004—2008 was ratified.

The representatives of the ASCR were actively involved **with the fundamental general issues of research and development in the Czech Republic**, and did so in close cooperation with the Council for Research and Development and the Ministry of Education, Youth and Sports. This primarily involved participation in preparing a draft approach for the Czech Republic towards the "Invest in Research: A Plan of Action for Europe" and other EU documents in the field of research and development, a proposal for the long-term direction to be taken by basic research, the processing of analyses of the condition of research and development in the Czech Republic in comparison with that undertaken abroad, *et cetera*.

The representatives of the ASCR also worked intensively on the preparation of a **draft of the new Act on Public Research Institutes and on a draft Amendment to the Act on the Academy of Sciences of the Czech Republic and Other Acts which relates to this**. Following interdepartmental comments, both drafts were accepted by the Government of the Czech Republic in their Resolution No. 1234 dated 8 December 2004 and were submitted to the Chamber of Deputies of the Parliament of the Czech Republic. In the event that these acts are approved, it will be necessary to prudently and thoughtfully bring in a number of legal, organisational, and economic changes throughout the next two years, changes that will ensure a change of legal forms for the Academy's institutes from public allowance organisations to public research institutes.

Regarding the 2005—2008 phase, **preparations for the election of the Chairman of the ASCR** were undertaken in August 2004, as were preparations for the **elections of members of the Academy Council and appointing new members of the Council for Sciences**, which will take place at the XXVI session of the Academy Assembly in March 2005.


2

2 Scientific Activities and the Results of Basic and Targeted Research

The results of the Academy's institutes are presented by the fields of research. The principal lines of research are given for each section. Abstracts of some of the studies, such as team studies, individual discoveries and important publications, are given for illustration (co-authors from establishments beyond the Academy are mentioned). The abstracts of studies whose titles are listed at the end of each section can be found at the ASCR's website. Of course they are just representative samples of all the work done at the Academy's institutes in 2004.

1 • Mathematics, Physics and Informatics

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

Research plans

Astronomy and astrophysics of galaxies, stellar systems, stars, solar physics, Earth-Sun interactions, interplanetary bodies and artificial satellites of the Earth
• Astronomical Institute

New information technologies — theoretical fundamentals, methods, means and application • Institute of Computer Science

Uncertainty methods in theoretical cybernetics: system identification, information processing, decision making and management
• Institute of Information Theory and Automation

Experimental and theoretical research on condensed systems with outstanding physical properties • Institute of Physics

The properties, structure and interactions of matter on the fundamental level, formulation of an integral theory of the basic natural forces • Institute of Physics

Properties of ionized media, non-linear and quantum optical systems
• Institute of Physics

Comprehensive development of mathematical disciplines with respect to the needs of physics and technology • Mathematical Institute

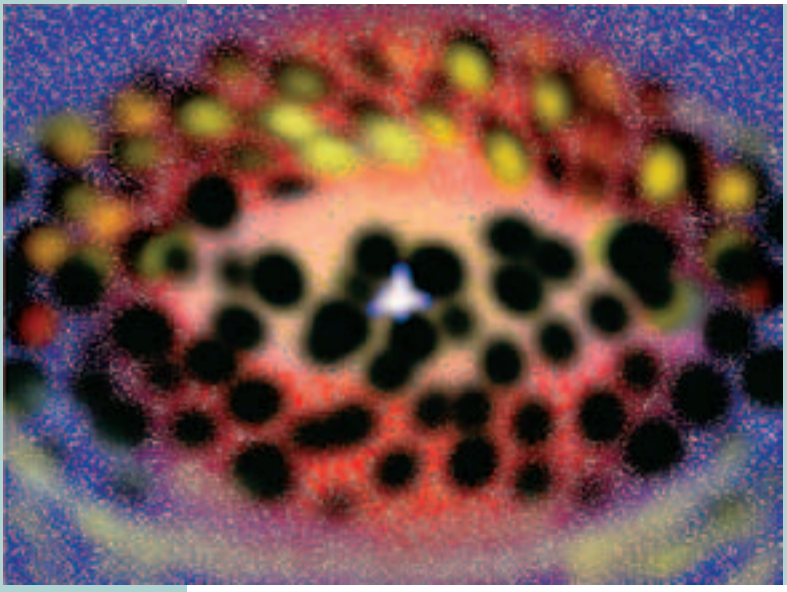
Illustrative abstracts

Theoretical and experimental studies of nuclei, use of nuclear methods in interdisciplinary research • Nuclear Physics Institute

Radiation of strongly gravitating objects • Astronomical Institute

Black holes and neutron stars are two kinds of very compact cosmic objects with extremely strong gravity. Information about these objects can be obtained by studying radiation properties of the gaseous environment in their neighbourhood, where swirling matter reaches almost the speed of light [299,792,458 metres per second] and the wavelength of emitted photons is visibly affected by the gravitational redshift. We show in our papers how this can be used to determine the mass and angular momentum of central black holes in cores of enormously distant galaxies and quasars.

This method employs spectral data collected with the help of specialised satellites orbiting the Earth. Our approach is based on a detailed analysis, within the framework of general relativity, of high-energy X-rays. We have studied several active galaxies, and we have also explored microquasar properties in our own Galaxy. Our conclusions are summarised in a review article. The impact of our findings concerns not just astronomy but can also help to answer fundamental questions of present-day physics about the fate of matter under extreme conditions. Our results provide a way of verifying predictions of general relativity in a strong gravity regime, in which it has not yet been properly tested.



Schematic view of the structure of the inner regions of an active galactic nucleus. Hot gas is orbiting in the strong gravitational field of a super-massive black hole. In the central region, glowing plasma emits high-energy X-rays produced in consequence of violent electromagnetic processes whereas temperature drops at the outskirts where dark clouds form and partly obscure the core. Extremely strong gravity is one of the principal factors determining the form of the object and its radiation properties.

Bursa, M., Abramowicz, M. A., Karas, V., Kluźniak, W.: The upper kilohertz quasi-periodic oscillations: A gravitationally lensed vertical oscillation. Astrophysical Journal Letters: December 10 (2004), in press
Dovčiak, M., Bianchi, S., Guainazzi, M., Karas, V., Matt, G.: Relativistic spectral features from X-ray illuminated spots and the measure of the black hole mass in active galactic nuclei. Monthly Notices of the Royal Astronomical Society 350: 745–755 (2004)
Dovčiak, M., Karas, V., Yaqoob, T.: An extended scheme for fitting X-ray data with accretion disk spectra in the strong gravity regime. Astrophysical Journal Supplement 153: 205–221 (2004)
Horák, J., Abramowicz, M., Karas, V., Kluźniak, W.: Of NBOs and kHz QPOs: a low-frequency modulation in resonant oscillations of relativistic accretion disks. Publications of the Astronomical Society of Japan, 56: 819–822 (2004)
Karas, V., Huré, J.-M., Semerák, O.: Gravitating discs around black holes. Classical and Quantum Gravity 21: R1–R51 (TOPICAL REVIEW ARTICLE) (2004)
Šubr, L., Karas, V., Huré, J.-M.: Star-disc interactions in a galactic centre and oblateness of the inner stellar cluster. Monthly Notices of the Royal Astronomical Society 354: 1177–1188 (2004)

Illustrative abstracts

Model of market equilibrium with vague utilities • Institute of Information Theory and Automation

The classical model of the free exchange market assumes that all input parameters (agents, initial quantities of goods, and utilities of the goods for agents) are precisely known. It is likewise assumed that prices negotiated by means of supply and demand are the same for all participants. The best result of the exchange, described by the concept of the Walras equilibrium, is such terminal allocation of goods that satisfies the realistic demands of agents and prices that enable the agents to reach such state. At the end of the 1970s, the author suggested an alternative to the model accepting the formation of "concerns" as coalitions whose participants need not respect the prices in the internal re-allocation of their goods. Both models, the original one and its cooperative modification, are closely connected with the theory of coalitional games.

The theory of fuzzy quantities [3] and the theory of fuzzy coalitional games [4] derived from it, enabled the author to derive a realistic market and even construct an equilibrium model for the exchange of goods in which the demands of agents are vague and the evaluation of the utility of goods allocations imprecise. Moreover, the model also admits (in a local or temporary sense) unstable prices which vary with the actual subjective attitudes of agents. The model and its basic properties are summarized in [1]. The author was asked to submit a chapter [2] in a monograph, which is now in press.

[1] M. Mareš: Vague utilities in a cooperative market. In: Proceedings of Int. Conf. on Fuzzy Sets and Soft Computing in Economics and Finance, St. Petersburg 2004. Russian Fuzzy Set Association, St. Petersburg, 2004. Vol. I, 143—153.
[2] M. Mareš: Fuzzy components of a cooperative market. In: I. Batyrshin, J. Kacprzyk (Edition): Fuzzy Sets and Soft Computing in Economics. Physica-Verlag (Springer), 29 stran, manuscript in press.
[3] M. Mareš: Computation Over Fuzzy Quantities. CRC-Press, Boca Raton 1994.
[4] M. Mareš: Fuzzy Cooperative Games. Physica-Verlag (Springer), Heidelberg 2001

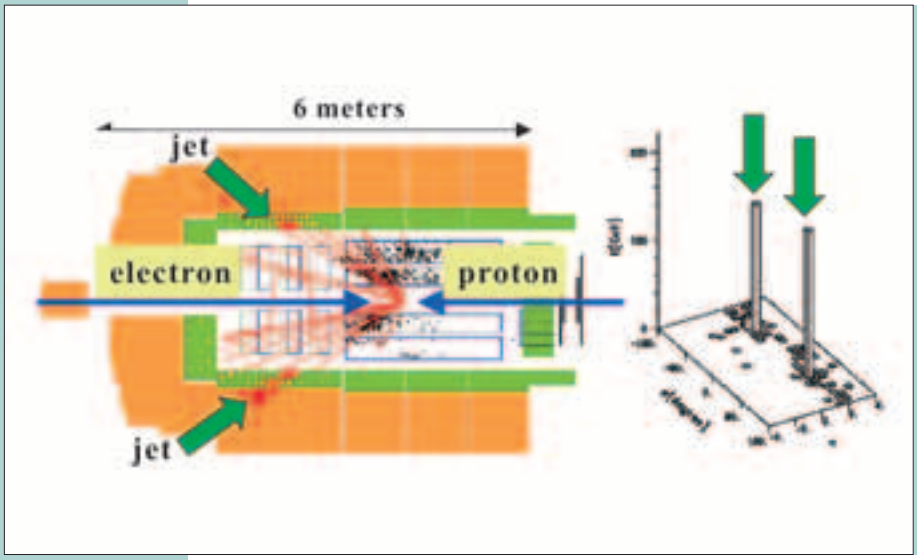
Illustrative abstracts

Does the photon have a structure? • Institute of Physics

Photon, a quantum of electromagnetic radiation, plays an indispensable role in our daily life. Photons that strike the retina are the sources of our ability to see; those radiated from telecommunication antennas bring us news from around the world. Such photons are of low energies, typically only a few electronvolts, and are real, i.e., they "live", if not disturbed, indefinitely and behave as point particles. Photons of energies a hundred billion times higher can be produced by large accelerators, but these photons are virtual, i.e., they only "live" briefly. According to our current knowledge of forces in the micro-world, these high energies photons, real as well as virtual, interact with quarks and gluons according to the theory called Quantum Chromodynamics. In hard collisions with protons or other particles, they behave as if composed of quarks and gluons. In this dynamical sense, a photon is not truly a point-like particle but exhibits a "structure" similar to that of protons. Using the HERA storage ring with a circumference of 6.3 km at DESY, (in Germany), the H1 Collaboration investigates the collisions of electrons with protons at the highest centre of mass energies ever achieved. In late 1980s and early 1990s, a group of physicists and engineers from the Institute of Physics took part in designing and developing parts of the H1 detector. The detector has been in operation since 1992 and they have been involved in its upgrade and in physics analysis of the data taken.

This group analysed the data taken with the H1 detector in 1998—2000 in which the virtual photon radiated from the incoming positron collided with the proton, producing two angularly collimated strays of particles called jets. Jets thus produced can be interpreted as traces of the quarks and gluons, which were produced primarily in the collision. Measuring energies and angles of jets provides the main method for investigating the structure of colliding particles and forces acting between them. An analysis of the collisions of virtual photons with protons allowed us to extract information on the structure of the former since the structure of the latter is well known. The paper brings the first

measurement of the dependence of the structure of virtual photons on their lifetime. A group of physicists and engineers at the Institute of Physics proposed the basic idea of the measurement, contributed to the development of special detectors required for its realisation, performed the whole physics analysis and wrote the paper.



Computer reconstruction of the collision between electron and proton as seen in the lateral, cut along the H1 detector (left). Two jets produced in this collision, marked by green arrows, were recorded in the calorimeter (brown and green layers). The legoplot on the right shows these jets as two pronounced towers in the angular flow of energy, illustrating the fact that the energy of produced particles is concentrated in two well separated cones.

A. Aktas, J. Chýla, J. Cvach, I. Herynek, J. Hladký, P. Reimer, K. Sedlák, M. Taševský, J. Zálešák (Hl Collaboration), Measurement of dijet cross-section at low Q**2 at HERA, Eur. Phys. J. C 3: 141—159 (2004).

Illustrative abstracts

Structure of light neutron-rich nuclei • Nuclear Physics Institute

Properties of exotic neutron-rich nuclei near the border of stability were investigated at GANIL, France. In these nuclei the ratio of numbers of neutrons to protons is several times larger than in stable nuclei and completely new phenomena such as neutron halo or shape coexistence appear. Recently, we have determined a new magic number N=16 for heavy isotopes from carbon up to neon by comparison of two-neutron separation energies. Magic numbers correspond to the number of nucleons required to close the nuclear shell and these nuclei become extremely stable.

The aim of the work was to obtain unique information on the ^{24}O nucleus, which should be a doubly magic nucleus (Z=8 and N=16) following our determination. The radioactive nuclei were produced using the beam of $^{36}S^{16+}$ of 2.8 GeV fragmented on the carbon target. The fragments were then focused on the beryllium target, where the ions being excited produced -rays that were detected by an array of 80 detectors surrounding the target. Behind the target, the ions have been were identified by SPEG spectrometer in coincidence with signals from -detectors. The experiment has revealed the stability of ^{23,24} O and has shown the existence of the new magic number N=16.

This result is very important, because it proves that some magic numbers (and also nuclear shells) are not universal constants and depend on the number of nucleons in nuclei. A new effect presented as a decoupling of proton and neutron density takes place at nuclei near the border of stability.

Stanoiu, M., Dlouhý, Z., Baiborodin, D., Mrázek, J .: Study of drip line nuclei through two-step fragmentation. N=14 and 16 shell gaps in neutron-rich isotopes — Eur. Phys. J. A 20, 95—96 (2004), Phys.Rev. C 69, 034312—1—10 (2004), Eur. Phys. J. A 22, 5—8 (2004), Nucl. Phys. A746, 135—139 (2004)

List of other studies

1. Tumbling asteroids (Astronomical Institute)
2. New solar flare model and its diagnostic possibilities (Astronomical Institute)
3. Convergence of GMRES for Tridiagonal Toeplitz Matrices (Institute of Computer Science)
4. Semi-normal forms and functional representation of product fuzzy logic (Institute of Computer Science)
5. Methods for multidimensional event classification: a case study using images from a Cherenkov gamma-ray telescope (Institute of Computer Science)
6. Projective moment invariants (Institute of Information Theory and Automation)
7. A fully probabilistic design of strategies making dynamic decisions under uncertainty (Institute of Information Theory and Automation)
8. Secure synchronization of chaotic systems (Institute of Information Theory and Automation)
9. Thermomechanical behaviours of NiTi alloy (Institute of Physics)
10. Exchange interactions and Curie temperatures of magnetic semiconductors (Institute of Physics)
11. Discovery of the spin Hall effects (Institute of Physics)
12. Gas optical sensors (Institute of Physics)
13. Soft-x-ray laser-induced damages to XUV/x-ray optics (Institute of Physics)
14. Berezin-Toeplitz quantization on the Schwartz space of bounded symmetric domains (Mathematical Institute)
15. On a class of physically admissible variational solutions to the Navier-Stokes-Fourier system (Mathematical Institute)
16. Uniqueness for stochastic evolution equations in Banach spaces (Mathematical Institute)
17. Evidence for M1 scissors resonances built on the levels in the quasicontinuum of ^{163}Dy (Nuclear Physics Institute)
18. Pseudo-Hermitian Hamiltonians in quantum theory (Nuclear Physics Institute)

2 • Applied Physics

Research plans

The section includes eight institutes focussing on the following lines of research:

New physical concepts of energy conversion in electrical engineering, control strategies and operating media • Institute of Electrical Engineering

Mechanics and transfer phenomena in liquid systems and the hydrosphere • Institute of Hydrodynamics

The behaviour and properties of metallic and other materials in relation to their structure, processes leading to degradation of the properties of materials • Institute of Physics of Materials

Generation and diagnostics of different kinds of plasma, and their interactions with other states of matter • Institute of Plasma Physics

Generation, transmission and processing of spread-spectrum, etalon and speech signals using semiconductor and optical structures • Institute of Radio Engineering and Electronics

Development of physical methods, special technologies and instrumentation principles using electron and light optics, and radiofrequency spectroscopy • Institute of Scientific Instruments

Mechanics of deformable bodies, constructions and environments with parameters of sustainable life • Institute of Theoretical and Applied Mechanics

Illustrative abstracts

Dynamics of fluids, bodies, and their interactions • Institute of Thermomechanics

Quantification of the effect of specimen geometry on the fatigue crack growth response by two-parameter fracture mechanics • Institute of Physics of Materials

Analysed and discussed are the application of two parameter fracture mechanics discrepancies in the high cycle fatigue crack propagation rate and corresponding threshold values observed in different specimen geometries.

The influence of constraint caused by different specimen geometry on fatigue crack growth is studied and a phenomenological model is proposed to correlate the fatigue crack propagation rate under different constraint levels. The constraint level is quantified by the value of T-stress. The fatigue crack propagation rate is then expressed in terms of the stress intensity factor K- and T-stress. The influence of K and T on the plastic zone size and crack opening near the fatigue crack tip is investigated. It is shown that assuming small scale yielding conditions, the plasticity induced crack opening and crack closure are not significantly influenced by the T-values, but the influence of T-stress on plastic zone size is significant and cannot be neglected.

The plastic zone size is considered as a controlling variable for near threshold fatigue crack behaviour and a simple procedure making it possible to estimate the changes of the fatigue crack propagation rate in the threshold region due to a different constraint level quantitatively is formulated. Corresponding experiments have been performed. The conclusion is that experimental values correspond well with those numerically predicted. The result makes it possible to relate experimentally measured data obtained from specimens with different geometries and thus contribute to more reliable estimates of the residual fatigue life of structures.

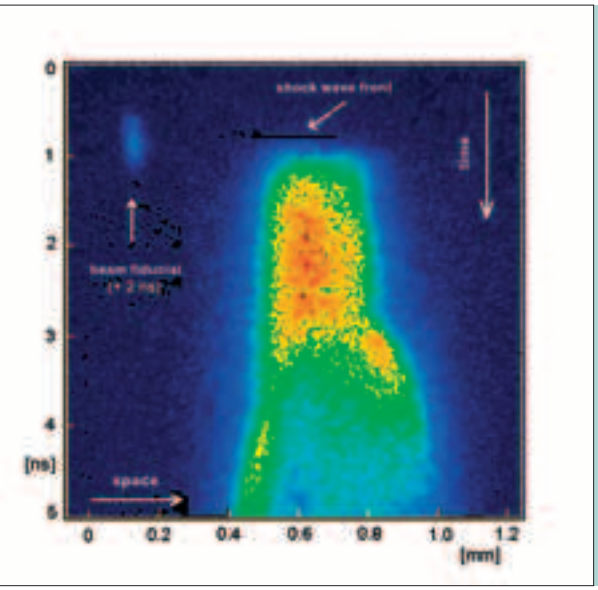
Hutař P., Seitl S., Knésl Z.: Quantification of the effect of specimen geometry on the fatigue crack growth response by two-parameter fracture mechanics, Mater. Sci. Eng. A 387–389 (2004), 491–494.
Hutař P., Seitl S., Knésl Z.: The role of constraint in the case of short cracks, Mater. Sci. Forum 482 (2005), in press.

Illustrative abstracts

Equation-of-state studies of selected materials at pressures over 1 Mbar • The PALS Research Centre, a joint laboratory of the Institute of Plasma Physics and the Institute of Physics

Detailed knowledge of the behaviour of matter under extremely high pressures is of importance for thermonuclear research, planetary physics and many other scientific fields. In laboratory conditions the pressures exceeding 1 Mbar (million of atmospheres) can be achieved, e.g., by concentrating a high-power laser beam onto a solid target. A group of Italian physicists and their Czech colleagues from the ASCR's IPP and IP exploited for that purpose a focused blue beam of the PALS (Prague Asterix Laser System) facility, the pulsed power of which is as high as 3000 GW (equivalent to 3000 Temelín power plants).

Laser beam impact at the target surface generates a wave of pressure (a so-called shock wave), from the energy and velocity of which the quantities characterising the state of the investigated material, i.e., pressure and temperature, can be calculated. For determining the velocity of the shock wave the physicists used a special infrared camera which recorded thermal radiation accompanying the shock wave arrival at the back of a thin planar target (see accompanying illustration). The experiments were performed at the PALS laboratory between 2002–2004, as part of Transnational Access and Laserlab-Europe international projects of the 5th and 6th Framework Programmes of the EU.



Streak picture of the spatial distribution of radiation at the backside of the target. The time runs downward from the top, the scale is in nanoseconds (ns). At the end of the first ns the front of the shock-wave reaches the back of the target and thermal radiation appears (the coloured spot). False colours represent different radiation intensity levels (black – the lowest, red – the highest). The fiducial mark determines the time of the beam impact at the target. It facilitates determination of the time delay between the onset of the laser pulse and the thermal radiation, from which the shock wave velocity is calculated. The space distribution of radiation along the target's surface is seen in the transverse direction. The initial width of the coloured spot corresponds to the diameter of the impinging laser beam. At the experiment the beam diameter was artificially increased and homogenized, so the front of the shock wave to be as flat as possible. Otherwise the beam focal spot could have been made at least five times smaller.

(Illustration created by Hamamatsu IR Streak Camera C6878.)

[1] Batani, D., Stabile, H., Ravasio, A., Lucchini, G., Strati, F., Desai, T., Ullschmied, J., Krousky, E., Skala, J., Juha, L., Kralikova, B., Pfeifer, M., Kadlec, Ch., Präg, A., Nishimura, H., Ochi, Y.: Ablation pressure scaling at short laser wavelength. Phys. Rev. E 68: 067403(1–4), (2003).
[2] Batani, D., Stabile, H., Ravasio, A., Desai, T., Lucchini, G., Strati, F., Ullschmied, J., Krousky, E., Skala, J., Kralikova, B., Pfeifer, M., Kadlec, C., Mocek, T., Präg, A., Nishim io, A., Shashkov, E., Stuchebrukhov, I.,Vovchenko, V., Krasuyk, I.: Shock pressure induced by 0.44 m ura, H., Ochi, Y., Kilp laser radiation on aluminum targets. Laser & Particle Beams 21 (4): 481–487 (2003).
[3] Batani, D., Strati, F., Stabile, H., Tomasini, M., Lucchini, G., Ravasio, A., Koenig, M., Benuzzi-Mounaix, A., Nishimura, H., Ochi, Y., Ullschmied, J., Skala, J., Kralikova, B., Pfeifer, M., Kadlec, Ch., Mocek, T., Präg, A., Hall, I .M., Milani, P., Barborini, E., Piseri, P.: Hugoniot data for carbon at Megabar pressures. Phys. Rev. Lett. 92 (6): Art. No. 065503 (2004).
[4] Batani, D., Barbanotti, S., Canova, F., Dezulian, R., Stabile, H., Ravasio, A., Lucchini, G., Ullschmied, J., Krousky, E., Skala, J., Juha, L., Kralikova, B., Pfeifer, M., Kadlec, Ch., Mocek, T., Präg, A., Nishimura, H., Ochi, Y.: Laser driven shock experiments at PALS. Czech Jour. Phys. 54C: C431 (2004).
[5] Batani, D., Stabile, H., Ravasio, A., Lucchini, G., Strati, F., Desai, T., Ullschmied, J., Krousky, E., Skala, J., Juha, L., Kralikova, B., Pfeifer, M., Kadlec, Ch., Präg, A., Nishimura, H., Ochi, Y.: Ablation pressure scaling at short laser wavelength. Phys. Rev. E 68: 067403(1–4), (2003).
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The optical resonator for nanometrology of lengths • Institute of Scientific Instruments

Recent advances in precision engineering and microelectronics are demanding significant improvements in the accuracy of measurement in manufacturing. In the microscale and nanoscale region the technology available at the moment are inductive or capacitive sensors and incremental laser interferometers. Calibrations of linearity and absolute precision of these devices are becoming a crucial problem, especially in connection with the recent boom in nanotechnologies. Thus, interest is growing in measuring methods and in development of devices capable of securing a direct link to the primary optical etalon of length the iodine-stabilized He-Ne laser.

We have developed a method for which not only resolution but also precision of distance measurement increases to the order of tenths of nanometer. This method uses a direct conversion of changes in the length of a passive Fabry-Perot resonator into changes in the optical frequency of an external tunable laser. In this process, the optical frequency of the laser is locked to the optical frequency of a selected resonant mode of the resonator by means of a derivation spectroscopy technique. At the same time, the laser beam is optically mixed with the ultra-stable optical frequency etalon, the He-Ne-I_2 laser. The radio-frequency beat signal is precisely and easily measured by counting. Then the measured value of that beat-signal is in direct proportionality to the length of the Fabry-Perot resonator.

A significant part of our effort was spent by development of the resonator itself where the elimination of the temperature and subsequent dilatation fluctuations proved to be crucial. Finally, we made the body of the cavity out of zerodur glass. The whole measuring system was enclosed by a polystyrene box equipped with electronic stabilization of temperature. One of the mirror holders of the Fabry-Perot resonator was combined with a piezoelectric transducer, enabling one to move over the measuring range of 2 m. The holder for capacitive or inductive sensors is available, too, and hence these sensors can be calibrated. Primarily, we used the method for verification of the scale linearity of our high-resolution incremental interferometer. These comparison measurements proved the resolution and precision of the frequency method in the order of tenths of nanometer.

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Petrů, F., Zemánek, P., Lazar, J., Číp, O.: Iodine -stabilized He-Ne lasers at 633 nm for testing the vacuum wavelength of laser interferometers. — Jemná mechanika a optika 48: 10—16 (2003).
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Illustrative abstracts

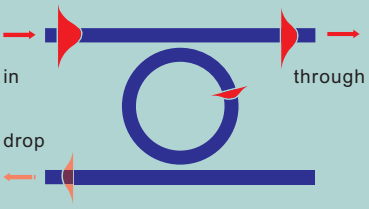
3D vectorial modelling of photonic waveguide microresonators • Institute of Radio Engineering and Electronics

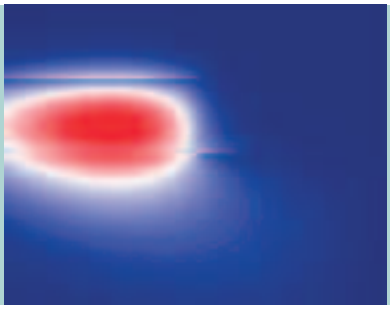
Photonic waveguide microresonators are very promising building blocks for photonic large-scale integrated devices combining functions like spectral filtering, add/drop wavelength-division multiplexing (WDM), space switching, modulation, etc., with expected extensive applications in metropolitan and access photonic networks. The basic idea can be understood from the left figure below. Waveguide ring microresonators coupled by evanescent coupling (optical tunelling) to straight waveguides the way where the optical signal goes depends on its wavelength: if the ring microresonator is off resonance, the signal is only weakly affected by the presence of a microresonator and exits from the “through” port, while at resonance it appears at the “drop” port. As the resonance wavelength of a microresonator can be changed electrooptically, thermooptically or using optical (Kerr-type) nonlinearity, such a device can be used not only as a passive spectral filter or add/drop WDM multiplexor but also as a tunable filter, as a modulator, or even as an optical logical element. In order to keep both the size and radiation loss of the microresonators small (typical diameter of the ring microresonator varies from a few micrometers to hundreds of micrometers), high-refractive index contrast waveguides have to be used. For the design of such structures, a 3D vectorial modelling of optical field distribution in the microresonators is necessary.

We have developed a novel semianalytic method for accurate and efficient calculation of vectorial electromagnetic field distribution in circular microresonators on a standard PC computer. The method is based on mode matching and is especially suitable for accurate calculation of radiation losses in both ring and disk microresonators. The right figure shows as an example the distribution of the

dominant (vertical) electric field component of the fundamental TM eigenmode of the disk microresonator. The field discontinuity at horizontal interfaces and radiation into substrate in the right down direction are clearly visible.

The method has been eveloped within European project IST-2000-28018 “NAIS”, and in combination with the coupled-mode theory developed at the University of Twente in the Netherlands it forms an original and efficient tool for modelling and design photonic microresonator devices.





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[4] L. Prkna, “Rotationally symmetric resonant devices in integrated optics,” PhD thesis, Charles University in Prague, 2004.
[5] L. Prkna, M. Hubálek, and J. Čtyroký, “Field Modelling of Circular Microresonators by Film Mode Matching,” IEEE J. Sel. Topics in Quantum Electron., vol. 11, No. 1, 2005, in press

List of other studies

1. Mathematical and computer modelling of selected coupled problems in the domain of thermal processing of metals by electromagnetic field (Institute of Electrical Engineering)
2. Flow of non-Newtonian fluids through annular passages (Institute of Hydrodynamics)
3. Vortical structure of shear flows (Institute of Hydrodynamics)
4. Volume magnetostriction of metals and intermetallic compounds (Institute of Physics of Materials)
5. Application of unconventional mechanical tests in the assessment of damage level of serviced parts of power facilities (Institute of Physics of Materials)
6. The influence of inherent structural imperfections on the properties of plasma sprayed materials (Institute of Plasma Physics)
7. Ultrasensitive measurement of short-term frequency stability (Institute of Radio Engineering and Electronics)
8. Silica-based optical fibers with refractive-index profiles tailored in a region of 1.45–1.62 for fiber-optic chemical detection (Institute of Radio Engineering and Electronics)
9. Nanocomposite coatings used as hard solid lubricants (Institute of Scientific Instruments)
10. Low temperature radiative properties of materials used in cryogenics (Institute of Scientific Instruments)
11. Timber frame with earthquake-resistant joints (Institute of Theoretical and Applied Mechanics)
12. The strength and life of high pressure gas linepipes (Institute of Theoretical and Applied Mechanics)
13. Dynamic behavior of bridges due to high speed trains (Institute of Theoretical and Applied Mechanics)
14. Numerical simulation of nonlinear aeroelasticity problems (Institute of Thermomechanics)¨
15. Amendment of the resonant ultrasound spectroscopy method (Institute of Thermomechanics)

Research plans

3 • Earth Sciences

The section consists of five institutes focussing on the following lines of research:

Study of the inner structure and physical properties of the Earth and its environment by geophysical methods • Geophysical Institute

Study of selected atmospheric processes • Institute of Atmospheric Physics

Evolution of the lithosphere and natural environment from the oldest geological past to the present time • Institute of Geology

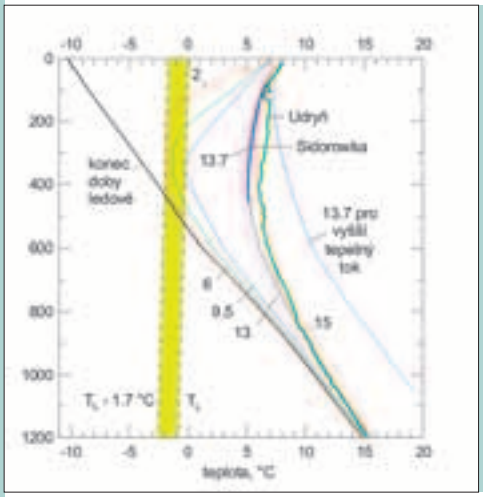
Processes in the lithosphere as interactions with human activities • Institute of Geonics

Geodynamic processes occurring in the upper layer of the Earth's crust and their effects on the environment; environmentally safe use of raw materials • Institute of Rock Structure and Mechanics

Illustrative abstracts

Geothermal anomaly in northeast Poland and the climate of the last Ice Age • Geophysical Institute

A precise temperature logging of several boreholes in northeast Poland was carried out in 2003 and 2004 as part of the Czech-Polish project, 'Present and past climatic changes derived from borehole temperature logs and hydrogeological analysis'. The measurements confirmed an anomaly unparalleled in Europe, where a temperature decrease is observed of 8 °C at the surface and 5 °C at a depth of 400 m in an area encompassing 16 km by 8 km. Combining the new data with earlier results of the basic geothermal research, we were able to analyse in detail the observed phenomenon, especially to compile a geothermal model of the site.



Profily teplota-hloubka naměřené ve vrtech Sidorowka a Udryň v oblasti teplotní anomálie a matematická simulace jejich časových změn

Počáteční rozložení teploty s hloubkou na konci poslední doby ledové (počátek simulace, čas 0) je v rovnováze s povrchovou teplotou -10.3 °C a hlubinným tepelným tokem 40 mW/m^2. Profil zcela vpravo odpovídá vyššímu toku 50 mW/m^2 vně oblasti s teplotní anomálií. Křivky T_L -1.7 °C a T_L vymezují hloubkově závislý interval teplot tání podzemního ledu.
Popis křivek v tisících let od počátku simulace

We were also able to estimate the mean surface temperature of the region during the Last Ice Age (which occurred between two and three million years ago), to reconstruct a temperature-depth profile at the beginning of the Holocene and to simulate the time evolution of the profile from the end of the last glacial to the present by solving numerically the heat conduction equation. The resulting model, consistent with all observed facts, indicates that the mean glacial surface temperature reached -10 °C,

the thickness of permafrost was 520 m, an onset of Holocene warming with a mean temperature of +7 °C occurred 14 ka ago, last remnants of the interstitial ice thawed only 4 ka ago to a depth of 300–400 m and the surface temperature has increased by an additional +1 °C during the last 150 years, bringing an overall amplitude of warming since the Last Ice Age to +18 °C. The reason the subsurface glacial conditions disappeared slowly is the exceptional geology of the region.

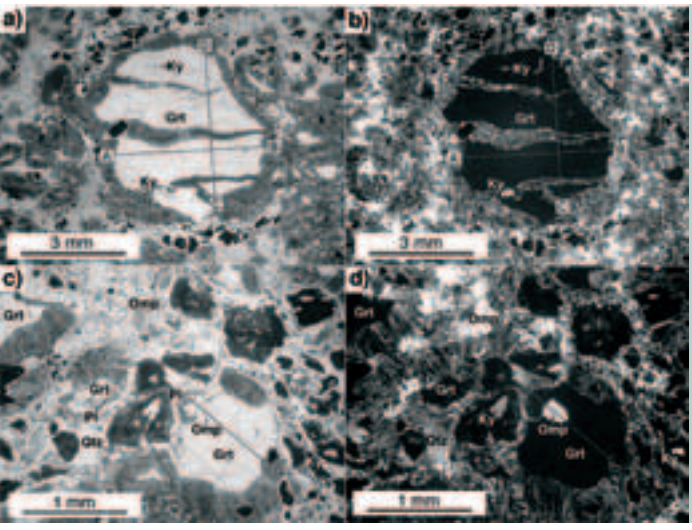
Šafanda, J., Szewczyk, J., Majorowicz, J.: Geothermal evidence of very low glacial temperatures on a rim of the Fennoscandian ice sheet. Geophys. Res. Letters, 31: L07211, doi:10.1029/2004 GL019547 (2004).

Illustrative abstracts

Very high-pressure eclogites associated with garnet peridotites • Institute of Geology

Equilibrium pressure-temperature (PT) conditions were estimated for kyanite-bearing eclogite (rocks of Earth mantle) from Nové Dvory, Czech Republic, by using garnet-clinopyroxene thermometry and garnet-clinopyroxene-kyanite-coesite (or quartz) barometry. The estimated P-T conditions are 1,050–1,150 °C, 4.5–4.9 GPa, which are mostly the same as previously estimated values for garnet peridotite from Nové Dvory (ca 1,1001,250 °C, 56 GPa).

Such very high-P conditions, which correspond to a depth of about 150 km, have been achieved for some garnet peridotites in the Gföhl Unit of the Bohemian Massif, but pressure conditions of eclogites associated with the garnet peridotites have not been constrained so well. This is the first substantial finding of eclogite that gives such very high-P conditions in the Gföhl Unit of the Bohemian Massif. The Gföhl Unit mainly consists of felsic granulite or migmatitic gneiss, but these rock types do not display high-P (>2.5 GPa) evidence. It is unclear whether both the peridotite body and surrounding felsic rocks in the Gföhl Unit were buried to very deep levels, but at least some garnet peridotites and associated eclogites in the Gföhl Unit have ascended from about 150-km depth.



Microphoto of the rock studied in thin section.

Large grains represent garnet (grt) with inclusions of kyanite (ky). Lines A–B a C–D are profiles studied for microprobe chemical analysis.

Nakamura D., Svojtka M., Naemura K., Hirajima T.: Very high-pressure (>4 GPa) eclogite associated with the Moldanubian Zone garnet peridotite (Nové Dvory, Czech Republic). Journal of Metamorphic Geology, 22: 593–603 (2004).

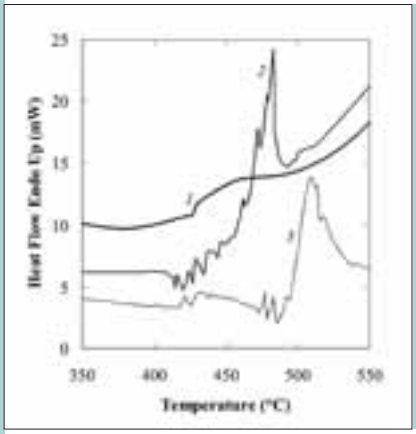
Illustrative abstracts

Processing of waste polyethylene with coal • Institute of Rock Structure and Mechanics

Industrial and communal waste contains significant amounts of polyethylene, which may, however, be processed thermally with coal into useful hydrocarbons mixtures. That is the reason why thermal

reactions of polyethylene with Ostrava-Karviná coal were studied. The differential scanning calorimetry method disclosed that under low temperature conditions (up to 550 °C) the coal used is decomposed within a wide range of temperatures with endothermal effect; the polyethylene alone decomposes under temperature close to the above-mentioned one. In the presence of coal, however, the decomposition occurred at a substantially lower temperature. Hence, coal supported the decomposition of polyethylene. Further facts were provided by the pyrolysis of polyethylene and the mixtures of coal with polyethylene, by the analyses of the products obtained, and also from thermogravimetric measurements. The decomposition of polyethylene alone yields unstable unsaturated hydrocarbons: alkenes and alkadienes. If the polyethylene-coal mixture is heated under low temperature conditions, the coal forms semi-coke and releases hydrogen, which hydrogenates these unsaturated hydrocarbons into stable saturated hydrocarbons. This is, however, preceded by adsorption of the unsaturated hydrocarbons on the inner surface of the coal and semi-coke. Therefore, the reaction of polyethylene with coal can be described as a two-stage process, in which the first stage includes the decomposition of polyethylene with formation of unsaturated hydrocarbons, and the second stage the adsorption of these products on the inner surface of coal and semi-coke and their subsequent hydrogenation by hydrogen from the coal. During the second stage the unsaturated hydrocarbons are hydrogenated into stable saturated hydrocarbons. Polypropylene behaves similarly.

The result will serve to determine the conditions of processing light waste plastics with coal into stable hydrocarbon mixtures for further use.



Rozklad polyethylenu
(křivka 3, vyšší teplota maxima)
je snazší v přítomnosti uhlí
(křivka 2, nižší teplota maxima),
křivka 1 odpovídá rozkladu uhlí

Straka P., Nahunkova J.: Thermal reactions of polyethylene with coal (TG/DSC approach). — Journal of Thermal Analysis and Calorimetry 76: 49—53 (2004)

List of other studies

1. Azimuthal variation of Pg velocity in the Czech Republic's Moldanubian (Geophysical Institute)
2. Record of short-term climatic changes in the "greenhouse" Cretaceous (Geophysical Institute)
3. Long-term trends in the ionosphere-atmosphere system (Institute of Atmospheric Physics)
4. Area-related estimates of probable maximum precipitation for the territory of the Czech Republic based on radar measurements (Institute of Atmospheric Physics)
5. Whistler mode wave propagation in the inner magnetosphere (Institute of Atmospheric Physics)
6. Recent deposition and migration of lead in forest ecosystems (Institute of Geology)
7. Study of mineralogical bond of arsenic in the environment (Institute of Geology)
8. The use of the nonconforming finite element method (Institute of Geonics)
9. Contribution to the application of the automatic classification of a seismological signal (Institute of Geonics)

10. New methods of prognosis of surface subsidence affected by underground exploitation of ore vein deposits of Rožná type (Institute of Geonics)
11. A new mineral found (Institute of Rock Structure and Mechanics)
12. Application of optical microscopy in fire prevention (Institute of Rock Structure and Mechanics)

4 • Chemical Sciences

Research plans

This section includes six institutes whose lines of research are as follows:

Development of new methods of analytical chemistry for practical application
• Institute of Analytical Chemistry

Theoretical fundamentals of chemical processes: balanced and dynamical behaviour of multiphase reactors • Institute of Chemical Process Fundamentals

The structure and preparation of new compounds, clusters and composites based on inorganic substances, mechanisms of transformation and transfer • Institute of Inorganic Chemistry

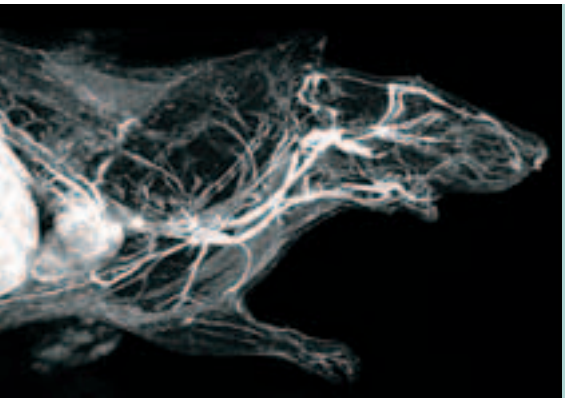
Clarification of the relationships between the structure and properties – dynamics and chemical reactivity in particular – of compounds and molecular systems
• J. Heyrovský Institute of Physical Chemistry

Targeted synthesis and study of chemical, physico-chemical and physical properties of macromolecular and supramolecular compounds and systems for advanced technologies
• Institute of Macromolecular Chemistry

Chemical principles of selected biological phenomena in medicine and ecology
• Institute of Organic Chemistry and Biochemistry

Illustrative abstracts

Polymeric gadolinium complex for angiography and magnetic resonance imaging
• Institute of Macromolecular Chemistry



MR-angiografy scan of the chest of rat using polymer-gadolinium complex

We have designed, synthesised and characterised by physicochemical methods water-soluble gadolinium complexes of N-(2-hydroxypropyl)methacrylamide copolymers to prepare a highly sensitive contrast material for diagnostic purposes, especially for applications in angiography and magnetic

resonance imaging of organs and tissues. Biological activity tests of the materials at the collaborating Deutsches Krebsforschungszentrum (DKFZ), Heidelberg, led to optimisation of the chemical structure of the contrast material suitable for medicinal applications. The material utilises the highly hydrophilic water-soluble copolymers capable of forming stable complexes with gadolinium. The polymer complex is stable in aqueous solutions (also in the presence of salts) for several months, is biocompatible but not immunogenic, does not show any signs of toxicity and is suitable for use in the bloodstream.

Comparing its properties with commercially available preparations of Schering Co. (Gadomer-17, GD-DTPA), our polymer complex exhibited a significantly higher relaxivity at magnetic field intensities 1.5 and 7 T. It persists in the bloodstream for a required time period making possible high-quality signal monitoring and does not permeate blood vessel walls, which results in a sharp image in angiographic imaging. The results of comparison of our preparation with commercial materials point to more superior and much higher-quality images obtained with our preparation. The research results are the subject of a joint patent application.

Peschke, P., Kiessling, F., Heilmann, M., Semmler, W., Debus, J., Ulbrich, K., Šubr, V.: Eine neue flexible makromolekulare Kontrastmittelstrategie für die MRT. — Erfindungsanmeldung P1050/631.

Illustrative abstracts

Structure and function of nanostructured redox catalysts in selective reduction of NO_x to nitrogen. Application to NO_x abatement in diesel engine exhausts • J. Heyrovský Institute of Physical Chemistry

The study focussed on the development of a nano-structured, highly selective catalyst for the reduction of nitrogen oxides (SCR-NO_x) by decane to molecular nitrogen under lean-burn conditions, i.e., in excess of oxygen and water vapour, a typical composition of exhaust gases from diesel engines. Complex analysis of the crystalline porous structure of oxide matrices, structure of active centres hosted in these matrices and their function on a molecular level under conditions of the real catalytic process led us to design a two-layered catalyst combined from Ag/alumina and Cu-(Fe)-ZSM-5 zeolite with optimised structures. This catalyst exhibits a high conversion of NO_x to nitrogen in widely ranging temperatures and fulfils limits for NO_x emissions from diesel driven cars by European Union in 2005.

Spectroscopic FTIR and UV-Vis measurements under *in situ* conditions of catalytic reactions provided the following information required for the optimisation of the catalyst: i) identification of the redox behaviour of Ag^+ ions and an analysis of their transformation to nano-sized metallic Ag_n clusters (n=2—8) on alumina; ii) identification of the structure of Cu and Fe centres which are coordinated to the ring of the zeolite matrix containing two framework AlO_2^- groups, and represent active centres stable even in the presence of water vapour; iii) description of Cu(II)-Cu(I) and Fe(III) [Fe(III)-O]-Fe(II) cycles taking part in the complex multi-step NO_x-N_2 transformation.

The FTIR spectra taken at *in situ* conditions of the catalytic reaction enabled us to identify individual steps of NO_x transformation involving consecutively CH_x-NO_2, -NO_3^-, -CN, -CNO, -NH and NH_3 reaction intermediates. Moreover, we elucidated the strong positive effect of hydrogen added to the reaction mixture on the NO-N_2 conversion, and both the negative effect of water vapour on the transformation of NO-NO_2 and its positive effect on the hydrolysis of -NCO to -NH intermediate, representing one step of the complex SCR-NO_x reaction.

This work was carried out conducted under the Project "AMMONORE" of program Growth No. G5RD 2001-00595, coordinated by the J. Heyrovský Institute of Physical Chemistry. The results are reported in seven publications; and our partners in industry are considering applying for a patent.

1. Wichterlová, B.: Structural analysis of potential active sites in metallo-zeolites for selective catalytic reduction of NO_x. An attempt for the structure versus activity relationship. Topics Catal. 28: 131 (2004).

2. Arve K., Čapek, L., Klingstedt, F., Eränen, K., Kalantar-Neyestanaki, A., Lindfors, L. E., Murzin, D. Y., Dědeček, J., Sobalik, Z., Wichterlová, B.: Preparation and Characterisation of Ag/alumina Catalysts for the Removal of NO_x Emissions under Oxygen Rich Conditions. Topics Catal.: 30–31: 91 (2004).
3. Brosius, R., Habermacher, D., Martens, J. A., Vradman, L., Herskowitz, M., Čapek, L., Sobalík, Z., Dědeček, J., Wichterlová, B., Tokarová, V., Gonsiorová, O.: NO oxidation kinetics on iron zeolites: influence of framework type and iron speciation. Topics Catal. 30–31: 333 (2004).

A novel approach to protect specific plants against insect pests using genetically modified (GM) plants and a simplified synthesis of insect pheromones • Institute of Organic Chemistry and Biochemistry

We succeeded to develop a novel approach for the specific protection of cultured crops against insect pests using genetically modified plants, while the protected crop is not necessarily transgenic. Transgenic tobacco plants were capable of producing a pheromone precursor, the pheromone itself or the component of a pheromone mixture for some insect species, according to our recently accepted patent. Productive lines have been selected and their products characterised. The pheromones serve insects of the same species to communicate and find proper mating partners. If, in the surroundings of the protected crop, some other plant will produce the proper "smell", the pests will have difficulties to find mating partners and their population thus will be diminished, without need for excessive use of toxic chemicals to kill them.

For this reason tobacco was prepared in which, under the constitutive CaMV 35S promoter, the functional expression of a specific gene coding insect acyl-CoA-delta11-(Z)-desaturase from *Trichoplusia ni* is allowed to produce (11Z)-hexadec-11-enoate, representing 6,5 percent of all extractable lipids. This ester is converted in the plant by endogenous reductase to (11Z)-hexadec-11-en-1-ol, which can function as a pheromone itself, can be a constituent of a pheromone mixture, or can be further synthetically modified. The results were obtained in cooperation with ICT Prague and Max-Planck-Institute Jena. A semisynthetic approach, starting from plant fatty acid pool and "molecular pharming", yielded the ester and in one pot synthesis also proper acetate, which are principal components of a large number of sex pheromones. The simplified one pot synthesis has been published and the effectivity of pheromone mixture obtained on *Mamestra brassica* was confirmed by field tests in comparison with commercial pheromone.

The gene donor,
cabbage looper moth
Trichoplusia ni

This work has been evaluated highly in Nature's Research Highlights section, 430, 8, 2004, p. 982, Max-Planck-Gessellschaft Highlights 36, 2004, Hospodářské noviny: Tuček J.: Čeští vědci učí rostliny vyrábět hmyzí feromony. 16. Sept. 2004.
Svatoš A., Šebek P., Kotrba P., Nešněrová P., Macek T. Czech Patient PV 2001-1283, Způsob specifické ochrany kulturních rostlin proti hmyzím škůdcům pomocí geneticky modifikovaných rostlin (2004)
Nešněrová P., Šebek P., Macek T., Svatoš A. First semi-synthetic preparation of sex pheromones. Green Chem., 6, 305–307 (2004)

Illustrative abstracts

Double-cluster metallatricarbollide complexes designed for linear molecular constructions

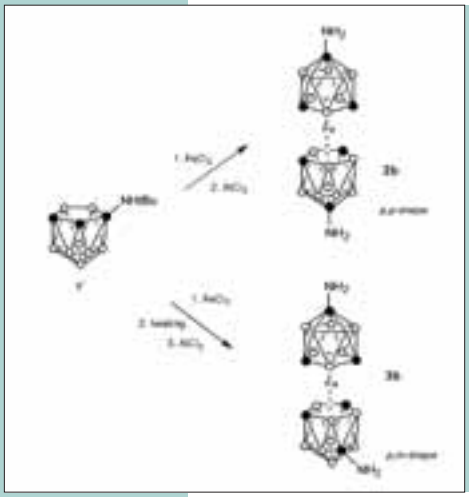
• Institute of Inorganic Chemistry

Boron-containing cluster molecules are three-dimensional polyhedral chemical objects that are adjustable in terms of geometry, chemical substitution, and chemical function. This geometrical and chemical flexibility, along with the fact that boron-containing cluster compounds are thermally very stable, make such chemical species very interesting candidates for use in high-tech, nano-mechanical, and specialised materials.

In this general context we report the synthesis and characterisation of a series of boron-containing cluster compounds that may be considered as basic "building-blocks" for the construction of extended boron cluster networks. These double-cluster "building-blocks" function with reactive — NH_2 groups that can undergo further chemistry to construct linear or L-shaped molecular rods of very high thermal stability.

The new "building-blocks" are made by the metallic coupling of two boron-containing cluster molecules of type (1) using iron (Scheme 1). The linear "p,p"-shape (2) is the more readily available of the two "building-blocks" from this new process, the L-shape "p,m" isomer (3) requiring higher reaction temperatures. The geometrical shapes available to the boron-containing clusters will allow for the tailoring of molecular constructions to fit required lengths, angles, and shapes. This molecular specificity is a very promising feature in the construction of polymeric and oligomeric materials using "building blocks" 2 and 3.

Current work is focussed on the exploitation of this synthetic breakthrough, and is aimed at the linking and polymerisation of compounds 2 and 3. We are confident that the ensuing materials will maintain the favourable physical and thermal characteristics of the "building blocks" shown in Scheme 1. We also anticipate unexpected properties in the new materials that we are acutely prepared to analyse what only continued research in this area will reveal.



The designed formation of linear or L-shaped metallatricarbollide precursors of molecular building blocks (BH and CH units denoted by white and black circles, respectively

Grüner, B., Bačkovský, J., Sillanpää, R., Kivekäs, R., Císarová, I., Teixidor, F., Viñas, C., Štíbr B.: Amino-substituted ferra-bis(tricarbollides) — Metallatricarbaboranes designed for linear molecular constructions. Eur. J. Inorg. Chem.: 1402—1410 (2004).

Illustrative abstracts

Electrochemical sensors for the flow diagnostics • Institute of Chemical Process Fundamentals

In spite of progress in anemometry (LDA, PIV), the near-wall region of the flow is still experimentally difficult to investigate. A measuring method suitable for the near-wall flow mapping is therefore being developed at our institute. The electrochemical diagnostics of the flow is based on the measurement of the limiting diffusion current at a small working electrode, which is embedded in the wall of the experimental set-up.

The fact that the flush-mounted sensors do not interfere with the flow, is the main advantage of this method. Together with our colleagues from abroad in the COST project, we have improved the technique of probe fabrication and successfully solved some problems connected with the probes frequency response. The direction sensitive sensors applied in our experiments have proved themselves to be an appropriate tool serving to detect the unsteady recirculation flow regions or to study the near-wall turbulence.

The electrochemical method was used at first to study the wavy film flow down an inclined plate. The results of calibration measurements, which were carried out for the liquid film flowing down an oscillating plate, provided a new method for the detection of short-time flow reversal using a double sensor. This method was then successfully applied to confirm, for the first time, the existence of a small backflow region located in front of the large solitary waves.

The array of electrochemical double sensors was then used to study the near-wall turbulence in a rectangular channel flow and to assess the role of high polymers in the drag reduction phenomenon. The frequency and amplitude of flow fluctuations were greatly reduced by the addition of polymer and the corresponding power spectra exhibited a shift towards low frequencies. Spatial correlations were calculated from the probe signals and an increase of the size of the coherent flow structures due to the polymer addition was observed.

Tihon J., Tovčigrečko V., Sobolík V., Wein O.: Electrodiffusion Detection of Near-Wall Flow Reversal in Liquid Films at the Regime of Solitary Waves. J. Appl. Electrochem. 33: 577—587 (2003).
Deslouis C., Tribollet B., Tihon J.: Near-Wall Turbulence in Drag Reducing Flows Investigated by Photolithography-Electrochemical Probes. J. Non-Newtonian Fluid Mech. 123: 141—150 (2004).

List of other studies

1. Optimization of proteomic procedure and utilization of nonspecific peptides for identification of cereal proteins (Institute of Analytical Chemistry)
2. Dynamic modification of microorganisms for on-line detection in capillary electrophoresis (Institute of Analytical Chemistry)
3. Photochemical selectivity in GC base pair structures (Institute of Organic Chemistry and Biochemistry)
4. Crosslinked ultrahigh-molecular-weight polyethylene for joint replacements with long lifetime (Institute of Macromolecular Chemistry)
5. New analogues of human insulin (Institute of Organic Chemistry and Biochemistry)
6. Processing of waste alumes to high-quality mullite concentrates (Institute of Inorganic Chemistry)
7. Combustion of dried sewage sludge in a fluidized bed reactor (Institute of Chemical Process Fundamentals)
8. Nuclear hyperfine interactions: Development of a theory and its application to interpretation of high resolution spectra of molecules important in atmospheric chemistry and astrophysics (J. Heyrovský Institute of Physical Chemistry)
9. Mechanisms of the formation of supported phospholipid bilayers and their diffusion properties characterised by ellipsometry and fluorescence correlation spectroscopy (J. Heyrovský Institute of Physical Chemistry)

Research plans

5 • Biological and Medical Sciences

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

Basic research on the genetic structures, physiological functions and developmental biology of vertebrates, especially species of biomedicinal, economic and other importance
• Institute of Animal Physiology and Genetics)

Biophysical properties of living systems and their changes due to external environmental factors
• Institute of Biophysics

The use of insects for assessing and perhaps improving the quality of ecosystems in Central Europe
• Institute of Entomology

Physiological and genetic fundamentals of controlling plant development, cell cycle, morphogenesis, reactions to stress, biotechnologies; organisation and functions of the genome
• Institute of Experimental Botany

Molecular and cellular grounds of selected diseases of the human organism, mechanisms of normal and pathological functions, diagnostic and therapeutical principles
• Institute of Experimental Medicine

Mechanisms of the effects of pharmaceuticals modulating immune reactions and those of the nervous system, with the object to find new compounds for clinical application
• Institute of Experimental Medicine

Cell and molecular biology, genetics, physiology and ecology of microorganisms, microbial biotechnologies; immunological studies • Institute of Microbiology

Regulation and signal pathways in gene expression, immunity, oncogenesis, virus replication, formation of cell structures, behaviour of cells, development and fertilisation • Institute of Molecular Genetics

Investigation of the normal and the pathological physiology of animals, i.e., functions of cells and organs with the object to clarify the fundamental mechanisms of normal and pathological functioning of the human organism • Institute of Physiology

Molecular organisation of genetic information in plants, analyses of targeted changes and manifestations of heredity in interactions with the environment and pathogens
• Institute of Plant Molecular Biology

Illustrative abstracts

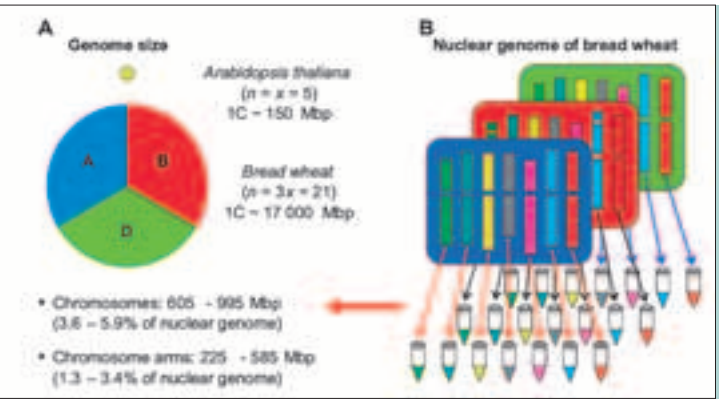
Analysis of the wheat genome using flow-sorted chromosomes • Institute of Experimental Botany

A majority of heritable information in plants and animals is localized in the cell nucleus in the form of chromosomes. Interestingly, the amount of nuclear DNA bearing this information does not correlate with organismic complexity. Whereas in humans one complete copy of this information (nuclear genome) is made up of about three billion DNA base pairs, genomes of many plant species are much larger. This is the case with the most important crop plant — bread wheat — whose genome is made up of 17 billion base pairs. Analysis of such a huge genome is extremely difficult and expensive not only

due to its enormous size but also because of its complexity, which reflects its origin. The wheat genome arose by hybridization of three wild grass species with similar genomes, marked as A, B and D.

In search of a way to simplify this analysis, we developed an original method for isolating small and defined parts of the wheat genome. The method is based on preparation of suspensions of chromosomes, which are analysed and classified according to their DNA content at high speed using laser flow cytometry. Simultaneously with the analysis, it is possible to separate a chosen chromosome type and obtain pure fractions of the particular chromosome types and their arms. Since individual chromosomes constitute only a small and defined part of the wheat genome, the availability of their DNA offers a radical simplification of its analysis.

Subsequent to this achievement we discovered that the DNA of flow-sorted chromosomes remains intact and thus should be suitable for construction of BAC DNA libraries. These libraries consist of a set of DNA fragments of about 100 thousand base pairs that represent the whole genome. They are a crucial resource for genomic sequencing and gene isolation. A successful construction of three large-insert DNA libraries from flow-sorted chromosomes* not only confirmed our proposition but provided a unique resource and tool for the wheat genomics. At present the libraries are used for wheat genome mapping and evolution studies and to isolate agriculturally important genes.



Comparison of nuclear genome size (1C) of a model plant Arabidopsis thaliana, which has been nearly completely sequenced, and that of wheat, which is composed of three subgenomes (A, B and D) each with seven chromosomes (A). DNA of particular sorted chromosomes represents only 3-6% of the wheat genome (B). Even smaller fragments of the genome can be obtained after sorting chromosome arms, whose size approaches that of the A. thaliana genome.

Janda J., Bartoš J., Šafář J., Kubaláková M., Valárik M., Číhalíková J., Šimková H., Caboche M., Sourdille P., Bernard M., Chalhoub B., Doležel J.: Construction of a subgenomic BAC library specific for chromosomes 1D, 4D and 6D of hexaploid wheat. Theor. Appl. Genet. 109: 1337–1345 (2004).
Kubaláková M., Vrána J., Číhalíková J., Šimková H., Doležel J.: Flow karyotyping and chromosome sorting in bread wheat (*Triticum aestivum L.*). Theor. Appl. Genet. 104: 1362–1372 (2002).
Šafář J., Bartoš J., Janda J., Bellec A., Kubaláková M., Valárik M., Pateyron S., Weiserová J., Tušková R., Číhalíková J., Vrána J., Šimková H., Faivre-Rampant P., Sourdille P., Caboche M., Bernard M., Doležel J., Chalhoub B.: Dissecting large and complex genomes: flow sorting and BAC cloning of individual chromosomes from bread wheat. Plant J. 39: 960–968 (2004).
Research done in co-operation with Dr. Boulos Chalhoub (Unité de Recherches en Génomique Végétale, Évry, France)

Actin and myosin participate in gene transcription • Institute of Experimental Medicine

Actin and myosin have been known for many years as key players in cell motility and intracellular movements. Our recent results suggest new crucial roles for them in critical steps of reading the genetic information in the cell nucleus.

First, we have investigated the role of actin and nuclear myosin I (NMI) in the transcription of ribosomal RNA genes (rDNA). Both proteins are associated with rDNA and are required for RNA polymerase I (Pol I) transcription. Microinjection of antibodies against actin or NMI, as well as short

interfering RNA-mediated depletion of NMI, decreased Pol I transcription *in vivo*, whereas overexpression of NMI augmented pre-rRNA synthesis. *In vitro*, recombinant NMI activated Pol I transcription, and antibodies to NMI or actin inhibited Pol I transcription both on naked DNA and pre-assembled chromatin templates. Whereas actin associated with Pol I, NMI bound to Pol I through the transcription-initiation factor TIF-IA. The association with Pol I requires phosphorylation of TIF-IA at Ser 649 by RSK kinase, indicating a role for NMI in the growth-dependent regulation of rRNA synthesis (1).

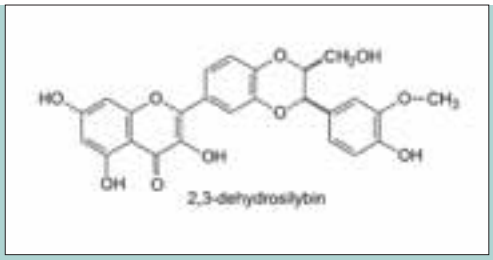
Second, we demonstrated that beta-actin is critically involved in transcription because antibodies directed against beta-actin, but not muscle actin, inhibited transcription *in vivo* and *in vitro*. Chromatin immunoprecipitation assays demonstrated the recruitment of actin to the promoter region of the inducible gene. Further investigation revealed that actin and RNA polymerase II co-localize in vivo and also co-purify. We employed an *in vitro* system with purified nuclear components to demonstrate that antibodies to beta-actin block the initiation of transcription. This assay also demonstrates that beta-actin stimulates transcription by RNA polymerase II. Finally, DNA-binding experiments established the presence of beta-actin in pre-initiation complexes and also showed that the depletion of actin prevented the formation of pre-initiation complexes. Together, these data suggest a fundamental role for actin in the initiation of transcription by RNA polymerase II (2).

Philimonenko V. V, Zhao J, Iben S, Dingova H, Kysela K, Kahle M, Zentgraf H, Hofmann W. A, de Lanerolle P, Hozak P, Grummt I. Nuclear actin and myosin I are required for RNA polymerase I transcription. Nature Cell Biol. 2004, 6:1165-72 IF=IF 20.268
Hofmann W. A, Stojiljkovic L, Fuchsova B, Vargas G. M, Mavrommatis E, Philimonenko V, Kysela K, Goodrich J. A, Lessard J. L, Hope T. J, Hozak P, de Lanerolle P. Actin is part of pre-initiation complexes and is necessary for transcription by RNA polymerase II. Nature Cell Biol. 2004, 6:1094-101 IF=IF 20.268

Illustrative abstracts

2,3-Dehydrosylibin a new compound for the therapy of psoriasis • Institute of Microbiology

Silymarin and its component silybin were isolated from seeds of Silybum marianum. These compounds are traditionally used in medicine for the treatment of hepatic diseases, mycotoxin toxicoses and as efficient antioxidants and cytoprotectives. Recently it has been found that they can also be used in the treatment of stubborn cutaneous diseases such as psoriasis and different types of dermatitis. With this objective in mind we prepared new semisynthetic derivatives that were extensively tested at the School of Medicine of the Palacký University in Olomouc.



The milk thistle, *Silybum marianum* (L.) Gaertn. (Asteracae) • Atopic eczema on hands • The active compound

The 2,3-Dehydrosilybin with antioxidant and cytoprotective acitivites substantially higher than those of silybin was found to be most effective. Silybin is primarily highly effective in the treatment of different types of dermatitis, psoriasis, atopic eczemas etc. At present, the compound is being tested at the Dermatological Clinic of the University Hospital in Olomouc. The data to date (negative toxicity, no side effects) have been positive and the compound will be used in therapeutic tests.

Illustrative abstracts

Discovering MBF1 as a protein protecting against oxidative stress • Institute of Entomology

Oxidative stress by free radicals contributes to degenerative diseases and ageing. Organisms therefore possess defence mechanisms against oxidants. This defence is triggered by activation of signalling pathways and in turn of transcription factors including the protein Jun. Jun has been known for 15 years to contain a cysteine residue sensitive to oxidation, which curbs the DNA-binding activity of Jun. Replacement of this cysteine contributes to an excess oncogenic function of Jun. How cells regulate the degree of Jun oxidation has been unclear. We found that a cofactor MBF1 binds Jun near the critical cysteine, protects Jun against oxidation, and preserves its DNA-binding activity under conditions that render Jun alone fully inactive. To demonstrate the MBF1 function in a living organism we generated mutant fruit flies Drosophila melanogaster that lack the MBF1 gene. In these flies, a Jun-dependent developmental process becomes sensitive to the oxidant hydrogen peroxide, suggesting the importance of MBF1 for Jun activity also in vivo. Although flies devoid of the MBF1 protein survive, they die earlier than normal flies in the presence of hydrogen peroxide. We conclude that even though MBF1 is not essential for life under favourable conditions, it provides an important advantage during oxidative stress. Considering a high MBF1 conservation between flies and mammals, MBF1 might play a similar role in human biology.

Jindra, M., Gaziova, I., Uhlirova, M., Okabe, M., Hiromi, Y., Hirose, S. Coactivator MBF1 preserves the redox-dependent AP-1 activity during oxidative stress in Drosophila. EMBO J. 23: 3538–3547 (2004)

List of other studies

1. Anaerobic fungi in ruminant animals (Institute of Animal Physiology and Genetics)
2. Possibility of natural replacement of permanent teeth? (Institute of Animal Physiology and Genetics)
3. Localization of genes responsible for melanoma tumors in laboratory pigs MeLiM (Institute of Animal Physiology and Genetics)
4. Anomalous structures of the fragile X chromosome (GCC) and (GGC) repeats (B) (Institute of Biophysics)
5. Interaction pathways of telomere binding proteins in plants (Institute of Biophysics)
6. The mechanisms of action of highly effective cisplatin derivative LA-12 (Institute of Biophysics)
7. New biodiversity estimates for herbivorous insects in tropical forests (Institute of Entomology)
8. Phylogeny, structure and function of insect telomeres (Institute of Entomology)
9. Plant repair of DNA double strand breaks (Institute of Experimental Botany)
10. Phosphatidic acid (PA) produced by phospholipases D (PLD) play a role in the regulation of plant cell expansion (Institute of Experimental Botany)
11. Diffusion parameters in the brain of transgenic APP23 mice a model of Alzheimer's disease (Institute of Experimental Medicine)
12. New enzyme of sugar metabolism (Institute of Microbiology)
13. Ergot taxonomy (Institute of Microbiology)
14. 2,3-Extradiole cleavage of L-DOPA is followed by intramolecular cyclization in lincomycin biosynthesis (Institute of Microbiology)
15. Negative regulation of mast cell signalling and function by the adaptor LAB/NTAL (Institute of Molecular Genetics)
16. A phenylnorstatine inhibitor binding to HIV-1 protease: geometry, protonation, and subsite-pocket interactions analyzed at atomic resolution (Institute of Molecular Genetics)
17. Characterization of chicken genes coding for receptor molecules of avian sarcoma/leukosis viruses of subgroups A and C (Institute of Molecular Genetics)
18. Common mechanism of blood pressure maintenancein different forms of hypertension (Institute of Physiology)
19. The role of membrane domains in mechanism of hormone action and desensitization (Institute of Physiology)

20. Analysis of thermal stress-mediated PSTVd variation and biolistic inoculation of the progeny of viroid "thermomutants" to tomato and Brassica species (Institute of Plant Molecular Biology)
21. Elucidation of the genetic diversity of the world population of TuMV (Institute of Plant Molecular Biology)

6 • Bio-Ecological Sciences

Research plans

The section consists of six institutes focussing on the following:

Biodiversity of plants: its variability, evolution and functioning at the levels of organisms, communities and ecosystems; its cultural aspects and application in the Průhonice Park • Institute of Botany

Biotic interactions in the pelagic zone of lenitic ecosystems, water reservoirs and lakes of different trophic levels at the time of significant reduction of industrial emissions in the post-communist Europe • Institute of Hydrobiology

Ecology of the landscape altered by human activities • Institute of Landscape Ecology

Parasitic and symbiotic organisms in animals and man: their interactions at the levels of populations, organisms, cells and molecules • Institute of Parasitology

Communities of soil organisms in the soils of ecosystems under different anthropogenic impacts: their structure, function and interactions • Institute of Soil Biology

The diversity of forms of organisation and functions of feral vertebrates: application of the gathered data to working out the strategy of protection and sustainable use of natural resources • Institute of Vertebrate Biology

Illustrative abstracts

Brood parasitism and predation: factors affecting the life-history strategies in birds • Institute of Vertebrate Biology

Both brood parasitism and predation are considered as strong selective agents that affect reproductive tactics in many bird species. It has been shown that radio-tagged cuckoo females use a habitat selectively for laying their eggs (9). Parentage relationships in a population of the common cuckoo were investigated using DNA markers, and we found that each female has specialised in one host species (8). We assessed whether an intruder near the nest influences the behaviour of the cuckoo host (3) in populations with known levels of parasitism (6).

A considerable research effort has been devoted to investigating factors affecting the recognition and rejection of the parasitic egg by the host species in European (4,7) and African brood-parasitism systems (5). Predation is the major cause of nest failure in the scarlet rosefinch, a mathematical model revealed the key characteristics in the variations in survival rates of this species (1). We examined some aspects of nest crypsis in mallards (2). Our results provide original data on a set of challenging problems in the areas of behavioural ecology and ornithology, and are important for understanding coevolution processes and their consequences for the evolution of highly specialised adaptive mechanisms in the host-parasite and prey-predator interactions.

1. Albrecht T.: Edge effect in wetland-arable land boundary determines nesting success of scarlet rosefinches (Carpodacus erythrinus) in the Czech Republic. Auk 121: 361–371 (2004).

2. Albrecht, T., Klvana, P. Nest crypsis, reproductive value of a clutch and escape decisions in incubating female mallards Anas platyrhynchos. Ethology 110: 603–613 (2004).
3. Honza M., Grim T., Čapek M., Jr., Moksnes A., Roskaft E.: Nest defence, enemy recognition and nest inspection behaviour of experimentally parasitized Reed Warblers Acrocephalus scirpaceus. Bird Study 51: 256–263 (2004).
4. Honza M., Prochazka P., Stokke BG., Moksnes A., Roskaft E., Čapek M., Jr., Mrlík V.: Are blackcaps current winners in the evolutionary struggle against the common cuckoo? J. Ethol. 22: 175–180 (2004).
5. Honza, M., Kuiper, S., Cherry, M.: Behaviour of African turdid hosts towards experimental parasitism with artificial red-chested cuckoo Cuculus solitarius eggs. J. Avian Biol., in press.
6. Kleven O., Moksnes A., Roskaft E., Rudolfsen G., Stokke R. G., Honza M.: Breeding success of common cuckoos Cuculus canorus parasitising four sympatric species of Acrocephalus warblers. J. Avian Biol. 35 (5): 394–398 (2004).
7. Procházka, P. Honza, M. Egg discrimination in the Yellowhammer (Emberiza citrinella). Condor 106: 405–410 (2004).
8. Skjelseth S., Moksnes A., Roskaft E., Gibbs H. L., Taborsky M., Taborsky B., Honza M., Kleven O.: Parentage and host preference in the common cuckoo Cuculus canorus. J. Avian Biol. 35: 21–24 (2004). 9. Vogl W., Taborsky B., Taborsky M., Honza, M.: Habitat and space use of European cuckoo females during the egg laying period. Behaviour 141: 881–898 (2004).

Illustrative abstracts

Phylogenetic relationships and molecular taxonomy of tapeworms (Cestoda) • Institute of Parasitology

To improve our understanding of the phylogeny and evolution of tapeworms (Cestoda) parasitising in economically important freshwater fish, a new set of molecular data was obtained and analysed. Analysis combining different types of molecular data, together with the prediction of secondary structures of selected DNA regions in the Proteocephalidea, made it possible to investigate phylogenetic relationships within a rich and taxonomically problematic fauna of South America. The results indicate that the current distribution of the parasites among the host species is due to frequent host switches and could be determined in a high degree by the phylogeny-independent bionomical traits of the hosts.

The comparison of the phylogeny and biogeography suggests that in a few cases the Neotropical (South American) species could have been introduced into the North America. A molecular data set was obtained for Bothriocephalus tapeworms, parasitising mostly freshwater fish, and several related genera within the order Proteocephalidea. The results obtained show that the genus *Bothriocephalus* is a parafyletic and hence an artificial assemblage. This finding indicates that further analyses will likely result in an extensive reclassification of this group, including the position of the broad fish tapeworm, *Diphyllobothrium latum*, the most important species of the tapeworms parasitising human beings in adult stages.

Hypša V., Škeříková A., Scholz T. Phylogeny, evolution and host-parasite relationships of the order Proteocephalidea (Eucestoda) as revealed by combined analysis and secondary structure characters. Parasitology (2005), in press.
Logan F. J., Horák A., Aydogdu A., Scholz T. Phylogeny of diphyllobothriid tapeworms (Cestoda: Pseudo-phyllidea) based on sequences of the ITS-2 region of the rDNA. Parasitology Research 94: 10–15 (2004).
Scholz T., Marcogliese D. J., Bourque J.-F., Škeříková A., Dodson J. J.: Occurrence of Proteocephalus tetrastomus (Rudolphi, 1810) (Cestoda: Proteocephalidea) in larval rainbow smelt (Osmerus mordax) in North America: identification of an unusual pathogen confirmed. Journal of Parasitology 90: 425–427 (2004).
Scholz T., Škeříková A., Shimazu T., Grygier M. J. A taxonomic study of species of Bothriocephalus (Cestoda: Pseudophyllidea) from eels in Japan: morphological and molecular evidence of the occurrence of B. claviceps (Goeze, 1782) and confirmation of the validity of B. japonicus Yamaguti, 1934. Systematic Parasitology 57: 87–96 (2004).
Škeříková A., Hypša V., Scholz T. A paraphyly of the genus Bothriocephalus Blanchard, 1852 (Cestoda: Pseudophyllidea) inferred from ITS2 and partial 18S rDNA sequences. Journal of Parasitology 90: 612–617 (2004).

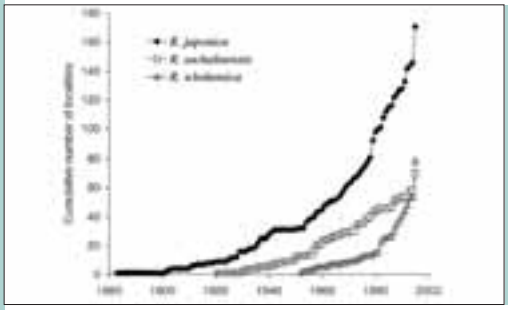
Illustrative abstracts

Species hybridisation plays a role in the process of diversity formation • Institute of Botany

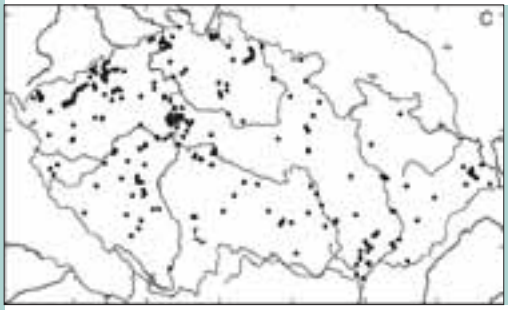
During the last 50 years, the role of species hybridisation in the formation of plant diversity has been under evaluation. Some papers have almost abandoned this role, while others have stressed its crucial importance. Recent research showed that this phenomenon is more important than had been thought. At the Institute of Botany, the role of hybridisation was studied using several model systems of Central European plants. In the first one *(Bolboschoenus)*, a new hybridogenous species (*B. laticarpus*) was described; its ecological features combine those of both parents, which fact seems responsible for its

wide distribution throughout the whole of Europe. The next system studied is *Potamogeton*, where the hybridisation has been in progress recently.

The survival and ecological importance of hybrids are also based on their long-term clonal growth, often separately from parental species. A comprehensive approach was used to analyse the pattern of hybridisation in hawkweeds (*Hieracium* subgen. *Pilosella*). The studies showed that the residual sexuality of apomictic species plays an important role in the formation of diversity within this group. These new types spread not only throughout Central Europe, but also to other parts of the world, such as New Zealand. A role similar to hawkweeds in New Zealand is played by alien *Reynoutria* species in Central Europe. They are native to Eastern Asia and produce a hybrid in Central Europe that spreads here faster than both parents. In general, the hybrid is sterile; however, in some areas it is fertile and produces a diverse progeny. These plants may be expected to have an increased invasion potential.



Rate of spread of
Reynoutria species



and their hybrid
and distribution of the hybrid
in the Czech Republic

Bímová K., Mandák B., Kašparová I.: How does Reynoutria invasion fit the various theories of invasibility. Journal of Vegetation Science 15: 495—504 (2004)
Kaplan Z., Fehrer J.: Evidence for the hybrid origin of Potamogeton ×cooperi (Potamogetonaceae): traditional morphology-based taxonomy and molecular techniques in concert. Folia Geobot. 39: 431—453 (2004)
Kaplan Z., Wolff P.: A morphological, anatomical and isozyme study of Potamogeton schreberi: confirmation of its recent occurrence in Germany and first documented record in France. Preslia 76: 141—161 (2004)
Krahulcová A., Papoušková S., Krahulec F.: Reproduction mode in the allopolyploid facultatively apomictic hawkweed Hieracium rubrum (Asteraceae, H. subgen. Pilosella). Hereditas 141: 1930 (2004)
Krahulec F., Krahulcová A., Fehrer J., Bräutigam S., Plačková I., Chrtek J.: The sudetic group of Hieracium subgen. Pilosella from the Krkonoše Mountains a synthetic view. Preslia 76: 223—243 (2004)
Mandák B., Pyšek P., Bímová K.: History of the invasion and distribution of Reynoutria taxa In the Czech Republic: a hybrid spreading faster than its parents. Preslia 76: 15—64 (2004)
Marhold K., Hroudová Z., Ducháček M., Zákravský, P.: The Bolboschoenus maritimus group (Cyperaceae) in Central Europe, including B. laticarpus, spec. nova. Phyton (Horn) 44: 1—21 (2004)
Morgan-Richards M., Trewick S.A., Chapman H.M., Krahulcová A.: Interspecific hybridisation among Hieracium species in New Zealand: evidence from flow cytometry. Heredity 93: 34—42 (2004)

Illustrative abstracts

Acid rain changes phosphorus and nitrogen cycling in lakes • Institute of Hydrobiology

In contrast to the well known nutrient transformations in circum-neutral lakes, acidified water bodies exhibit significant changes in nutrient (P and N) cycles. These changes were evaluated in the strongly acidified Plešné Lake [in the Czech part of the Bohemian Forest – Plechý]. (1) Orthophosphate liberated from sedimenting seston is bound from a liquid to a particulate phase by colloidal Al hydroxides in the hypolimnion, and deposited. This abiotic P immobilization with Al reduces by ~20percent the pool of potentially bio-available P and contributes to a severe P limitation of phytoplankton. (2)

The cessation of nitrification due to long-term water acidification leads to an atypical situation, where Plešné Lake becomes a net source of ammonium (NH_4^+). NH_4^+ entering the lake from terrestrial and atmospheric sources which is assimilated by phytoplankton and transformed to organic nitrogen. After NH_4^+ depletion, nitrate is utilised as an alternative nitrogen source. Organic nitrogen is mineralized and liberated as NH_4^+ from the dead, sedimenting phytoplankton. Because the dissimilation occurs mostly below the productive layer, the liberated NH_4^+ is not re-assimilated and accumulates in the hypolimnion. After the lake overturns, this NH_4^+ is exported from the lake. The acidified productive lakes, with dissimilative production of NH_4^+ exceeding their assimilation, thus become net NH_4^+ source.

1. Kopáček, J., K.-U. Ulrich, J. Hejzlar, J. Borovec, and E. Stuchlík., 2001. Natural inactivation of phosphorus by aluminum in atmospherically acidified water bodies. Wat. Res., 35: 3783–3790.
2. Kopáček, J., M. Brzáková, J. Hejzlar, J. Nedoma, P. Porcal, and J. Vrba. 2004. Nutrient cycling in a strongly acidified mesotrophic lake. Limnol. Oceanogr. 49: 1202–1213.
3. Kopáček, J., M. Brzáková, J. Hejzlar, J. Kaňa, P. Porcal, and J. Vrba. 2003. Mass balance of nutrients and major solutes in the Plešné watershed-lake ecosystem in the 2001 hydrological year. Silva Gabreta 9: 33–52.

List of other studies

1. New methods for the evaluation of cyanobacterial toxicity and health hazards (Institute of Botany)
2. Dispersal capacity limits distribution of rare species in a fragmented landscape (Institute of Botany)
3. Impact of weather extremes on carbon flux in a spruce canopy (Institute of Landscape Ecology)
4. Landscape changes and landscape scenery: a social perspective (Institute of Landscape Ecology)
5. Long-term effect of elevated CO_2 on spatial differentiation of Rubisco activity in Norway spruce canopy (Institute of Landscape Ecology)
6. Reproduction of tapeworms and phylogenetic importance of ultrastructure (Institute of Parasitology)
7. The genome of the diatom *Thalassiosira pseudonana* (Institute of Parasitology)
8. The development of new methods for long-term maintenance of algal and cyanobacterial cultures (Institute of Soil Biology)
9. Chromosomal variation and populations of the house mouse in Europe (Institute of Vertebrate Biology)
10. Antibodies to mosquito-borne viruses in the Central Bohemian population in the area affected by flood in 2002 (Institute of Vertebrate Biology)

7 • Social and Economic Sciences

Research plans

The section is formed by five institutes working on the following:

The economy at the time of advanced transformation • Economics Institute

Basic research on psychology in interdisciplinary contexts, particularly the psychology of personality, general psychology and psychology of health • Institute of Psychology

Illustrative abstracts

Sociological analyses of changes occurring in the contemporary Czech society • Institute of Sociology

Implementation of the principles of public law and supranational law • Institute of State and Law

The life and work of T. G. Masaryk in the historical and the present context, the Czech issue as one of the problems of democracy • Masaryk Institute

T. G. Masaryk — the quest for the ideal and the truth 3 (1893—1900) • Masaryk Institute

The third volume of the six-volume biography of T. G. Masaryk describes the second period of Masaryk's life in Prague. Forty-three-year old Masaryk withdrew from politics, and concentrated on "non-political politics", i.e., education of the young generation of intellectuals and developing an ideological framework of modern "Czechness." Masaryk's intellectual and literary activities were culminated during that period. He published a series of works on the Czech question, considered to be his first attempt to create a philosophy of Czech history. His criticism of Marxism was keenly followed abroad. At the same time Masaryk published a series of impassioned reflections on modern man and on religion. Masaryk was the most popular professor at Charles University's Faculty of Arts when he opposed the anti-Semitic myth charging Jews with ritual murder, but afterward he became the most hated person in Czech society.

T. G. Masaryk
terčem antisemitské karikatury
v období Hilsnerovy aféry

Polák, S., T. G. Masaryk — Za ideálem a pravdou, Masaryk Institute, ASCR, Prague 2004, 484 pp., ISBN 80-86495-20-5, hardback, illustrations, 250 Kč.

Illustrative abstracts

Selected chapters from cognitive psychology: Mental representations and mental models • Institute of Psychology

This synthesizing monograph sums up the results of extensive research in the field of mental representations and mental models of the mind. The classification and analysis of mental operations in the human mind during the process of acquiring the knowledge, the ways of constructing the mental models and their exploitation in everyday life was the focus of the research. The pieces of knowledge concerning the mental modelling can serve as a starting point for processing some psychological topics, e.g., in the development-oriented implicit theory that is often called "theory of mind" in the folk psychology. "Theory of mind" is an explanation of development, the ability to understand not only one's own experience and behaviour but also the experience and behaviour of other people. The so-called folk (lay or naïve) psychology provides an insight into construing mental models in everyday life. The

practical implications applicable, e.g., in the modern conception of didactics, underscore the attraction of the book. The monograph, emphasising one of the key topics of human cognition, is a unique achievement.

Sedláková, M., Grada, Prague 2004, 252 pp.

Central European Parliaments: First Decade of Democratic Experience and the Future Prospective
• Institute of Sociology

The present periodical summarises and assesses the first decade of research on parliaments in Central and Eastern Europe and sets research priorities in the context of the EU enlargement. Its main goal was a shift from isolated research projects on national parliaments and their actors, which dominated the last decade, to international co-operation and comparative parliamentarism studies. Maximum attention was focussed on the role of parliaments in the new EU member states vis-à-vis changes in their agenda, role and potential links to the European Parliament. The study is a significant contribution to current discussions on parliamentarism.

The book is divided into four thematic parts – the first titled *The Parliamentary Research Agenda* maps the main results of empirical studies of MPs and parliaments in Central Europe and in Germany. The second part, *Parliaments in Processes of Globalisation and Europeisation* analyses the shift in the roles and positions of national parliaments in processes of transformation and globalisation. Contributions in the third part, titled *The Role of Political Parties in Parliaments*, concentrate on the renewed interest in the study of the influence of political parties in parliaments. The fourth and last part, titled *Legislative Recruitment*, concentrates on changes in recruitment and career patterns of MPs. The final chapter summarises the main ideas and results of a discussion roundtable titled *Opportunities for co-operation and co-ordination of comparative research.*

Z. Mansfeldová, D. M. Olson, P. Rakušanová (editors), Parlamenty ve střední Evropě: První dekáda demokratických zkušeností a budoucí vývoj. Institute of Sociology, ASCR, Prague 2004, 240 pp. ISBN: 80-7330-067-2

List of other studies

1. Recalls and Unemployment Insurance Taxes (Economics Institute)
2. The Demand for Bank Reserves and Other Monetary Aggregates (Economics Institute)
3. Tale of the Czech Transition: Understanding the Challenges Ahead (Economics Institute)
4. Psychosemantics. Psychosemantic approach to research and psychodiagnostics (Institute of Psychology)
5. Housing Standards 2003/2004: Housing Policy in the Czech Republic: More Efficiently and in a More Targeted Manner (Institute of Sociology)
6. The Quality of Electoral Preference Surveys (Institute of Sociology)
7. Commercial Code: Practical Annotated Edition with Selected Jurisdiction Since 1900 (Institute of State and Law)
8. Public Administration Reform in Theory and Practice: Problems of Public Administration Reform in the Czech Republic, Hungarian Republic, Polish Republic and Slovak Republic (Institute of State and Law)
9. The Accountancy Act after Amendment. Since 1 January 2004 with Commentary (Institute of State and Law)
10. The Masaryk Compendium XI–XII (1999–2003) (Masaryk Institute)
11. The Masaryk Institute at home (Masaryk Institute)

Research plans

8 • Historical Sciences

The section includes six institutes with the following research themes:

Key questions of the prehistoric and early historical development north of the central Danube in view of the present results of archeological research • Institute of Archeology in Brno

Basic research on the ancient and medieval history of Bohemia in the European context, preservation of the archeological part of the national heritage • Institute of Archeology in Prague

The development of science and culture in the Czech Lands, institutions and personalities involved preservation, organisation and use of the sources • Archives of the ASCR

The history of Czech visual arts from the early Middle Ages to the present time • Institute of Art History

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

Czech history in the international context up to 1945 • Institute of History

Illustrative abstracts

Vlastislav Hofman (1884—1964). An Arch Cubist • Institute of Art History

The monograph on the architect Vlastislav Hofman (1884—1964), the foremost representative of the unique phenomenon of Czech architectural cubism, focuses on all fields of his artistic activity. Hofman entered the history of modern art during the first half of the twentieth century through the avant-garde Group of Creative Artists. From the beginning he was the most radical follower of new ideas and his exceptionally inventive spirit was soon recognised. The exhibition and catalogue reveal him not only as an architect, urbanist, world-famous scenographer (in cooperation with the director, K. H. Hilar) and important designer of applied artworks, but also as a painter, graphic artist, illustrator, theoretician and designer of bridges. The exhibition follows his activities in the Group of Creative Artists, which he left in 1912 together with several friends sharing his views to start his own career as an independent artist. Hofman was also one of the initiators of the *Tvrdošíjní* group. He exhibited with the group at all its exhibitions both at home and abroad.

Vlastislav Hofman,
obálka knihy

grafické řešení Robert V. Novák

The exhibition is unique in that it shows Hofman's work in its entirety. It covers all aspects of his creativity reflecting the mutual relations between them, and places his work in the European context. A list of the artist's publications combined with excerpts from nine of his most important theoretical studies is included in the large exhibition catalogue containing extensive pictorial documentation

(482 plates). Members of the Institute Rostislav Švácha and Mahulena Nešlehová participated in preparing the exhibition as well as the catalogue accompanying it, which is published in both Czech and English.

Mahulena Nešlehová, ed., Obecní dům, Prague 2004. 473 pp. (B)

Encyclopedia of architects, builders, bricklayers and stonemasons in Bohemia • Institute of Art History

The encyclopaedia lists personalities of Czech architecture and construction to an extent and depth that has not yet been achieved by any other publication. It covers the period from approximately the beginning of the fourteenth century – i.e., the time when the oldest preserved sources on Czech architecture and builders of monuments emerged from anonymity – to the second half of the twentieth century. The book also includes artists and craftsmen born around 1900. Each entry is up-to-date and comprises in condensed form all known data including bibliographical references. The authors also present new results of archival research that has not yet been published in its entirety. The encyclopaedia also refers to the activities of architects and builders abroad. Each entry concludes with a short list of sources and secondary works, and a full bibliography is located at the end of the book. The encyclopaedia was edited by Pavel Vlček, who also contributed a large number of entries. Members of the Institute Jiří Hilmera (a former member), Markéta Svobodová and Marie Platovská also participated in its preparation.

Pavel Vlček editor, Academia Prague 2004. 761 pages.

Oral History in the Research of Contemporary History • Institute of Contemporary History

This study represents, to a certain extent, a new approach in Czech historiography as it has not been devoted to a specific topic or process in history but rather deals with the development and analysis of a specific historical method of research, namely, that of oral history. The study seeks to clarify the term properly, denoting the key moments in its development, namely, within the International Oral History Association, describing also its development and application hitherto of the oral history in the Czech historiography.

Miroslav Vaněk, Publication series The Voices of the Past. Vol. 1. ICH Prague, 2004, 175 pp., ISBN 80-7285-045-8.

Regesta diplomatica necnon epistolaria Bohemiae et Moraviae, vol. V, fasc. 4 (Jul. 1352–Apr. 1355)* • Institute of History

Modern critical editions of historical sources are very basic parts of European contemporary production in medieval history, being outstanding scientific accomplishments of lasting value for historians in several disciplines. The editorial series *Regesta diplomatica* was founded by the "father" of Czech national historiography František Palacký in the 19th century. Until recently, the fragment of volume V that should have contained papers from the first nine years of the rule of Emperor Charles IV, was felt to be a palpable gap. This gap is now filled by fascicles No 3 (J. Zachová, 2000) and No. 4 (present title) that were completed, devoting meticulous attention to all the methodological and technical demands that are usual in modern European editorial practice.

Based on detailed heuristics and textual elaboration of the collected material the documents published in Vol. 4 make accessible a significant part of the papers issued by Charles IV as a Czech king and also Roman emperor. The edited deeds corroborate an imposing scope of Charles' interests in the state and development of Bohemian Crown Lands in home as well as in the European context. Besides royal deeds, the volume contains other documents, papers and deeds concerning the administration of the nobility's

Illustrative abstracts

Illustrative abstracts

Illustrative abstracts

property, sources to urban development, etc. This method of volume composition puts the edited documents into a broader historical context. Texts are provided with modern explanatory and critical commentaries in Latin, making the book linguistically comfortable for the international community of medieval scholars.

J. Zachová. (ed.), Scriptorium, Prague 2004, 262 pp.

Illustrative abstracts

Manuscripts in central and church libraries in the Czech Republic: A Guide to Manuscript Collections in the Czech Lands • Archives of the ASCR

The fourth and concluding Guide gives an overview of the manuscripts contained in central and church libraries in Bohemia, Moravia and Silesia. In it, the authors continue in the parameters of the three preceding volumes of the Guides, embracing the manuscript collections held in castles, chateaux and palaces (1995), in archives (1998) and in museums and galleries (2001). Thus, it concludes the series, presenting a basic overview of the country's wealth of manuscripts. The present volume is divided into two sections. Manuscripts in central libraries are recorded in the first and church manuscripts in the second. In the interests of continuity with the preceding volumes, the same abbreviations and headings have been used.

The publication of this volume concludes the first stage of the project to create a general catalogue. This is a long-term undertaking being conducted by the Department for the Recording and Study of Manuscripts, whose task it is to set up a standard record of all manuscripts held in this country. A second edition of the Guide is planned for the future which will contain all current, and any additional information adduced in a single, comprehensive volume.

Pražské arcibiskupství — Manderscheidská knihovna, hodinky, sign. XV2 (druhá polovina 15. století, Francie)

Brodský, P., Hradlová M., Petr S., Tošnerová M. Volume IV, Manuscript Studies — Monographia X [Studie o rukopisech — Monographia X]. Archives of the ASCR, Prague, 2004, 634 pp.

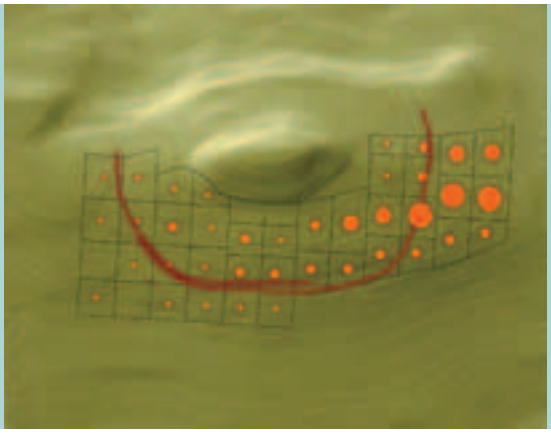
Illustrative abstracts

Ancient Landscapes, Settlement Dynamics and Non-Destructive Archaeology • Institute of Archaeology, Prague

The book comprises the results of the most extensive archaeological research project undertaken in the Czech Republic in the post-communist period. The principal aim of the project was to determine the fundamental factors of the structure, continuity and change in prehistoric settlement from the Neolithic to the Middle Ages both in the traditional settlement zone of lowlands, and in the lesser attractive higher grounds.

The prehistoric landscape is presented here as a palimpsest comprising “components” (archaeological traces of activity areas) which are revealed over large territories through the application of chiefly non-destructive investigative field methods. Particular attention is paid to the natural scientific methods of the environmental reconstruction of the landscape (namely, in the floodplain). A complex research, where the data gained by field work (mostly spatial non-destructive investigation, complemented by limited excavation) are combined with archival data and are assessed by GIS, is considered an effective method aiming at the reconstruction of past settlement history.

Libkovice (okr. Mělník):
letecký snímek půdorysu
dlouhého domu nadzemní konstrukce
z období kultury s lineární keramikou
(2. pol. 6. tis. př. Kr.)
zviditelněného prostřednictvím
porostových příznaků



Trpoměchy (okr. Kladno):
digitální model terénu (vytvořený pomocí
GIS – geografických informačních systémů)
se zakreslenými výsledky analytických
povrchových sběrů (oranžové kroužky),
letecké prospekce a geofyzikálního měření
(červené linie vyznačující pravěké příkopy)

M. Gojda (ed.), Academia, Prague 2004, in press

1. The development of municipal books in Brno in the Middle Ages [in the context of the development of municipal books in the Czech Lands] (Archives of the ASCR)
2. Illuminated manuscripts of Czech origin in Polish collections (Archives of the ASCR)
3. The Gravettian along the Danube. Proceedings of the Mikulov Conference 2002 (Institute of Archeology, Brno)
4. Mediaevalia archaeologica 6. – Mining and processing of precious metals: residential and technological aspects (Institute of Archeology, Brno)
5. Die Höhensiedlungen der Hallstatt- und Latènezeit in Westböhmen (Institute of Archeology, Prague)
6. Prague. Detailed map of archaeological reference points in the historical part of the town (Institute of Archaeology, Prague)
7. Czech Art History Bibliography from 1988–1991 and 1994–2003 and its digitalisation from 1971–1987 and 1992–1993 (Institute of Art History)
8. The Prague Spring in the Media: A Selection of Contemporary Columns (Institute of Contemporary History)

List of other studies

9. Common Ground: Expectations and Reality of the Post-War Era. Contributions to the History of Czech Society between 1945 and 1948 (Institute of Contemporary History)
10. Against Beneš! Czech and Slovak Opposition in London, 1939—1945 (Institute of History)
11. Biographical Lexicon of the Czech Lands (Institute of History)

9 • Humanities and Philology

Research plans

The section consists of six institutes focussing on the following studies:

Dynamics of the national language, its literary and non-standard forms. Reflection of social changes, general linguistics, confrontational aspects of the Czech language • The Czech Language Institute

The history and theory of Czech literature from its origins to the present time. The Institute also provides information, making its database available to external scholars and students • Institute of Czech Literature

The Czech Lands and people: social and cultural phenomena and their changes during historical development • Institute of Ethnology

Czech musical culture in the European context • Institute of Ethnology

Selected key questions of philosophy, philosophical dimensions of the changes taking place in the Czech Republic, editing and publication of relevant texts • Institute of Philosophy

Czech culture in the Latin context • Institute of Philosophy

Paleoslavonic studies, byzantinology, Slavonic languages and literatures, history of Slavonic studies, Russian and Ukrainian immigrants and their activities in Czechoslovakia • Institute of Slavonic Studies

Open questions of the histories, languages (quantitative linguistics, lexicography, phonology) and cultures (literature, religion) of selected Asian and African countries • Oriental Institute

Illustrative abstracts

Arnold Schönberg: Styl a idea (Style and Idea) • Institute of Ethnology

A selection of theoretical essays by Arnold Schönberg (1874—1951) is featured this volume. The title of the book is taken from an anthology published by the composer in New York in 1950. Other treatises from the years 1902—1950 have been added. Arnold Schönberg won general recognition as a composer and a creator of the twelve-tone composition technique, which significantly influenced the musical development of the 20th century, and he became one of the most important personalities of modern music. [Schoenberg, born in Vienna, himself described the system as a "method of composing with 12 notes which are related only to one another".] The extraordinary impact of his lifelong work stemmed from his radical intransigence in matters of both artistic and civic ethics. He was an first-rate expert of classical traditions of European music, in which he intentionally maintained his interest, and was an outstanding teacher of composition. A few of his students were Alban Berg, Anton Webern and Hans Eisler.

The volume also includes a set of reproductions of Schönberg's works of art.

I. Vojtěch, Arbor Vitae publishers, Prague 2004, 400 pp., ISBN 80-86300-48-X.

Illustrative abstracts

Logic and logics • Institute of Philosophy

The book is an overview of formal systems of propositional calculi, which discusses their properties, and also addresses the question of their sense and applicability. Thus the book fills a certain gap for Czech literature which traditionally studied intensively mathematical properties of standard logic and, more recently, also studied relatively intensively non-mathematical aspects of logic. Analysed in particular are the systems of intuitional logic, many-valued logics, relevance logics and modal logics, with a stress on the Kripkean semantics based on the concept of "possible-world". Also presented is a somewhat generalised concept of propositional calculus and its semantics.

J. Peregrin, Academia, Prague 2004, 205 pp.

Illustrative abstracts

Dobrowsky and the Slavonic Bible • Institute of Slavonic Studies

The volume contains 50 papers by scholars from 13 countries, read at an international conference organized on the occasion of the 250th anniversary of the birth of Josef Dobrovský. The objective of this scholarly gathering was to assess the significance of his work in the light of contemporary research. The authors of individual papers analysed in which respect Dobrovský's contribution was original and seminal, which of his findings and contentions are still valid, what was his impact on the further development of Slavonic studies and their specialised fields. One of the papers, on Dobrovský's studies dealt with the Slavonic translation of the Bible, and was elaborated in a monograph which is published as a separate companion volume to the proceedings of the conference. It is an exhaustive survey of the development of research in this field from the very first attempts to analyse this question till the present in which the author has shown the enduring unassailability of findings reached by Dobrovský nearly two centuries ago.

Josef Dobrovský –
Fundator studiorum slavicorum,
obálka knihy

V. Vavřínek, H. Gladkova, K. Skwarska (editors): Josef Dobrovský – Fundator studiorum slavicorum; Proceedings of the International Conference, Prague, June 2003, Institute of Slavonic Studies, ASCR, Prague 2004, 562 pp., ISBN 80-86420-17-5. Francis J. Thomson, A companion volume to the Proceedings of the International Conference on Josef Dobrovský – Fundator studiorum slavicorum, Institute of Slavonic Studies, ASCR, Prague 2004, 154 pp., ISBN 80-86420-18-3. Published with financial support of the ASCR

Illustrative abstracts

The Czech Electronic Library: Poetry of the 19th Century, Internet Application • Institute of Czech Literature

The full-text database offers (with several exceptions) 1200 first editions of poetic texts, including those which are not generally accessible. The given complex includes other editions as well, when the

collection had been completely reworked during a poet's life and thus shows his artistic development (the second edition is always accompanied by variant reading) or when a canonical critical exists. Thus the collection may appear several times in the application.

We present for the first time the work of the poets of the given period within the framework of the whole full-text database. The importance of the database is in comprising works by forgotten poets, in representing all layers of the poetic production of the period regardless of the artistic value of the modern poetry written in Czech. The poetic works of all the authors have been considered with accompanying editorial material. It involves the column publishing data (data on the place and time of edition, publisher), motto and its author, and especially the editorial note and commentary. The editorial note gives an account of the poetic language of the author with all the individual singular features and variation of the usage, the commentary concentrates primarily on the concrete language problems, on translations of words or passages in foreign languages, and explanation of the outdated or obsolete words, if necessary.

Náhled hlavního okna
nové internetové aplikace ČEK

Základní zobrazení
uživatelem vybrané sbírky

A key premise is to provide the reader with the text of poetry as an individual work without any later distortion, i.e., in a form that facilitates the analysis that is fully independent of our a priori — e.g., aesthetic — notions. The software of the full-text database that makes possible meticulous work with the text in variant readings demonstrates the advantage of our project as well.

For the target user we consider both the specialised researchers, bohemistics institutes and the wide cultured public at home and abroad, especially students at colleges and universities (we offer resources for e-learning as well). To promote broader and easier accessibility of the material deposited in a full-text database, we have decided to offer it free of charge on the web. Thus we are making use of the most modern methods for reading and analysing the poetry and promoting greater appeal for readers and form fundamental grounds for more precise analyses in literary or linguistic research. The full-text

database provides all the advantages of digital work with the text, whether books, their parts (collections, poems, verses, individual lines, words) or a complex of texts chosen by the user. It offers high speed and well-arranged searching for and displaying of all the books and their structures; the option between two versions: diplomatic (fully faithful to the original) and editorially adapted (i.e., with the textology commentary by the editor); high speed full-text searching according to many adjustable parameters, i.e., the searching for one word, a couple or group of words at different levels of the text: within the framework of a line, verse, poem, collection, book and the entire database; definition of groups of related words or different ways of the graphic record of the same word is possible by means of the user dictionary; searching for phrases of the individual words and motifs, automatic compilation of the frequency index; obtaining statistical data on the number of words and lines in a chosen whole, on the length of a word or line in a given collection, author or group of authors; printing and export of limited parts of works; adding one's own notes and data from other sources to the database.

B. Svadbová et al., http://www.ucl.cas.cz/ek/

List of other studies

1. Colour terms and their use in the toponymy of Bohemia (The Czech Language Institute)
2. New words in the Czech language: A dictionary of neologisms (The Czech Language Institute)
3. A study on the titles of nobility in Germanic, Slavonic and Baltic languages: Etymology as an auxiliary science to history (The Czech Language Institute)
4. Literary Trash. The "Operation of Elimination, the Operation of Replacement" — 1938—1951 (Institute of Czech Literature)
5. En route to Producing Meaning [The Poetics of a Literary Work of the 20th century] (Institute of Czech Literature)
6. Roma Migration in Europe: Case studies (Institute of Ethnology)
7. Round Dances — 19th Century Derived Couple Dances (Institute of Ethnology)
8. František Lýsek: Písně z Lašska (Institute of Ethnology)
9. Conceptual Systems (Institute of Philosophy)
10. On the way to scholastics. Monastery school in Le Bec: Lanfrank of Pavia and Anselm of Canterbury (Institute of Philosophy)
11. Why Gorgias Speaks. Introduction into the philosophy of non-being (Institute of Philosophy)
12. Modernism and Historism. Historical representation in the changes of literature at the turn of the 19th century (Institute of Philosophy)
13. Russian-Czech and Czech-Russian Dictionary of Neologisms (Institute of Slavonic Studies)
14. West Slavic Literatures in the Czech Milieu in the 20th Century (Institute of Slavonic Studies)
15. The Concept of the Perfect Man in the Mirror of Islamic Mysticism: The Treatise "The Divine Ordinance for the Remedy of Human Kingdom" (Oriental Institute)
16. The Fundaments of Asian Religions (Oriental Institute)
17. A Dozen Faces of Nasreddin (Oriental Institute)


3

3 Cooperation with Universities and the State of Accreditation and Training

Cooperation with universities mainly developed in working on research projects at joint departments, in the training of students in Doctoral Study Programmes (DSP) based on joint DSP accreditation, *et cetera*. The mutual coordination of work manifested itself, for example, in the participation of university employees in activities conducted by the bodies of the ASCR, *i.e.*, the Academy Assembly, Council for Sciences, and the Supervisory Committee, and in the special councils at the Grant Agency of the ASCR. Similarly, a number of research workers at the ASCR were members of university bodies, for example university and faculty science councils. Frequent meetings were held between the senior representatives of the ASCR and university management.

Collaboration with the Presidium of the University Council and the Czech Rectors' Conference was close as well. University and ASCR researchers collaborated on 603 joint research projects supported by the Czech Science Foundation and Grant Agency of the ASCR. In addition, there were 19 cooperation contracts with universities. A **General Cooperation Contract** was newly concluded in 2004 **between the ASCR and the West Bohemian University in Plzeň, as was a General Cooperation Contract between the ASCR and the VŠB Technical University of Ostrava and Cooperation Agreement for the implementation of doctoral study programmes between the ASCR and the VŠB — Technical University of Ostrava**. The overall number of joint ASCR and university departments increased to 55. The number of research centres involved in the programmes of the Ministry of Education, Youth, and Sports stood at 23.

Collaboration with universities has moved forward in a positive manner thanks to a ruling by the Accreditation Commission of the Ministry of Education, Youth and Sports extending the accreditation of doctoral study programmes. A total of 53 ASCR institutes benefited from this ruling in 2004.

Attention was also paid to collaboration with the Czech Science Foundation in implementing its **Doctoral Team** programme which brings together doctors in a specific field. The aim of the programme is to raise the social profile of doctoral studies thereby making a career in science more attractive to graduate students. The Czech Science Foundation funded a total of 42 doctoral projects in 2004. ASCR institutes received grants for 7 doctoral projects, and in 19 other projects they were joint recipients.

Among its other activities, the Academy's Council for Collaboration with Universities and Graduate Study Programmes sponsored seven week-long **Courses of Research Fundamentals**, attended by 209 DSP students (161 students whose supervisors were

ASCR academic personnel and 48 students whose supervisors work at universities). Most of them were students of biology and chemistry (156), while 27 were social science students and 26 read physics and technical sciences. (The concept of the course, its content, and its current programme can be found on the ASCR website at http://www.cas.cz/cz/spol/kzvp.) The aim of the course is to familiarise new DSP students with the principles of presenting the results of scientific work, and to introduce them to other information that is important for their training.

A total of **1939 graduate students** attended ASCR institutes in 2004, whether in full-time study, extramural study, or a combination of the two. The number of DSP graduates who obtained Ph.D. degrees rose slightly to 204 in contrast to previous years. Supervisors of 421 incoming DSP students are on the research staff at ASCR institutes. A total of 236 foreign graduate students were trained at 36 ASCR institutes, and 24 of them obtained Ph.D. degrees in 2004.

Slavnostní předávání
titulů DSc.,
které uděluje
Vědecká rada AV ČR

The long-standing trend of increasing the active participation of **ASCR staff in teaching university courses** continued in 2004, with 903 ASCR employees teaching at universities during the 2003/2004 summer semester and 934 in the 2004/2005 winter semester. Four hundred eighty one ASCR employees took additional positions at the universities, and 361 university employees also worked at ASCR institutes. It is also of positive significance for ASCR institutes and university faculties that a total of 210 professors and 296 associate professors worked at ASCR institutes on either a full- or part-time in 2004, a slight increase over previous years. The ASCR awarded the title of Doctor of Science (DSc.) for the first time in 2004 to seven of its employees.


4

Cooperation with the Business Sphere and Institutions

4

The transfer of the results of basic research into practice is among the priorities stipulated in the founding documents of the Academy of Sciences of the Czech Republic. In order to reinforce this process in 2004, ASCR institutes made use of six partial programmes of National Research Programme I, which supplements or even substitutes any existing programmes announced by the ministries and other institutions. Industrial enterprises and private research institutions collaborated with ASCR institutes on several dozen projects of the Czech Science Foundation. The results of basic research were also put into practice in the form of business contracts (the institutes of the Academy of Sciences entered into more than 600 of these) or via direct collaboration under agreements between ASCR and other institutes. The results of fundamental research carried out by the Academy are applied in industry, agriculture, protection of the environment, support of cultural values, n health services, and in examining the state of Czech society.

The projects of the Ministry of Trade and Industry are of prime importance in launching **new technology and product innovations**. ASCR institutes contributed to 41 of these projects, most as part of the Tandem Programme (15 projects) and in partial partnerships (13 projects). About one-third of these projects and almost half of all business contracts were related to technological innovations within the Support of Targeted Research and Development programme. The scope of applications is illustrated by the following selected co-operative projects and results:

New technology and product innovations

The development of techniques of low-cost testing on the bending strength and fracture toughness of ceramic materials at high temperatures
- **Institute of Physics of Materials — Saint Gobain Advanced Ceramics, Turnov.**

The results of co-operation of the **Institute of Physics** with the **Food Research Institute** in Prague on a project called “Utilization of high pressures for non-thermal foodstuff processing” are now applied to the pressure processing of foodstuffs by the company **Beskyd Fryčovice, a.s.**

In co-operation with the Belgian company **Envitech** (investor) and Czech companies Ateko (reactor supplier) and **ELMES** (supplier of plasma generator based on a licence granted by the **Institute of Plasma Physics**), a plasma reactor was created for the gasification of solid organic substances and the vitrification of inorganic substances, whilst successful tests were carried out on the gasification of bio-mass with the production of energetically highly valuable gas with high hydrogen content.

Tensometric measurement and the evaluation of forces in special rods at the River City Nile House building in Prague-Karlín was part of an architecturally non-traditional solution of façade structure suspension; the measurements done and their conclusions allowed the fast, safe, and reliable performance of a unique structure • **Institute of Theoretical and Applied Mechanics — Excon, a.s.**

The execution of personal dosimetry of aircraft crews and presentation of results to individual airlines
• **Nuclear Physics Institute — ČSA, a.s., Travel Service, Ltd., Fischer Air, Ltd.**

The production of absorption cuvettes filled with caesium for use in laser spectroscopy and the development of special technology for filling • **Institute of Scientific Instruments — Humboldt University, Berlin.**

The measurement of the dynamic features of an impellor with blades with continuous linkage was performed on a 1 MW testing turbine for the company **Škoda Energo, Ltd.** in Pilsen at their lab; the design and installation of a magnet-resistive sensor was executed for measuring the dynamic features of an impellor with bandaged blades in the axial and peripheral direction • **Institute of Thermomechanics.**

The preparation of background material for the pilot production of TiO_2 nano-particles to be used in special self-cleaning paints and construction materials • **Institute of Inorganic Chemistry — Precheza, Přerov.**

The development of an industrial ultrasound generator and sonifier for 1000 W output
• **Institute of Inorganic Chemistry — University of Pardubice and the companies Unicat and Karas.**

The semi-pilot preparation of mullet precursors, concentrates, and their characterisation
• **Institute of Inorganic Chemistry — Diamo, s.p., Stráž pod Ralskem.**

The design of production technology of suspension natrium hydride and technical servicing in production at Synhydride • **Institute of Inorganic Chemistry — Lučební závody, a.s., Kolín.**

The development of a new type of natrium-potassium crystal in clear and coloured modifications
• **Institute of Inorganic Chemistry — Moser, a.s., Karlovy Vary.**

The intensification and safe control of the operation of industrially sprinkled reactors
• **Institute of Chemical Process Fundamentals — VÚANCH, Ústí nad Labem, VŠCHT in Prague.**

The development of ammonia alum processing for NS fertilizers of Dasalex type
• **Institute of Chemical Process Fundamentals — Diamo, Stráž pod Ralskem.**

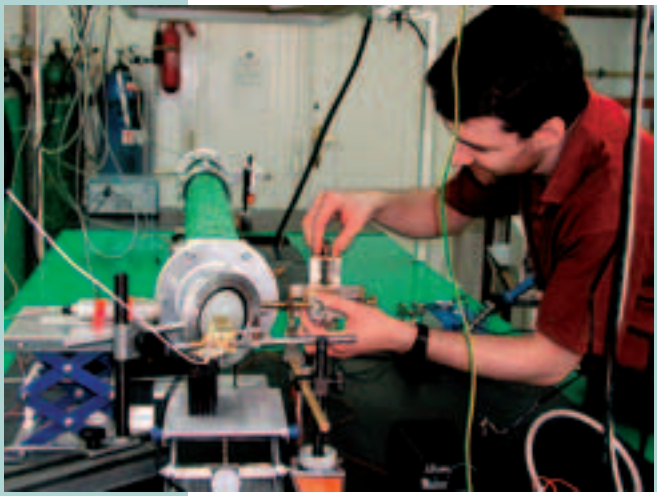
Semi-pilot laboratory experiments on the extraction column for creosol extract refining
• **Institute of Chemical Process Fundamentals — Paramo, a.s.**

The optimising of silicate inter-porous molecular sieve synthesis with tin — catalyser for adamantane oxidation • **J. Heyrovsky Institute of Physical Chemistry — VÚANCH, Ústí nad Labem.**

The preparation of nano-crystallic $Li_4Ti_5O_{12}$ and TiO_2 for applications in Li-ion batteries
• **J. Heyrovsky Institute of Physical Chemistry — HPL S.A., Switzerland.**

The development of composite membranes of type silicalite-1 alpha alumina for the separation of water-acetic acid mixtures • **J. Heyrovsky Institute of Physical Chemistry — BNRI, Japan.**

The development of devices for the automation of electrochromatographic and electrophoretic analyses
• **Institute of Analytical Chemistry — Ecom, s.r.o., Prague.**



Unikátní spektrometr pro milimetrovou oblast ve Společné laboratoři molekulové spektroskopie ÚFCH JH AV ČR a VŠCHT použitelný pro frekvenční oblast 10—270 GHz umožňuje extrémní přesnost v určování frekvencí přechodů, která je odvozována od atomových hodin. Spektrální rozlišení je omezeno šířkou pásu. Přístroj je určen především pro plynné vzorky atmosferických specií a molekul s astrofyzikálním významem

The development of polypropylene nano-composites prepared by mixing in the melt
- **Institute of Macromolecular Chemistry — Silon, a.s., Planá nad Lužnicí.**

The preparation and application of new polymer ionic-exchangeable materials and the development of continual lamination technology of composite ionex membranes
- **Institute of Macromolecular Chemistry — Mega, a.s., Stráž pod Ralskem.**

The high-tech application of phtalocyanine derivates
- **Institute of Macromolecular Chemistry — Research Institute of Organic Syntheses, a.s., Pardubice.**

The development of polymer doxorubicine conjugates linked by hydrazone link to a poly[N-(2-hydroxypropyl)metacrylamide] carrier, intended for tumour disease therapy
- **Institute of Macromolecular Chemistry — Zentiva Prague, Institute of Microbiology.**

Chiral synthesis in the preparation of active pharmaceutical substances
- **Institute of Organic Chemistry & Biochemistry — VÚFB, a.s., Zentiva Prague.**

The design, synthesis and development of new immuno-therapeutics based on modified muramyl glycol-peptides and the utilization of these substances as defined adjuvants in structuring DNA vaccines
- **Institute of Organic Chemistry and Biochemistry — IC-Vec Ltd., London, Institute of Zoo-pharmacy and State Health Institute, Prague.**

The development of fat emulsions for parental nutrition with specific pharmacological effects
- **Institute of Biophysics — Infusia, a.s., Hořátev.**

The development of directed cytostatics
- **Institute of Microbiology — Zentiva, a.s., IVAX Pharmaceuticals, a.s., Institute of Macromolecular Chemistry.**

The development of technology for the production and cultivation of algae in solar bio-reactors and in fermenters with organic carbon source to be applied in human nutrition, the fodder industry, and cosmetics industry; the construction of a base for high-volume algae cultivation in South Greece
- **Institute of Microbiology — BCS Engineering, a.s., Brno, Agency for Industrial Development, Kalamata, Greece.**

The development of submersion technology of the *Actinobacillus pleuropneumoniae* strain for the preparation of vaccines against upper air passage disease in pigs
• **Institute of Microbiology – Bioveta, a.s., Ivanovice na Hané.**

The development of technology for enzyme preparation – oxidases of de-amino-acids and glutaryl-ACK-acylase using ferments • **Institute of Microbiology – Bioferma Murcia S.A., Spain.**

The development of an apparatus and technological procedures for industrial and medical applications of ionising radiation, especially the use of boron-phenyl-alanine in the therapy of certain brain tumours by using the technique of neutron capture • **Institute of Experimental Medicine – ÚJV Řež, a.s.**

The development of technology for the production of antigens suitable for cyto-megalo-virus infection diagnostics • **Institute of Molecular Genetics – Vidia, s.r.o.**

The creation and introduction of monitoring the effects of algicides used at the Dukovany nuclear power station on the biotic component of water ecosystem; and the development of paints for the cooling system • **Institute of Botany – Research Institute of Organic Syntheses, Pardubice.**

There is also an extensive cooperation with other, mainly non-commercial organisations, especially in these spheres: **health service, the environment, and agriculture**. The institutes of the Academy of Sciences of the Czech Republic participated in 47 projects of the Ministry of Health of the Czech Republic, 24 projects of the Ministry of Agriculture, 11 projects of the Ministry of Environment, 3 projects of the Ministry of Transport and Communications, 1 project of the Ministry of Defence, 3 projects of the Czech Mining Authority, and in a number of projects with output in the aforementioned areas as supported by the Czech Science Foundation.

Cooperation with hospitals and other establishments within the health service

Co-operation with **hospitals and other establishments within the health service** was undertaken mainly as part of the following projects:

Preparing and supplying FDG and Rb/Kr radio-pharmaceutics for hospitals in the Czech Republic and Slovakia • **Nuclear Physics Institute.**

The combination of micro-chips with mass spectrometry for the highly effective population and selective screening of inborn metabolic disorders • **Institute of Analytical Chemistry – Teaching Hospital, Brno.**

The utilization of telomerasis as the diagnostic and predictive marker of colorectal carcinoma
• **Institute of Biophysics – Teaching Hospital, Brno.**

The development of grid memory tests of humans in the real world and their computer analogies
• **Institute of Physiology – Hospital Na Homolce, Prague.**

The testing of electromagnetic field effects on the growth of experimental model tumours
• **Institute of Microbiology – InnoAktiv, s.r.o.**

The development and testing of a system for the standard determination of the residual biological contamination of surgical instruments after washing/disinfection in automatic machines in hospitals
• **Institute of Microbiology – Envisan, s.r.o.**

The development of quantitative diagnostics of Lyme borreliosis and tick encephalitis using the technique of "SMART real time PCR" • **Institute of Parasitology – Dynex, s.r.o.**

Cooperation in the environmental sphere

The authorities of public administration and regional and local self-management both can be considered partners and customers who are concerned with results in terms of the **environment**, as can private businesses.

A sampling of projects handled is presented below.

Monitoring radio-nuclides in the gaseous exhausts of nuclear power plants and in the ground atmospheric layer • **Nuclear Physics Institute — SÚRO.**

The instrumentation and monitoring of the water regime of soils and formed rainfall in the Šumava mountains • **Institute for Hydrodynamics — Czech Geological Service.**

A survey of the carbon dioxide pressure field in the West-Bohemian spa region
• **Institute for Geophysics — Gekon-GF Praha, s.r.o.**

The characteristics of sources of vegetation and the environmental conditions of the origination of super-stratum at the Bílina mine; knowledge of coal-seam vegetation, an expert report on the continuous strata profile and the spatial and time evolution of the basin have mediated technological significance in stratum mining • **Institute of Geology — Severočeské doly, a.s., Bílina.**

The determination of parameters of rock disintegration in underground tunnel driving the composition of minerals, abrasiveness, grindability and dissolubility with cutting tools
• **Institute of Geonics — Subterra, a.s., Pudis, a.s., Prague.**

The identification of elementary phases of the thermal alteration of flammable materials for a database and atlas of technical and building materials in fires
• **Institute of Rock Structure & Mechanics — Ministry of the Interior of the Czech Republic;**

The development of electrochemical biosensors for the detection of herbicides in water
• **Institute of Microbiology — BVT Technologies, Brno**

An assessment of the effect of exposure to poly-cyclic aromatic hydrocarbons absorbed on respirable particles of air-dust on DNA adducts and chromosome aberrations, i.e., on potential genetic damage
• **Institute of Experimental Medicine — State Health Institute, Prague, EcochemM, a.s., Prague, ČHMÚ Prague; Teplice Hospital, Testing Institute in Ústí nad Labem.**

Determining the risk of the long-term effects and changes in the level of air contamination on the medical condition of children
• **Institute of Experimental Medicine — Centre for Environment Issues at Charles University, Prague, ČHMÚ Prague; Teplice Hospital, Testing Institute in Ústí nad Labem, Testing Institute in České Budějovice.**

The development and introduction of methodology for the detection of cyano-bacteria in raw potable water using fluorescence • **Institute of Botany — Brněnské vodovody a kanalizace, a.s.**

The recultivation of soil organism communities on dumps after coal mining and the proposal of recultivation mixtures of tree species which maximise carbon accumulation in dump soil
• **Institute of Soil Biology — ENKI, v.p.s., Třeboň.**

The balance of carbon in forest ecosystems: the regional quantification of the carbon stock and its development modelling in relation to Kyoto Protocol conventions
• **Institute of Landscape Ecology — IFER, s.r.o.**

Již od roku 1997 probíhá na Nové Guineji pod vedením Dr. Vojtěcha Novotného projekt sdružující vědce a studenty z Entomologického ústavu AV ČR a Biologické fakulty Jihočeské university v Českých Budějovicích, Smithsonova Intitutu, Minnesotské univerzity a britské Sussexské univerzity. Výzkum zahrnuje řadu projektů zabývajících se především ekologií herbivorního hmyzu, ale také např. i projekty s oblasti ekologie rostlin. Výzkum klade velký důraz na úzkou spolupráci s novoguinejskými odbornými asistenty a studenty

Cooperation in the sphere of agricultural research

In the sphere of **agricultural research**, ASCR institutes worked on the following projects (among others) in collaboration with applied survey and research bodies:

A study of the regularities and possibilities of affecting the creation of biological glass for the preservation of plant biodiversity • **Institute of Physics — Research Institute of Plant Production.**

An evaluation of the effect of starch grain size distribution on the technological quality of barley
• **Institute of Analytical Chemistry — Brewing & Malt Research Institute, a.s.**

The design, synthesis, and development of new immune-therapeutics based on modified muramyl glycol-peptides and new poly-cationic vectors of DNA plasmides and the utilization of these substances in the construction of DNA vaccines
• **Institute of Organic Chemistry and Biochemistry — Institute of Zoo-pharmacy, Brno.**

The development of insecticide proteins aimed at the insect digestive tract
• **Institute of Organic Chemistry and Biochemistry — Research Institute of Plant Production, Prague.**

The development of base cultivating materials with horizontal resistance genes to late blight
• **Institute of Experimental Botany — Sativa Keřkov, a.s., Selekta Pacov, a.s., Vesa Velhartice, a.s., VÚB Havlíčkův Brod.**

The development of new methods for monitoring diversity and evaluating genetic sources and the assessment of their potential
• **Institute of Experimental Botany — Hop-growing Institute Ltd., Research Institute for Plant Production, Prague.**

The increase of competitiveness of flax varieties (*Linum usitatissimum L.*) and diversification of their use by cultivation according to classical and biotechnological procedures
• **Institute of Molecular Plant Biology — Agritec, s.r.o., Šumperk.**

The modification of retrovirus vectors with the aim of preparing a vector suitable for the preparation of transgenic poultry • **Institute of Molecular Genetics — Biopharm, a.s., Jílové.**

The improvement of *in vitro* insemination procedures for swine
• **Institute of Animal Physiology and Genetics — Research Institute for Animal Production, Uhříněves.**

The development of methods for evaluating the efficiency of transgenic products of modified organisms in plant protection and an assessment of the risks involved in their introduction
- **Institute of Soil Biology — Research Institute of Plant Production, Prague.**

Every year, staff members of ASCR institutes carry out hundreds of appraisals, overviews, and analyses **for the consumer, including the bodies of state and regional administration and EU administrative institutions**. This activity is strongly supported by the institutes of social sciences and humanities. The Institutes of Archaeology in Prague and Brno provided more than two thousand professional opinions and written appraisals, which determined the conditions for protecting archaeological sites and cultural monuments, and entered into 170 commercial agreements on preservation-related archaeological research on localities affected by construction. **Preservation-related archaeological research** into prehistoric settlements from the Bronze Age in Kletnice pod Pavlovskými vrchy is one of the most important operations of this kind (301 sunken buildings, 26 000 movable findings) and was discovered when building a pilot bore for gas mining. Long-term preservation-related research on the right bank of the River Elbe focused on another prehistoric settlement. In addition to this, more than 200 other examples of significant preservation-related research can be mentioned, together with hundreds of smaller preservation operations involving supervision of construction work.

Cooperation in the sphere of social sciences and the humanities

In the sphere of social sciences and the humanities, ASCR institute personnel worked on five research projects of the Ministry of Education, Youth and Sports, three research projects of the Ministry of Foreign Affairs, four projects of the Ministry of Work and Social Affairs, five projects of the Ministry of Culture, one project of the Ministry of the Interior, one project of the Ministry for Regional Development, and a number of other tasks for the needs of public administration and self-governing authorities.

Mezinárodní projekt
Archeologického ústavu v Brně —
Dzerava skala (paleolitická jeskyně)

A sample of the tasks handled is presented below:

The Institute of Archaeology in Brno carried out an assessment of a collection of finds which explains: social developments in the Moravia-Silesia area during the 9th century A.D.,

The Institute of Archaeology in Prague carried out a project called The Archaeological Database of Bohemia, on which all archaeological establishments in the Czech Republic cooperate (museums, institutes of archaeological care for historical monuments, non-profit organisations, regional associations);

The Institute of Sociology conducted a survey for the Ministry of Work and Social Affairs on reasons for the low number of women in political and decision-making positions, together with research on sexual harassment;

Institute of Art History cooperated with subjects from both the non-profit and business sectors in drawing up and implementing seven art exhibitions;

The Institute of Psychology embarked on a survey on the specific impact of anti-drug policy in Central Bohemia and a survey of the adequacy and efficiency of psychosocial assistance provided to the victims of floods, this in cooperation with the Czech Catholic Charity;

A study was drawn up at the **Institute of Philosophy** for the Research and Development Council which provided an overview and evaluation of foreign methods for the selection of elementary directions of research in advanced industrialised European countries;

The Institute of Ethnology conducted research into the problems of the integration of foreigners in the Czech Republic for the Ministry of Education, Youth and Sports, and began publishing of collected works of Antonín Dvořák with the support of the Ministry of Culture;

Lawyers of the **Institute of State and Law** participated in the preparation of essential new codes of law (the Labour Code, Civil Code, Commercial Code and Penal Code) as committee members of the central bodies of public administration. In this context, the appraisals and proposals drawn up by staff members who are not on preparatory committees are also important.

In addition to the results and projects mentioned above, the employees of ASCR institutes participated in drafting a series of technical standards, methodologies, analyses, measurements, laboratory tests and diagnostic methods, as well as several dozen major appraisals and hundreds of expert opinions on documents, projects, and reports, together with reports from the area of applied research and development.

Patents granted, inventions registered, and effective licence contracts in the ASCR — 2004

Institute	Patents granted		Invention registrations	Effective licence contracts	
	In CR	Abroad		Total	Of which in 2004
Institute of Physics	1			5	
Institute of Material Physics			1		
Institute of Plasma Physics	1				
Institute of Analytical Chemistry		1	1		
Institute of Inorganic Chemistry	3		2	2	2
J. Heyrovsky Institute of Physical Chemistry	1	1			
Institute of Chemical Process Fundamentals	2	2	3		
Institute of Macromolecular Chemistry	4	1	5	14	
Institute of Organic Chemistry and Biochemistry	7	1	8	3	1
Institute of Microbiology	1	2			
Institute of Experimental Botany		1	7	108	17
Total ASCR	**20**	**9**	**27**	**132**	**20**

5 International Cooperation

Cooperation within EU and NATO structures

The accession of the Czech Republic to the **European Union**, the reconstitution of the European Commission, and difficulties in the implementation of the so-called Lisbon Strategy of the EU have all brought about a number of activities in the spheres of research, development, and innovation. One central theme is the preparation of the 7th EU Framework Programme and EU Budget for the period beginning 2007. Such concentrated activities brought about the need to organise a number of briefings, meetings, and conferences, all attended by representatives of the ASCR to the maximum extent possible. This primarily involved activity within the scope of the EURAB advisory body, the programme committees of the 6th EU Framework Programme, and meetings about policies concerning research, development, and innovation within the European Research Area. The Technological Centre at the ASCR successfully completed its task as the National Contact Organisation for the 6th EU Framework Programme and the National Information Centre for European Research (NICER).

Authorized by the Ministry of Education, Youth, and Sports, the ASCR set up a **Centre for Mobility in the Czech Republic** and linked it to the Europe-wide network of these centres. The centre is able to provide information and services to foreign research workers and their families, help them find work and study opportunities at research institutes in the Czech Republic, and to endeavour to simplify as much as possible all official procedures associated with their arrival in the Czech Republic, their stay and working here. A network of regional offices at selected universities will assist in ensuring a smooth operation of the Centre Activity. The centre should officially get underway in April 2005.

The structure of auxiliary bodies (panels) of the Science Committee at **NATO** underwent change in 2004. These changes resulted from a new programme document entitled "Security through Science". Priorities of this programme include the prevention of terrorism and other threats to security. The ASCR has a representative on the NATO Science Committee.

ASCR cooperation with other international governmental organisations

CERN (Conceil Européen pour la Recherché Nucléaire) celebrated the 50th anniversary of its establishment 2004. Many speeches by government representatives at the main celebration of this anniversary in Geneva reminded the assembly that CERN has

become the most successful particle physics laboratory in the world in its 50 years. The Committee for Cooperation of the Czech Republic with CERN (led by a representative of the ASCR) organised a number of domestic events to mark this anniversary (television and radio shows, press conferences, a CERN Day in Carolinum, a series of seminars and lectures, etc.).

In research, Czech physicists and engineers at CERN participated primarily in preparing three experiments in 2004. In collaboration with Czech industry they provided radiation shadowing, pixel detectors, and a significant part of a so-called hadronic calorimeter for the ATLAS experiment, developed low-voltage sources and a PHOS supporting cradle for the ALICE experiment, and produced so-called Roman vessels for the TOTEM experiment.

CERN also created new technology and many new applications for this technology. This mainly involved the application of detectors and particle beams in medicine, development of superconducting magnets, and of the GRID network which is expected to facilitate effective use of sources of information and the computational capacity throughout the world. CERN also contributed to the education of young researchers and engineers through a number of special schools, conferences, courses, and summertime activities for students.

Working contacts continued between the Nuclear Physics Institute, Institute of Macromolecular Chemistry, Institute of Rock Structure and Mechanics, and Institute of Physics and the **Joint Institute for Nuclear Research in Dubna** in experimental, theoretical, and mathematical physics, ion physics and the chemistry of Tran uranium, in radiobiology and medical physics, in the application of methods of neutron physics in the solid state physics, in geophysics, and in polymer research. Collaboration also continued in the development and improvement of detectors and other parts of experimental equipment. ASCR institutes and laboratories at the Joint Institute for Nuclear Research also participated in 24 targeted projects (a total of 38) with a capacity of about 60 researchers. An ASCR scientist represents the Czech Republic as coordination of collaboration with the Dubna institute.

Cooperation with **UNESCO** focussed on the scientific programme "Man and the Biosphere" (**MAB**), the International Hydrologic Programme (**IHP**), and the International Geological Correlation Programme (**IGCP**). Beneficial results are being achieved by the Czech National Committee of the MAB programme under the aegis of the ASCR. The year 2004 saw the representatives of the National Committee of the MAB appear for lectures at a number of national and international meetings and conferences. They also prepared extensive documentation on the "Třeboň Pond Management Heritage", which was nominated for entry in the UNESCO Register of World Cultural Heritage. As part of the IHP, Czech specialists are working on a number of projects, perhaps the most important of which include the "Regional Cooperation of the Countries of the River Danube in Hydrology" project and the project entitled "Treating Drinking Water in Hazardous Situations".

Priority hydrologic issues are as follows: reduction of damage following natural disasters, principally floods and drought; application of the principles of sustainable development in practice; revitalisation of water elements of the landscape; and the application of "General EU Guidelines on Water". The ASCR participates in 12 projects as part of IGCP. Czech scientists are involved in the international management of two of these projects, and cooperate with the International Social Science Council (**ISSC**) under UNESCO. A representative of the ASCR attended the General Assembly of this organisation, which was held in China.

ASCR cooperation with international non-governmental science organisations

ALLEA (All European Academies), an organisation which brings together European academies of sciences, was very active in discussing selected problems affecting all of Europe. ASCR representatives attended the General Assembly of this organisation in Brussels in March 2004. Its main themes included creating a European Research Area and the positives and negatives of such a concept, a comparison of the level of European and American research and discussion on how and through which instruments it would be possible to bring Europe to the same level as the USA.

The International Council of Scientific Unions (**ICSU**) encompasses international scientific unions for all natural and social sciences. The relevant science committees are partners of these international unions at the national level. The ASCR manages these committees for the Czech Republic. The ASCR regularly monitors the activities of the national committees through the Council for International Affairs. It also sets up new committees, dissolves non-functioning ones, and approves personnel changes. The ASCR also pays the membership contributions for 35 national committees to the respectivet international unions and provides financial support for some of their international activities. A new committee was established in 2004, the Czech National Committee of Anthropological and Ethnological Sciences.

ASCR's membership in the International Institute for Applied Systems Analysis (**IIASA**) continues to encounter problems involving the payment of a disproportionately high membership fee of 10 million CZK. It was for this reason that the representatives of the ASCR and Ministry of Education, Youth, and Sports discussed the matter with their counterparts at IIASA in Prague in August 2004. It was recommended that a draft project be submitted to the Europska komise (EC) to support this membership and shift the financial burden from the ASCR to the Czech Science Foundation.

The InterAcademy Panel (**IAP**) is an organisation which brings together national science academies from around the world. As a permanent member of this organisation, the ASCR signed up for the "Science Education" programme and the "Access to Scientific Information/Digital Divide" initiative in 2004, and nominated its representative to the programme council entitled "Revitalizing the Role of the Sciences in World Heritage".

The Union Académique Internationale (**UAI**) unites 57 member states throughout the world and coordinates and provides financial support for cooperation on significant projects in the humanities. ASCR institutes participate in six projects: Moravia Magna, *Clavis Monumentorum Litterarum Bohemiae, Lexicon Iconographicum Mythologiae Classicae/Thesaurus Cultus et Rituum Antiquorum, Corpus Vasorum Antiquorum, Dictionnaire du Latin Médiéval, and Aristoteles Latinus.*

In 2004, the **Czech Historical Institute in Rome**, a joint department of the ASCR and the Faculty of Arts at Charles University in Prague, undertook fundamental research publishing the Papal letters of Eugene IV. (1431—1447). Meanwhile, another two editions are at the final stage, as is research into the Bohemica manuscripts of the Palatina Library as stored in the Vatican Library. Two one-day festive science meetings were staged in Rome and in Prague to mark the 10th anniversary of the Czech Historical Institute.

The ASCR is a member of the prestigious European Science Foundation (**ESF**) together with the Czech Science Foundation. Both of these organisations are permanently represented in bodies of the ESF and participate in 26 programmes. The institutes of the ASCR also participate in EUROpean COllaborative RESearch (EUROCORES) programmes financed by the Czech Science Foundation.

Cooperation with other countries under international bilateral agreements with the ASCR

Bilateral contacts between academic institutes are unsurpassed in international scientific collaboration, which includes the countries of the expanded EU and cooperation with scientific institutions throughout Europe. The ASCR currently has concluded 60 agreements with partners in 45 countries. These agreements assist in contact-making journeys, conference and symposia trips, and trips aimed at arranging joint projects. In addition to these traditional exchanges, a great many people are increasingly being sent abroad or come to the Czech Republic as part of joint projects. Cooperation principally takes the form of joint two- and three-year projects with partners in the USA, Canada, Germany, France, Spain, Italy, and Portugal. A total number of 111 such projects have been implemented thus far. Such projects are not only an effective form of cooperation, but also focus on supporting young scientists (e.g., the PPP programme, the German Academic Exchange Service (DAAD), in which the participation of students and graduate students in implementation teams is required). These projects generate potential teams which eventually become engaged in international projects.

The ASCR broadened contacts to include new partners, for example, the King Abdulaziz City for Science and Technology (KACST), the Academy of Sciences and Art in Montenegro, and the Maison des Sciences de l´Homme in France. Concluded agreements are updated continuously, whilst new, more effective forms of cooperation are sought. Three documents were updated in 2004 (with the Austrian Academy of Sciences, Estonian Academy of Sciences, and with the German DAAD). In some cases, agreements increased bilateral exchange quotas (for example, with the Slovak Academy of Sciences, Hungarian Academy of Sciences, the Spanish Council for Scientific Research (CSIC), and the Russian Academy of Sciences).

In the countries where it does not have its own contractual partners, the ASCR has made contacts generated at governmental level, such as cultural agreements (with Greece and Denmark) or agreements on scientific and technical cooperation (as with, Slovenia, Austria, and France). Research teams from universities may also become involved in the Academy's agreements that are entered into for specific projects [e.g., within the scope of the NSF (USA), DAAD or Gabinete de Relações Internacionais da Ciencia e do Ensino Superior (GRICES) Portugal programmes].

In 2004, 658 Czech specialists went abroad under bilateral agreements for a total of 8,053 days, and 533 foreign scientists came to the Czech Republic for 5397 days.

Selected European Cooperation in the field of Scientific and Technical projects

Examples of international projects involving ASCR institutes in 2004

TARSKI — Theory and Application of Relational Structures as Knowledge Instruments • coordinator: University of Ulster, UK, participants: Institute of Computer Science and research laboratories in 13 countries.

Developing the Scientific Basis for Monitoring, Modelling and Predicting Space Weather • Geophysical Institute, Institute of Atmospheric Physics, and Nuclear Physics Institute in cooperation with partners in 25 countries.

Lead Free Materials • Institute of the Physics of Materials, Masaryk University in Brno, and the VŠB-Technical University of Ostrava together with 55 partners in 18 European countries and Canada.

Selected projects of the 5th EU Framework Programme

Nonlinear Speech Processing • Institute of Radio Engineering and Electronics together with the Faculty of Electrical Engineering and Communication Technology at VUT Brno and other institutes in 15 countries.

Use of Radar Observations in Hydrological and NWP Models • Institute of Atmospheric Physics, Czech Hydrometeorological Institute, and other establishments in 20 European countries.

MEREDIAN-2 – Mediterranean-European Rapid Earthquake Data Information and Archiving Network • coordinator: Geophysical Institute, participants: institutes from six new EU member states/EU candidates.

CONTINENT+NAS – High-Resolution Continental Paleoclimate Records at Lake Baikal • Institute of Geology, ASCR, GeoForschungsZentrum, Potsdam, Germany, and another 17 institutes in eight European countries.

Re Urban Mobil – Mobilising Re-urbanisation on the Condition of Demographic Change • Institute of Geonics and 11 cities and institutes in seven countries.

Assembly and Application of Photosystem II-Based Biosensors for Large Scale Environmental Screening of Specific Herbicides and Heavy Metals • coordinator: Instituto di Cristalographia, CNR, Italy, participants: Institute of Microbiology and institutes in England, France, Germany and Italy.

The Conservation of Vital European Scientific and Biotechnological Resources: Microalgae and Cyanobacteria • Institute of Botany, Institute of Soil Biology, and another six European research institutes and universities.

The Value Systems of Citizens and Challenges to Socio-Economic Conditions for EU-Enlargement from Democratisation • Institute of Sociology, a comparative project linking 11 countries in Central and Eastern Europe.

Selected projects of the 6th EU Framework Programme

LASERLAB-EUROPE • Institute of Physics and Institute of Plasma Physics with 17 prominent laser laboratories in nine European countries.

NMI3 – Integrated Infrastructure Initiative for Neutron Scattering and Muon Spectroscopy • Nuclear Physics Institute, the Studsvik Neutron Research Laboratory in Sweden, and 10 institutes in Central and Western Europe.

MUSCLE – Multimedia Understanding through Semantics (Network of Excellence) • Institute of Information Theory and Automation in cooperation with 42 European research institutes.

ELFNET – European Lead-Free Soldering Network • Institute of Physics of Materials together with 32 research institutes in 18 European countries.

EXTREMAT – New Materials for Extreme Environments • Institute of Plasma Physics and 38 EU partners.

ATOM-3D – Advanced Techniques for Optical Manipulation Using Novel 3D Light Synthesis • coordinator: University of St. Andrews, United Kingdom, participants: Institute of Scientific Instruments and five institutes in five European countries.

ePIXnet – European Network of Excellence in Photonic Integrated Components and Circuits • Institute of Radio Engineering and Electronics in collaboration with 31 European universities and industrial research laboratories in 10 West European countries.

European Research Programme to Partition Minor Actinides and High Active Wastes Issuing in the Reprocessing of Spent Nuclear Fuel • coordinator: CEA Saclay, France, participants: Institute of Inorganic Chemistry and 25 teams from France, Spain, Italy, Germany, England, Belgium, Holland, and Poland.

Novel Organic-Inorganic Materials in Opto-Electronic Systems to Monitor and Control Bio-Processes Institute of Chemical Process • Fundamentals with universities and research institutes in the UK, Germany, and Spain.

Advanced Nanostructure Metal/Metal-Oxo/matrix Catalysts for Redox Processes. Application of NO_x Reduction to Nitrogen — AMMONORE • project coordinator: J. Heyrovsky Institute of Physical Chemistry, participants: six other institutes in Belgium, Finland, France, UK, and Sweden.

3D Genome • coordinator: Universiteit van Amsterdam, participants: Institute of Biophysics in cooperation with institutes in Germany, France, and the Netherlands.

Targeting Tumour-vascular/Matrix Interactions • coordinator: University of Bergen, Norway, participants: Institute of Experimental Medicine and nine universities and research institutes in Italy, Sweden, the Netherlands, Germany, United Kingdom, and Luxemburg.

Assessing LArge-scale environmental Risks with tested Methods (ALARM) • participants: Institute of Botany and 52 European institutes.

Integrated Project to Evaluate the Impact of Global Change on European Freshwater Ecosystems • coordinator: University College, London, participants: Institute of Hydrobiology and 36 European partners.

Examples of other international projects implemented at ASCR institutes

EII — European Interferometric Initiative OPTical Infrared COordination Network for astronomy (OPTICON) project • Astronomical Institute and partners in 15 countries

ATLAS-CERN • Institute of Physics, Institute of Computer Science, Faculty of Mathematics and Physics at Charles University, Faculty of Nuclear Science and Physical Engineering of the Czech Technical University, and 130 institutes in 33 countries.

ALICE-CERN • Institute of Physics, Nuclear Physics Institute, and another 81 institutes in 26 countries.

Barrande • Mathematical Institute, Faculty of Mathematics and Physics at Charles University, Czech Technical University, Université de Toulon and Université de Nancy, France.

EUROMET — European Collaboration in Measurement Standards • Institute of Radio Engineering and Electronics with institutes in 29 European countries and Turkey.

AERO-NEWS (Specific Targeted Research Project) • Institute of Thermomechanics and 18 research institutes in eight countries, primarily France, Germany, and Belgium.

Optimized Hydride Generation Systems for Arsenic Speciation Analysis • Institute of Analytical Chemistry and the University of North Carolina at Chapel Hill, North Carolina (USA).

Polymer-Virus Hybrid Vectors for Safe and Efficient Gene Therapy of Prostate Cancer • Institute of Macromolecular Chemistry with Oxford University and the University of Barcelona.

Design of Cidofovir Analogues with Improved Activity against Poxviruses and an Improved Toxicological Profile (Biodefences and SARS Product Development) • Institute of Organic Chemistry and Biochemistry and the Rega Institute for Medical Research, University of Leuven, Belgium.

The Role of Lipids in Neurodegeneration and Their Preventive Potential in Diet • coordinator: University of Heidelberg, participants: Institute of Physiology and universities in Germany, Hungary, Israel, Switzerland, Finland, and the Netherlands.

Consomic Strains Between C57/BL/6 and PWD • project leader: The Jackson Laboratory, Bar Harbor, Maine (USA), participants: Institute of Molecular Genetics, Institute of Botany, Institute of Parasitology.

Investigation of Selected Aspects of Lyme Disease Glycobiology • Institute of Parasitology and the Institute of Biological Sciences, National Research Council of Canada, Ottawa

Behavioural and Genetic Analysis of a Prezygotic Isolation Mechanism in House Mice (project run by the National Research Council of USA) Collaboration in Basic Science and Engineering (COBASE) • Institute of Vertebrate Biology and Butler University (USA).

Methodological and Experimental Research Centre and Infrastructure for Studies of GCC Impacts on Forests • Institute of Landscape Ecology with several European institutes.

Risk factors in the Educational, Social, and Health Development of Young People • coordinator: Yale Child Study Center, USA, participants: Institute of Psychology with institutes in the USA, Belgium, Russia, Germany, Surinam, and South Korea.

European Digital Content for Global Networks. Linguistic Ontologies for Legal Information Sharing (LOIS) • Institute of State and Law with scientific and commercial establishments in Italy, United Kingdom, the Netherlands, Portugal, and Austria.

Lexikon zur keltischen Archäologie (project of the Austrian Academy of Sciences) • Czech coordinator: Institute of Archaeology in Prague.

Cubism, Surrealism and Tradition: The Presence of the Past in Modernist Art • Institute of Art History in cooperation with the University of Essex, UK.

The Parallel History Project on NATO and the Warsaw Pact • Institute for Contemporary History with the Center for Security Studies, George Washington University (USA).

Questions of Music Philology: Editing Issues in the Music of Antonín Dvořák and Bohuslav Martinů in the 19th and 20th Centuries • Institute of Ethnology and DAAD, Germany.

The Institutionalisation of Ethics in Science Policy: Practices and Impact IUE Newly Extracted Spectra (INES) 2004—2005 • Institute of Philosophy with research institutes in Belgium, Denmark, Italy, Germany, the Netherlands, Spain, Switzerland, United Kingdom and Bulgaria.

Other ASCR activities as part of international relations

Two sessions of the **V4 Science Academy Forum** were held in 2004, one in Bratislava and the other in the Hungarian town of Visegrád. Both were attended by delegates of the ASCR. The topics of discussion included issues revolving around two joint projects in the humanities and social sciences and supporting young people getting started in science. A series of conferences for young scientists is under preparation, the first devoted to mathematicians. An award for young scientists under age 35 was established, the Young Researchers Award. Other topics included coordination of activities within such international organisations as the ICS, IAP, and ESF, and preparation of the 7th Framework Programme. From now on the V4 Science Academy Forum will convene once a year.

Representatives of the ASCR also participated in the activities of the International Human Rights Network of Academies and Scholarly Societies, which protests against injustices done to prominent science personalities. For example, ASCR President Helena Illnerová appealed to the Chinese President and Prime Minister regarding the release of Wang Bingzhang, a seriously-ill scientist who has been imprisoned under inhumane conditions since 2002. An appeal was sent to Muammar Qaddafí to release five Bulgarian nurses and a Palestinian doctor who have been sentenced to death in 1999. [The Libyan Supreme Court will decide 31 May 2005 whether to consider the appeal.]

Udílení Descartesových cen za rok 2004 — 2. prosince 2004, Pražský hrad. Předsedkyně AV ČR prof. Helena Illnerová v rozhovoru s nositelem ceny Howardem T. Jacobsem z univerzity v Tampere (Finsko) a předsedou Poslanecké sněmovny Parlamentu ČR Lubomírem Zaorálkem

The ASCR was visited by a number of prominent foreign guests and delegations during 2004, among them the General Secretary of the Max Planck Society Dr. B. Bludau, the President of the Austrian Academy of Sciences H. Mang, delegates of the Agency for Technology in Singapore, delegates of the Royal Society in Edinburgh, representatives of the international organisation IIASA, the American astronaut of Czech origin E. A. Cernan, and a delegation of the Korean Ministry for Science and Technology. The traditional meeting of the Academy's top officials and their counterparts from the Slovak Academy of Sciences took place, this time in Smolenice in Slovakia.

ASCR officials and scientists delegated by them took part in important international conferences, briefings, and meetings. This included attendance at general assemblies of international organisations of which the ASCR is a member, organisations such as ESF, ALLEA, UAI, and ISSC. An ASCR representative attended the first pan-European forum of scientists, economists, industrialists and politicians in Stockholm. ASCR representatives were invited by several science academies in neighbouring countries to their celebratory meetings (e.g., the Austrian Academy of Sciences, Academy

of Science and Art in Salzburg, Berlin-Brandenburg Academy of Sciences, Bavarian Academy of Sciences, and Slovak Academy of Sciences).

The good relations between the ASCR and organisations abroad are helped by good contacts of Academy's leaders with ambassadors and other members of the diplomatic corps in the Czech Republic. One prominent component of international scientific cooperation involves lectures given by members of ASCR institutes at universities abroad and at international conferences and congresses. ASCR staff members are on the editorial teams of foreign science magazines and publications. The institutes deal directly with partners abroad and take part in international science programmes and centres of excellence. (A summary of these activities is shown in Table.)

ASCR institutes prearranged several scientific meetings or contributed to the organisation of such meetings. Scientific meetings that were arranged by the Academy of Sciences of the Czech Republic itself took place as well, for example the 6th annual "Science or Else?" colloquium on the subject of "Science in Society: Threads and Threats", or a meeting of the European Science Foundation.

Examples of international conferences sponsored by ASCR institutes in 2004:

20th General Conference of Condensed Matter Division of the European Physical Society • joint sponsor: Institute of Physics; 819 participants, 656 from abroad.

COMPSTAT 2004 • joint arrangers: Institute of Computer Science; 500 participants, 350 from abroad.

EPDIC IX – European Power Diffraction Conference • joint organiser: Institute of Physics; 320 participants, 266 from abroad.

XV International Symposium on Gas Flow, Chemical Lasers and High Power Lasers • sponsor: Institute of Physics; 261 participants, 233 from abroad.

20th International Conference on Heat Treatment • joint organiser: Institute of Physics of Materials; 250 participants, 120 from abroad.

21st Symposium on Plasma Physics and Technology • joint sponsor: Institute of Plasma Physics; 233 participants, 148 from 22 other countries.

3rd International and 28th European Symposium on Peptides • joint organiser: Institute of Organic Chemistry and Biochemistry; 1154 scientists, 1110 from abroad.

13th European Congress on Obesity • sponsor: Institute of Physiology; 3000 participants, 2800 Institute of Chemical Process Fundamentals; 1001 participants, 811 from abroad.

European Congress of Reproductive Immunology • organiser: Institute of Microbiology; 250 participants, 200 from abroad.

First United Workshop on Microsporidia from Invertebrate and Vertebrate Hosts, NATO Advanced Research Workshop • sponsor: Institute of Parasitology; 65 participants, 59 of these from 17 countries abroad.

Logica 2004 • organiser: Institute of Philosophy; 60 participants, 40 from abroad.

Czech-Slovak Sociology Days • joint sponsor: Institute of Sociology, ASCR; 116 Czech and Slovak participants.

The "Beaker Days" in Bohemia and Moravia • joint organisers: Institute of Archaeology in Brno and Institute of Archaeology in Prague; 56 participants, 49 from abroad.

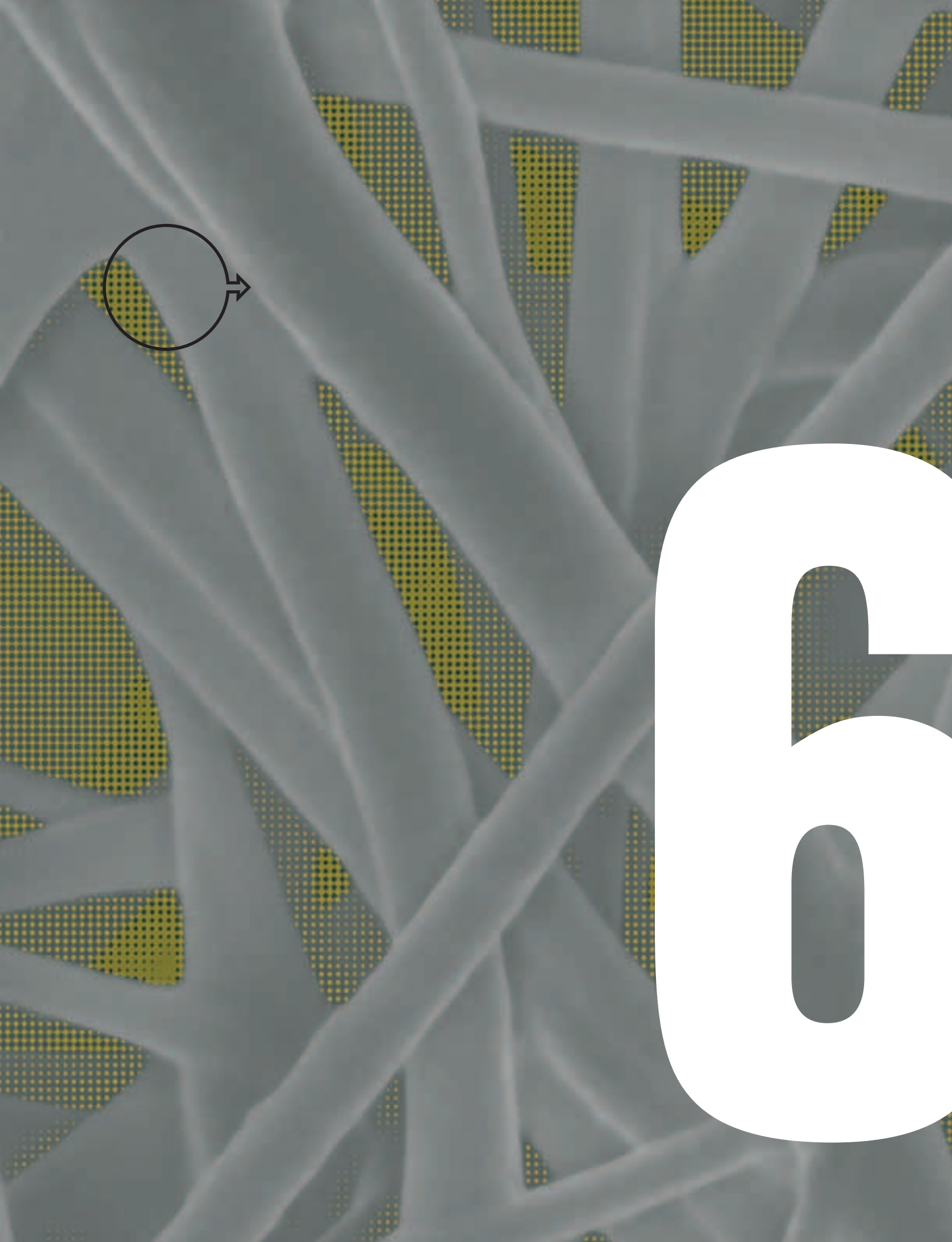
Words and History 2004 • sponsor: The Czech Language Institute; 74 participants, 21 from abroad.

Confession and Nation in the Era of Reformations: Central Europe in Comparative Perspective (conference of the Forum of British, Czech, and Slovak Historians) • organiser: Institute of History; 28 participants, 13 from abroad.

Involvement of the ASCR institutes in international cooperation

	1	2	2a	3	3a	3b	3c	4	5	6	7	8	8a
I. Mathematics, Physical and Earth Sciences Division													
Section 1	34	2090	1534	961	702	191	357	16	125	114	172	86	40
Section 2	19	634	576	523	392	60	284	8	52	131	73	37	20
Section 3	18	465	396	372	305	29	163	10	38	82	18	35	10
Total	71	3189	2506	1856	1399	280	804	34	215	327	263	158	70
II. Life and Chemical Sciences Division													
Section 4	28	895	813	739	352	123	499	13	103	66	76	80	68
Section 5	32	1285	965	886	421	171	665	31	161	129	139	67	28
Section 6	20	450	410	307	229	60	177	19	80	59	18	54	35
Total	80	2630	2188	1932	1002	354	1341	63	344	254	233	201	131
III. Humanities and Social Sciences Division													
Section 7	30	319	309	249	219	78	14	12	18	56	73	21	11
Section 8	47	327	211	199	187	137	10	13	22	43	30	19	3
Section 9	38	288	221	206	180	114	3	4	67	50	62	7	2
Total	115	934	741	654	586	329	27	29	107	149	165	47	16
Other units	2	127	119	5	0	0	0	0	2	6	2	0	0
Total ASCR	**268**	**6880**	**5554**	**4447**	**2987**	**963**	**2172**	**126**	**668**	**736**	**663**	**406**	**217**

1 — Number of international conferences (the institutes being organisers or joint organisers)
2 — Number of journeys abroad undertaken by staff members including those beyond bilateral agreements
3 — Active participants in international conferences
3a — Papers read at the conferences
3b — Invited papers inclusive
3c — Posters
4 — Professors at universities in other countries
5 — Members of editorial boards of international magazines
6 — Members of the bodies of international scientific governmental and non-governmental organisations (societies, committees)
7 — Lectures given by the institutes' guests from other countries
8 — Grants and projects financed from abroad
8a — EU programmes inclusive


6

Public Tenders in Research and Development

6

As in previous years, the specific financial resources of the budget chapter of the ASCR were used to support programme and grant projects. Resources for both types of project are distributed on the results of public tenders in research and development as announced by the Academy or its Grant Agency. Whereas the successful projects of the programmes announced by the Academy must meet the objectives of the programme in question in terms of content (as specified during the announcement process itself), the thematic focus of research grant projects as supported through the Grant Agency of the Academy of Sciences of the Czech Republic (GA AS) primarily focus on the individual activity of the researchers.

The volume of specific resources was relatively high in 2004 (more than 633 million CZK). This figure included resources for the final year of all 19 extensive departmental projects of the **Programme of Support of Basic Research in Key Scientific Spheres** totalling about 185 million CZK. In addition, only projects continuing from previous years were supported as part of the **Programme for the Support of Specific Research and Development** in 2004 (an overall sum of 89.5 million CZK). This programme will end in 2005.

In 2004 projects were launched which come under the new programme **The Information Society**, which is a thematic programme of the National Research Programme I. More than 150 million CZK was earmarked to support this programme in the Academy budget.

Programmes announced by the Academy

Programme of Support of Basic Research in Key Scientific Spheres Work on all projects in this programme got underway in 2001. The quality of their results achieved during the three years was assessed by a commission appointed by the Academy Council based on a written statement of the Council for Sciences at the Academy, a statement which drew on the ongoing reports of project leaders. Programme projects enable the Academy to focus specific resources on dealing with expansive thematic units that generally exceed the activity of a single institute and successfully assist the conceptual development of scientific disciplines. This was also manifested in the Council for Sciences' assessment of project success.. This assessment was very positive, subsequently specific subsidies were provided for all projects in the amounts requested in the final year. A total of 185 043 thousand CZK was drawn in dealing with 19 projects.

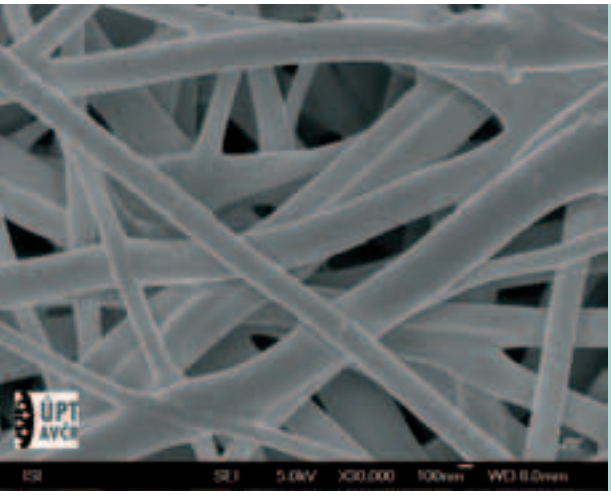
Work on 106 projects continued in 2004 under the Programme for the Support of Targeted Research and Development. The Council also assessed the results of projects completed by 31 December 2003 lasting 2—5 years. The objectives of 13 projects were met, and the Council rated as outstanding the results of five projects.. The materials used in the assessment of results included final reports based on publications produced (an average of eight published results per project; two patent applications for one project), and the written declaration of users on the acceptance of the outcome of the project work.

The Academy announced a public tender for **The Information Society** programme. The public tender received 57 project proposals. The programme council recommended the acceptance of **43** projects based on the assessment of a minimum of two Czech evaluators. Approved for the year were **70,480** thousand CZK for the support of successful projects on which work began on 1 July 2004. For the second round of the tender, a total of 91 bids were received with an estimated project start date of 1 January 2005. The programme board recommended the monetary support of 33 projects and approved **89,000** CZK for the first year.

A public tender for the newly initiated programme **Support for Targeted Research Projects** was also announced. This partial programme is included in Sectional Programme II within National Research Programme I. The aim of the programme is to provide the tools to direct advanced stages of research for results that will be applicable to an onward development of innovative technologies or new materials and products with high added value, or apply to the socioeconomic sphere. Therefore, the focus of the newly initiated programme builds on the "Programme for the Support of Specific Research and Development", which will end. A total of 75 proposals were submitted for the public tender. The programme board recommended that **28** projects be accepted. Specific subsidies for the first year of work ran to a total of **48,091** thousand CZK.

Grant projects of the Grant Agency of the ASCR

A total of 206,433 million CZK in specific resources was allocated to the GA AS in 2004. These resources were then distributed to support the implementation of newly initiated and continuing grant projects alike. A further 3,540 million CZK was distributed in support of medical research. This sum was provided to the Academy as the sponsorship contribution of PRO.MED.CS Ltd.



Ústav přístrojové techniky AV ČR —

snímek struktury netkané nanotextilie
pořízený rastrovacím elektronovým mikroskopem
s vysokým rozlišením (1 nm)

Support for newly initiated grant projects

Work on 85 standard research grant projects authorized a total of 47,535 thousand CZK began on 1 January 2004. Approximately 18,892 thousand CZK was provided to 50 junior projects. The sum of 663 thousand CZK was allocated for four supplementary publication projects.

Assessment of completed and continuing grant projects

The Departmental Councils (hereinafter referred to as the DCs) of the GA AS assessed the standard of implementation and the results of projects completed by 31 December 2003 in the first weeks of 2004 on the basis of reports provided by the grant holders. They also considered how projects continuing in the year 2004 were being handled. A total of 79 research projects with a duration of between two and five years were completed. An average of 7.7 publications per project was issued in the course of project work, the majority of publications in prestigious and reviewed periodicals. A total of 19 junior research projects (duration of one to three years) were completed with more than two published results per project. The DCs further appraised the progress of 284 standard and 79 junior research grant projects, on which a total of 142,883 thousand CZK was invested in 2004 (26,052 thousand CZK of this on junior projects).

The progress and results of public tenders in 2004

The Grant Agency of the ASCR arranged the XV round of tenders supporting new grant projects. A total of **327** proposals were submitted to the public tender for standard grant projects, and **191** junior project proposals. A total of 2001 assessments of project proposals were obtained, 945 by Czech and 1056 by foreign evaluators, i.e., approximately 3.9 assessments per project proposal. The management at GA AS decided to grant support to **71** standard projects (22 per cent of the proposals received for the tender) and **50** junior research grant projects (26 percent of the proposals received). The sum of **37,860** thousand CZK (standard) and **18,495** thousand CZK junior research projects will support successful projects in 2005 (the first year of implementation). A total of 25 proposals were submitted to the public tender for supplementary publication grant projects. Two appraisals from Czech evaluators were obtained for all proposals. The amount of support for these projects was low given the number of proposals submitted. The Grant Agency management decided to award seven grants totalling **1,096** million CZK recommended by the DCs.

Public Relations

7

During the year 2004 the ASCR continued its search for new ways to present to the public specific scientific activities and the principal societal problems associated with science and research in a manner that the layperson could understand. Our endeavour was to attract youth and reinforce our goal to heighten awareness of the significance of the sciences for the quality advancement of society. To arouse active interest in research, a series of lectures was presented to secondary school students entitled **Don't be Afraid of Science**. The professional and the lay public, meanwhile, were targeted with a sequence of lectures under the title **Academic Prague**, which were presented in association with Charles University.

One of the most prestigious events sponsored by the ASCR was a gathering of the Grand Jury for the Award of the European Union Descartes Prize and the presentation of these awards to selected European scientists. The awards were made 1—2 December 2004 on ASCR premises (on 1 December) and at Prague Castle (on 2 December). The event was attended by the President of the Czech Republic, Václav Klaus, EU Commissioner for Science Janez Potočnik, the competition panel headed by Chairwoman Ene Ergma, and other representatives of European and Czech science. The announcement of results enjoyed major attention by and through the media.

Týden vědy
a techniky 200

Britská rada
připravila pro mládež
interaktivní program
Expedice na Mars

Science and Technology Week 2004 took place 1—14 November. Arranging this event involved cooperation between the ASCR and the British Council, which prepared an

interactive programme called **Expedition to Mars** along with the American Science and Information Centre, the Czech Science Foundation, and the Learned Society of the Czech Republic. The media partners of the event were Czech Radio 1 (Český rozhlas 1-Radiožurnál) and Herafilm Science Media-Popularis. Fifteen lectures were given and attended by more than 2,000 visitors, mainly secondary school students. There were also two roundtable discussions and two exhibitions. For the first time, this year's lectures and roundtable dialogue were transmitted online over the Internet. One part of the Science and Technology Week consisted of **Open Door Days** at 53 ASCR institutes. These open door days drew over 7,000 visitors. **European Week of the Mind**, a series of six lectures organised in cooperation with the Institute of Experimental Medicine, was held in March.

25 press conferences and seminars were held as cooperative ventures between ASCR institutes and the Council for the Popularisation of Science at the ASCR. Among the most successful of these were the press conferences held with Nobel Prize in Physics winners Ricardo Giacconi and James W. Cronin. Major attention was also devoted to subjects such as *50 years of CERN; Culture, Racism, and Nationalism; Contemporary Czech Language; How to Deal with Science in the Media,* and a screening of the documentary film *Louže* (A Pool).

The ASCR published its monthly **Academic Bulletin, Information Monthly**, and internal Journal, intended for the directors of ASCR institutes. Forty nine press releases covering all aspects of Academy work were issued through the Press Department. It was also through the activity of the Press Department that 4,222 contributions concerning the ASCR were published in the printed and electronic media during 2004. This represents an increase of almost 600 over the year 2003.

The year 2004 also saw the continuation of a two-year project named ETHNIC, which is funded by the European Union and whose aim is to improve awareness of science and technology among ethnic minorities. The target group in the Czech Republic is the Roma community. As part of the programme, meetings at schools, seminars, discussions, science information days, and excursions to science institutes were organised for the target group in question in 2004. The project was also accorded considerable attention by the media.

Individual ASCR institutes also prepared a number of publicity and educational events, some of which took on Europe-wide significance. Examples of such events include the participation of the Astronomical Institute in the European project *Venus Transit 2004* (monitoring the passage of Venus across the Sun), which was principally intended for school children, or the participation of the Institute of Physics in events to commemorate the 50th anniversary of the founding of the CERN laboratory.

Lectures are also classed as significant activities in all spheres of science. Experts from institutes, such as the Geophysical Institute, Institute of Organic Chemistry and Biochemistry, Institute of Macromolecular Chemistry, and The Czech Language Institute, lectured to primary and secondary schools and the general public alike. The Institute of Animal Physiology and Genetics organised a series of lectures known as the **Mendel Lectures** at the Mendel Centre in Brno. The Institute of Macromolecular Chemistry became involved in the **Open Science** project which focuses on promoting scientific and technical education among secondary school teachers and students.

The popularisation effort undertaken also included professional assistance in the "Olympics" for primary school and secondary school pupils (i.e., competition in math, chemistry, the Czech language, and other subjects) or conducting summer schools for students (for example, those sponsored by the Institute of Plant Molecular Biology and Institute of Landscape Ecology).

Academy institutes are able to present themselves to the public via a television magazine known as **Popularis**. Among these is a piece by a young scientist K. Luterová from the Institute of Physics, "How to

Measure the Earth", or another on the activities of the Institute of Rock Structure and Mechanics. Televised segments have also been devoted to the work of scientists at the Institute of Organic Chemistry and Biochemistry, mapping out the issues involved in tissue-specific stem cell research at the Institute of Animal Physiology and Genetics). Documentaries and educational films are also useful tools in this respect, for example, the films *Život kukuřičného pole* (The Life of the Cornfield) and Louže (Pool), which were made in cooperation with the Institute of Entomology and "The FATE Study", a film by the Institute of Botany made with the company Fontis, Ltd., and an educational film by the Institute of Microbiology in Třeboň.

An important component in publicising scientific results comes in the form of **exhibitions**. One example is the permanent display at Prague Castle entitled *The Story of Prague Castle*, conceived by the Institute of Archaeology and the Institute of Art History. Other exhibitions are the exhibition entitled *The Algae, Cyanobacteria, and Water Flowers in our Reservoirs, Water 2004*, and *Ecology in Focus*, all organised by the Institute of Hydrobiology, or the *Hidden Treasures of the Persian Gulf* exhibition arranged by the Institute of Geology. An exhibition entitled *Josef Sudek. Designfotografie der dreissiger Jahre* was held at the Czech Centre in Berlin with the assistance of the Institute of Art History. The Press Department of the ASCR also sponsored 15 exhibitions on the ASCR premises on Národní třída, the most successful of which included the exhibition of books published by Filosofia, the of illustrations by Adolf Born, and an exhibition to accompany "Science and Technology Week 2004".

The activities of the ASCR are also publicised through books and electronic publications that highlight the work of individual institutes; for example, a CD-ROM of the Institute of Theoretical and Applied Mechanics about the history of the institute and also the Academy, or the Institute of Sociology's Internet magazine "SOCIOweb", which serves as a means of communication between the sociology community and the public.

The Use of Financial Resources

8

There was a slight increase in 2004 in the overall amount of support for research and development from the state budget. But the gross domestic product actually fell to 0.54 percent and consequently returned to the 2001 level. The government made this determination despite the fact it ranked among its budget priorities the support of education, research and development, and even though it agreed do the Lisbon Strategy of the European Commission, which calls for a continuously prolonged value of 0.7 percent GDP.

The balance of the budget chapter of the ASCR rose by a mere 10.9 percent in comparison with the previous year. Three-quarters of this absorbed a mandatory increase in expenditure in relation to the change to a sixteen-category payment system and expenditure on the thematic programme the Information Society that began as part of the National Research Programme. The ASCR operated with a total of 6,023.4 million CZK in the year 2004, 4,082.2 million of which came from the organisation's own budget chapter.

1997 98 99 00 01 02 03 04

State support of research and development in the 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

The institutional resources provided for research objectives and for the assurance of the research infrastructure amounted to 84.6 percent of the total volume of resources assigned to the Academy of Sciences from the state budget. The total volume of specific resources obtained in public tenders for research and development rose only marginally in comparison to 2003. A total of 810.9 thousand CZK was directly transferred to ASCR institutes from other budget chapters in this manner pursuant to Act No. 130/2002 Coll. without budget measures. Most came from the Czech Science Foundation: a total of 413.2 million CZK in 2004, i.e., more than 34 percent of all specific funds of the CSF.

The non-investment funds of the ASCR in 2004 were generated as follows: 64.5 percent, resources of its own state budget chapter; 14.6 percent, transfers from other state budget chapters, and 20.9 percent own revenues and extra-budgetary funds. The final component is of particular significance in that it rose by 1.5 percent in comparison to the previous year.

The investment funds of the ASCR consisted of means from its own budget chapter (92 percent) and transfers from other state budget chapters (8 percent).

Joint expenditures which were primarily intended for foreign relations, the computer network, membership contributions to international organisations, and subsidies to the 59 scientific societies joined under the Scientific Societies Council were covered by

means of the budget of the Head Office of the ASCR, through which all specific funds also passed which are intended for non-academy entities to implement projects of the Grant Agency of the ASCR and projects as part of the research and development programmes of the ASCR.

The structure of financial resources

The structure of financial resources (in million CZK)		Non-investment funds	Investment funds
Approved chapter budget		3,512.7	520.6
Amended ASCR chapter budget		3,456.8	615.3
of this:	subsidies to research and service departments	3,223.2	608.8
	to the Head office of the ASCR	228.4	6.5
	fixed resources	5.2	
Extra-budgetary resources of the ASCR chapter		4.0	6.1
Subsidies from other budget chapters		782.7	37.4
of this:	Czech Science Foundation grants	399.4	13.8
	Projects of other departments	383.3	23.6
Own resources of research and service departments		1 121.1	
of this:	Main activity orders	100.7	
	Sales of publications	146.1	
	Sales of goods and services	123.1	
	Licences	364.3	
	Conference fees	18.3	
	Foreign grants and donations	190.6	
	Rent	49.8	
	Own fund resources	25.1	
	Other	103.1	
Total resources		**5,364.6**	**658.8**

The research and service departments of the ASCR specified 5,021.3 million CZK to cover their own costs. This was from their overall yields of 5,127.0 million CZK. In addition to covering any losses incurred in previous years, an improved trading income total of 105.7 million will primarily be used for the supplementation and revitalization of instruments and equipment essential for the scientific activity of institutes.

The structure of the costs of research and service departments

Structure of the costs of research and service departments	in %	in million CZK
Employees' salaries and other payment for work done	39.59	1 988.1
Mandatory health insurance paid by the employer	13.45	675.2
Purchase of material	14.08	706.9
Purchase of energy, water, and fuels	3.06	153.8
Purchase of services	10.75	540.0
Repairs and maintenance	4.74	238.1
Total travel expenses	3.32	166.6
Depreciation of fixed assets	6.85	343.7
Total other costs	4.16	208.9
The ASCR institutes and service departments used in total	**100.00**	**5,021.3**

It is clear when comparing expenditures the Academy's institutes over a number of years that the share of the majority of items in overall total resources invested remains practically unchanged. However,

personnel expenses rose somewhat in consequence of the change to a sixteen-category payment system, the financial demands of which had to be partly covered at the expense of direct material expenses.

The creation of investment resources and their use

Investment resources are primarily created through institutional and specific subsidies from the state budget and budget resources from depreciation. The data for the ASCR as a whole can be summarised as follows:

Total investment resources

Total investment resources (in million CZK)			**1 033.5**
of this:	Depreciation	343.7	
	Transfer from improved trading income	4.5	
	Recipients; joint recipients (pursuant to Act No 130/2002 Coll.)	37.4	
	Foreign grants and donations	26.5	
	Subsidies from the state institutional budget	601.9	
	specific	19.5	
These resources were used to fund:			
	Buildings	361.8	
	The acquisition of instruments and equipment	568.1	
	Maintenance and repairs	19.4	
	Other	24.5	
Total used for acquisition of fixed assets			973.8
Fixed asset renewal fund increased by			58.7
Sum returned to the state budget			1.0

The arrears from the previous decade for maintenance and renewal of scientific instruments, the modernisation of laboratories, and the reconstruction of buildings used forced the ASCR to increase the amount of investment resources in its budget within restricted possibilities of the expense budget of its chapter. Subsidies for depreciation remain a significant supplement to investment resources.

Among the most significant reconstruction work undertaken in the year 2004 was the completion of reconstruction work on the GMO glass houses of the Institute of Experimental Botany at Karlovec, construction of small flats for employees and the reconstruction of the laboratory of fish genetics at the Institute of Animal Physiology and Genetics in Liběchov, construction of a multi-purpose building for the biological centre in České Budějovice, the addition of a hall to the accelerator building at the Nuclear Physics Institute in Řež, and building an infrastructure for the advancement of research in molecular and cell biology, genomics, biotechnology, and bio-organic chemistry (INFRAGEN) at the complex in Krč.

Although most of the damage caused by the floods in 2002 was repaired throughout 2002 and 2003, some work was not completed until 2004. A new Archives building has been constructed in Prague. The construction of two buildings for the depository of the Library in Jenštejn, to which the majority of the many books will be moved from endangered locations in Prague. Funds in the amount of 6,142 thousand CZK received in 2003 from the Solidarity Fund of the European Union and transferred into the reserve fund with the consent of the Ministry of Finance were used for this purpose.

Analysis of employment and the drawing of wage funds

The overall number of ASCR employees rose from 6,886 in 2003 to 7,020 in 2004. The number of employees shown in the category of research and development workers with university education fell from 3,791 to 3,563 in consequence of methodological changes in Czech legislation. Only those employees who have passed the prescribed attestations are ranked under this category this year.

The average monthly income at the institutes from all sources (institutional, specific, and extra-budgetary) stood at 23 189 CZK. A year-on-year increase of 13.53% was principally brought about by an increase in salary tariffs for research workers as of 1 January 2004 in connection with the switch to 16 payment categories.

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

Average gross monthly earnings

Category	Average adjusted number of employees	Average monthly earnings in CZK
Graduate research worker (with certificate)	2 261	33 232
Graduate R&D specialist	1 299	21 950
Graduate specialist	371	20 414
Specialist with secondary education and technical college	1 085	16 492
R&D specialist with secondary education and technical college	54	17 332
Technical and financial employee	886	21 815
Manual worker	659	12 804
Operator	299	11 162
Total for ASCR (non-inclusive of ACADEMIA Publishing House and Optical Development Workshop)	**6 914**	**23 308**

An analysis of wage resources demonstrates that we paid 75 percent of our payroll costs from institutional resources restricted by a wage limit. The source of fluctuating components of a salary principally involves specific and extra-budgetary resources. The specific resources of our budget chapter (GA AS grants, projects of programmes of ASCR endeavours) contributed 8.7 percent to wage resources, whilst resources for implementing the grant projects of the Czech Science Foundation and projects offered by other providers contributed 9.6 percent and other extra-budgetary resources (including other activity) contributed 6.7 percent.

9 Awards for Outstanding Results

The following employees of the ASCR were presented international, national and other awards:

ASCR Awards for Outstanding Scientific Results of Major Significance

RNDr. Eduard FEIREISL, DSc. (Mathematical Institute) for the monograph **Dynamics of Viscous Compressible Fluids**

Doc. RNDr. Zdeněk HUBÁLEK, DSc. (Institute of Vertebrate Biology) **for Biology of the West Nile virus causing West Nile fever** (set of papers)

PhDr. Jan NĚMEČEK, DSc., (Institute of History) for the monograph **From an alliance to separation. Relations between Czechoslovak and Polish representations in exile, 1939—1945**

ASCR Awards to Young Researchers for Outstanding Results

RNDr. Kateřina LUTEROVÁ, PhD., RNDr. Petr FOJTÍK, PhD. (both of the Institute of Physics) for **Optical properties of silicon-based semiconductor nanostructures**

Ing. Michal HOCK, CSc. (Institute of Organic Chemistry and Biochemistry) for **Papers on the development of original methods of synthesising new kinds of purine derivatives, and for discovering several new cytostatics**

PhDr. Jiří WOITSCH (Institute of Ethnology) for the monograph **Forgotten potash. Potash producers and potash production in the 18th and 19th centuries**

ASCR Award for a Particularly Successful Programme or Grant Project

Ing. Blanka WICHTERLOVÁ, DSc., Ing. Zdeněk SOBALÍK, CSc., Mgr. Jiří DĚDEČEK, CSc. (all of the J. Heyrovský Institute of Physical Chemistry) for Oxidation-reduction zeolite catalysers for nitrogen oxide transformations of environmental significance. The relationship between structure and activity

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

The highest distinction — the **DE SCIENTIA ET HUMANITATE OPTIME MERITIS honorary medal** — was awarded to the following:

Prof. RNDr. Antonín HOLÝ, DSc. — Institute of Organic Chemistry and Biochemistry, ASCR
Prof. MUDr. Vratislav SCHREIBER, DSc. — First Medical School, Charles University, Laboratory of Endocrinology and Metabolism, Faculty of General Medicine, Charles University, Prague
Eugene A. CERNAN (Captain, USN, Ret.) — NASA (USA)
Prof. Dr.phil. Siegmar von SCHNURBEIN — Römische-Germanische Kommission des DAI, Germany

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

The B. BOLZANO Honorary Medal for merit in the mathematical sciences:

Prof. Owe AXELSSON — University of Nijmegen, The Netherlands
Prof. RNDr. Ivan NETUKA, DSc. — Charles University, Prague
Prof. Christopher C. PAIGE — McGill University, Montreal, Canada

The E. MACH Honorary Medal for merit in the physical sciences:

Dr. Herbert HERMAN, Distinguished Professor Emeritus — State University of New York (USA)
Prof. Ing. Dr. Pavel CHRÁSKA, DSc. — Institute of Plasma Physics, ASCR
Jan KOUBA, DSc. — Geodetic Survey of Canada, Ontario

The J. HEYROVSKÝ Honorary Medal for merit in the chemical sciences:

Prof. Dr. Tilmann D. MÄRK — Leopold-Franzens Universität, Innsbruck, Austria
RNDr. Jiří ZÁVADA, DrSc. — Institute of Organic Chemistry and Biochemistry, ASCR

The G. J. MENDEL Honorary Medal for merit in the biological sciences:

Prof. Dr. James H. OLIVER, Jr. — Georgia Southern University (USA)
Doc. MUDr. Jiří FOREJT, DSc. — Institute of Molecular Genetics, ASCR
Prof. E. Peter GEIDUSCHEK — Center for Molecular Genetics, California (USA)
Prof. RNDr. Jan KLEIN, PhD. — University Park, Pennsylvania (USA)
RNDr. Jan ZÁVADA, DSc. — Institute of Molecular Genetics, ASCR
Prof. Paula M. PITHA-ROWE, PhD — Johns Hopkins University School of Medicine, Baltimore (USA)

The J. E. PURKYNĚ Honorary Medal for merit in the biological sciences:

Prof. Elizabeth U. CANNING — Imperial College, London, U.K.

The F. PALACKÝ Honorary Medal for merit in the social sciences:

Prof. Dr. Axel HONNETH — Goethe-Universität, Frankfurt am Main, Germany

The V. NÁPRSTEK Honorary Medal for merit in science communication:

Mgr. Ivo BUDIL – Czech Radio, Prague
Mgr. Václav VĚTVIČKA – Botanical Garden, Charles University, Prague
Prof. PhDr. Miroslav VERNER, DSc. – Czech Institute of Egyptology, Charles University
Prof. RNDr. Ivo VOLF, CSc. – University of Hradec Králové
Doc. RNDr. Zdeněk KLUIBER, CSc. – Ekogymnázium (Environment-oriented Grammar School), Prague

Předsedkyně Helena Illnerová
při předávání čestné medaile Vojtěcha Náprstka
za zásluhy v popularizaci vědy
Mgr. Václavu Větvičkovi,
řediteli Botanické zahrady UK Praha

The following researchers working at ASCR Institutes were given international, national and other awards:

The national **Medal for Merit in Science** was awarded to Prof. RNDr. V. HOŘEJŠÍ, DSc. of the Institute of Molecular Genetics and Prof. Dr. Ing. L. TONDL, DSc. of the Institute of Philosophy

Award of the Minister of Education, Youth and Sports for Research and Development to RNDr. F. FARNÍK, CSc. and RNDr. M. KARLICKÝ, DSc. of the Astronomical Institute for designing the roentgen spectrometer launched with the American MTI satellite, Mgr. I. STRAŠKRABA, CSc. of the Mathematical Institute for his paper "Mathematical and Computational Methods for Compressible Flow", Doc. PhDr. E. SEMOTANOVÁ, DSc. and Prof. PhDr. J. ŽEMLIČKA, DSc. of the Institute of History for the Historical Atlas of Czech Towns

Award of the Minister of the Environment to RNDr. J. KVĚT, CSc. of the Institute of Landscape Ecology for his lifelong contribution in the protection of nature and for representing the Czech Republic in international cooperation in this field

Award of the Czech Science Foundation to Dr Marian FABIAN of Mathematical Institute for his project "Geometrical analysis in Banach spaces", and to RNDr. A. KOVAŘÍK, CSc. of the Institute of Biophysics and Prof. RNDr. Antonín HOLÝ, DSc. of the Institute of Organic Chemistry and Biochemistry for their project "The role of epigenetic factors in the regulation of gene expression in higher plants"

Award of the Learned Society of the Czech Republic to Ing. V. HAVLÍČEK, DSc. of the Institute of Microbiology and Prof. RNDr. Ing. M. STRNAD, CSc. of the Institute of Experimental Botany.

Josef Hlávka Award to J. KAŠPAROVÁ, PhD. of the Astronomical Institute, V. PRAVDA, PhD. of the Mathematical Institute, Ing. J. SVOBODOVÁ, PhD. of the Institute of Physiology, Dr. M. HORÁČEK of the J. Heyrovský Institute of Physical Chemistry, and Mgr. L. VESELÁ of the Main Library of the ASCR

Prix Bohemiae to Prof. RNDr. A. HOLÝ, DSc. of the Institute of Organic Chemistry and Biochemistry

Česká hlava (Czech Intellect) **Award** to Prof. Ing. J. NĚMEC, DSc. of the Institute of Theoretical and Applied Mechanics

L'Ordre National des Merites was awarded by the president of France to Prof. JUDr. P. ŠTURMA, DSc. of the Institute of State and Law for his involvement in international law

UNESCO Prize in the Earth Sciences to RNDr. J. ŠAFANDA, CSc. of the Geophysical Institute

The French **Order Chevalier des Palmes Académiques** to Doc. PhDr. V. HEROLD, CSc. of the Institute of Philosophy.

THE ACADEMY
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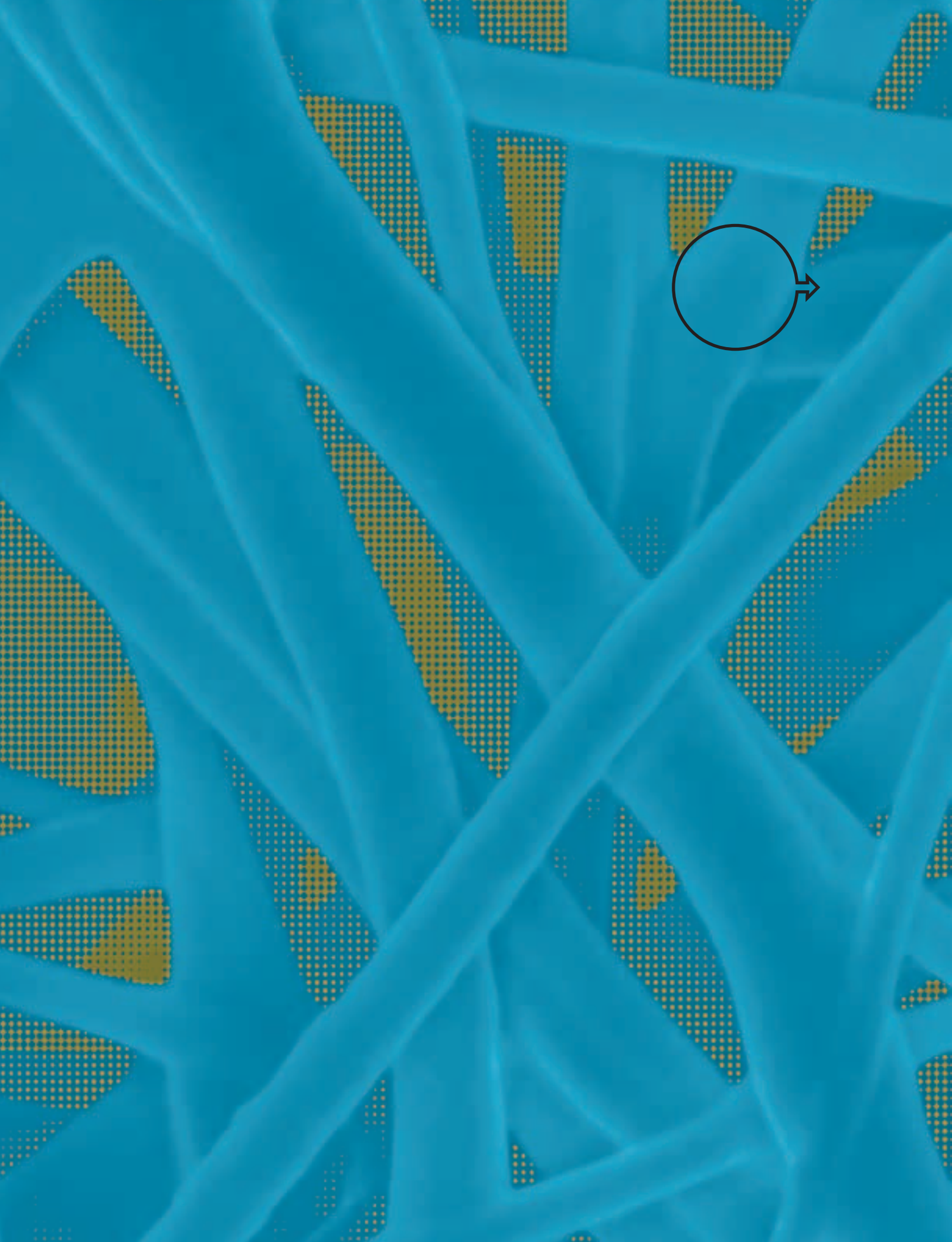

Section of Mathematics, Physics and Informatics 1

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

Section of Applied Physics 2

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

Section of Earth Sciences 3

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

Section of Chemical Sciences 4

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

Section of Biological and Medical Sciences 5

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

Section of Bio-Ecological Sciences 6

Institute of Botany
Institute of Hydrobiology
Institute of Landscape Ecology
Institute of Parasitology
Institute of Soil Biology
Institute of Vertebrate Biology

Section of Social and Economic Sciences 7

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

Section of Historical Sciences 8

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

Section of Humanities and Philology 9

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

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