The Czech Academy of Sciences

ANNUAL REPORT
OF THE CZECH ACADEMY OF SCIENCES
2015

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THE CZECH ACADEMY OF SCIENCES

The Czech Academy of Sciences (the CAS) was constituted by Act No. 283/1992. The CAS conducts research through its institutes established in the form of public research institutions. The CAS employs over 8,000 workers, more than a half of whom are researchers with university education.

The primary mission of the CAS and its institutes is to conduct research in a broad range of natural, technical and social sciences and humanities. This research, whether highly specialised or interdisciplinary in nature, aims at advancing the development of knowledge at the international level, while respecting the current needs of Czech society and respecting Czech culture.

The institutes of the CAS participate in education – primarily by educating young researchers in doctoral study programmes, but also by pedagogical work of the researchers at universities.

The CAS also fosters collaboration with applied research and industry. A wide range of joint international projects together with the exchange of scientists with partner institutions abroad reinforce the integration of Czech science into the international framework.

ADDRESS OF THE PRESIDENT JIŘÍ DRAHOŠ

Dear Reader,

In front of you, there is the Annual Report of the Academy of Sciences. Throughout the whole of 2015, the Czech Academy of Sciences continued to implement its long-term strategy aimed at further and vigorous development of its research, educational and cultural activities. Among significant social events highlighted by the CAS during the whole of the year, prominence was given to the celebrations of the 125th anniversary of the foundation of ´The Czech Academy of Emperor Franz Josef I for Sciences, Literature and Art´ (ČAVU), which – together with other scientific institutions – formed the basis of the Czechoslovak Academy of Sciences established in 1952. Notwithstanding the fact that the idea of establishing a non-university research institution in the Czech Lands is much older, the year 1890 represents one of the milestones on the long road leading to the formation of modern Czech science. On January 23rd of that year, the Emperor confirmed the prestigious status of the Czech educated elite that had long exerted every effort to establish a national research institution – an Academy of Sciences.

20 years later the potential shape of the Czech Academy was outlined by T. G. Masaryk in the *Athenaeum* journal. When considering its future profile, he envisioned an institution whose publication and auxiliary activities would encourage universities to meet their pedagogical and scientific objectives. Masaryk´s concept was not put into practice at that time, nevertheless the succeeding architects and organizers of the Czech Academy could both find inspiration in his ideas and the challenge of implementing them.

It is, therefore, no coincidence that at present, 125 years later, the CAS considers its participation in education to be an integral part of its mission, rated just next to research in significance. To function as a scientific research institution, the Czech Academy of sciences must, therefore, be engaged in education as well. And vice versa: to serve as educational institutions, universities must also inevitably act as scientific research institutions.

It should be emphasised, on the other hand, that in spite of their close connection with the process of education, the Institutes of the CAS, unlike universities, are obliged, and have all the necessary prerequisites, to focus primarily on addressing highly specialized or extensive interdisciplinary projects requiring long-term concentrations of capacities as well as expensive infrastructure.

It is my pleasure to point out, therefore, that in 2015 we succeeded in launching our new *Strategy AV21*, within the framework of which the CAS can perform research into complex and pressing issues facing contemporary society, including future energy resources in the Czech Republic, human health, migration, and effective public policies, the solution of which requires broad-based multilateral interdisciplinary research. That is why I consider the year 2015 as a significant milestone in the existence of the CAS. I am convinced that the novel mission of our Academy is best expressed in its new motto: *Top Research in the Public Interest*.

PROFILES OF RESEARCH AREAS

Mathematics, Physics and Earth Sciences

In *the Section of Mathematics, Physics and Computer Science*, methods of mathematics and computer science have been developed, in some cases for needs of other research areas. The research in physics generates knowledge of fundamental laws of the micro and macro world, principles of the behaviour of physical systems in extreme conditions and about the possibilities of practical utilisation of new discoveries and newly identified phenomena. The elaborated topics include the research into condensed matter systems with distinctive physical properties (including nanoscale structured systems), exploration of properties, structure and interaction of matter on the subatomic level, as well as the study of classical, particle, quantum and non-linear optics. Astrophysical and astronomical research units investigate the nature and behaviour of matter and radiation originating in the upper layers of the Earth's atmosphere as well as in the remotest parts of the universe. The research is directed towards galaxies, star systems, stars, Sun, Earth-Sun relations, interplanetary bodies and artificial satellites of the Earth.

The subject matter of *the Section of Applied Physics* is the research into the properties of ionized media and laser plasma, photonics, generating and diagnosing high and low-temperature plasma, transmission phenomena in liquid systems and the hydrosphere, mechanics of ductile objects and biomechanics, dynamics of liquids, thermodynamics, research into the properties of high-voltage electromagnetic systems, new concepts of energy conversion, sensors, transmission and processing of signals, material research and exploration of the properties of advanced materials in the relation to their microstructure. The development of new physical methods, special technologies and instrumentation principles, the development of interdisciplinary basic as well as applied research focused on fundamental knowledge outstripping the disciplinary borders are also fostered. Typical are the applications in bioengineering, medicine, ecology including protection of human health and safety, and preservation of natural and cultural heritage of mankind.

The institutes organised in the *Section of Earth Sciences* investigate the t Earth with its immediate and distant vicinity. The priority here is seen in the study of inner structure of the Earth, exploration of the development of the lithosphere, biosphere and environment from the oldest geological eras to the present including the research of human-induced processes in the lithosphere. The research into geodynamic processes in the upper layer of the Earth's crust and examination of hydrological processes influencing the environment and ecologically responsible management of raw materials are of particular importance for industrial applications.

Life and Chemical Sciences

The Section of Chemical Sciences includes six institutes oriented on the synthesis and the structural and functional characterisation of new inorganic and organic compounds with a special focus on crystalline, composite, glass and polymeric materials, supramolecular and nanostructured systems. Another priority is the

research of the relations between the structure, properties and reactivity of materials, associated with the clarification of temporally and spatially distinguished mechanism of their reactions. This research gives a theoretical basis for applications. Substantial part of the research is devoted also to the study of chemical principles in biological phenomena in biomedicine and ecology, and to the development of new chemotherapeutics, biologically active substances and polymeric biomaterials for therapeutic applications. Advanced technologies are the objective of the research focused on the processes in multiphase reactive systems, molecular engineering, new methods for initiating chemical reactions and processes important for environmental decontamination and protection. The development of instrumental, analytical and bioanalytical methods forms an integral part of the chemical research.

The Section of Biological and Medical Sciences is formed by eight institutes where processes in the living systems on various levels of organisation are explored. A special attention is paid to the development of genomics, proteomics and system biology as the groundwork for the future biomedicine and biotechnologies. Biomedical research is focused on the knowledge of the biophysical properties of living systems, the mechanisms of the function and disorders of the nervous, immune, cardiovascular and reproductive systems, including the external factors influencing them, on the study of gene expression and signalling pathways, the genetic bases of diseases and human evolution, on the research of tumour and stem cells, on the development of new pharmaceuticals, on the influence of lifestyle factors on the health of the population, and on the biology of microorganisms and microbe biotechnologies; the emphasis is placed on obtaining knowledge applicable in the prevention, diagnostics and therapy of serious diseases and in modern biotechnologies. Research in biology of animals includes physiology and the pathologic processes in animals. The genetic and physiological basis of the development in plants, the interaction of the plant genome with the environment, and on the biodegradation of xenobiotics in water and soil are also investigated.

The Section of Biological-Ecological Sciences includes four institutes oriented in their research on the mutual relations between organisms, on the relations between organisms and the environment, and on the functional mechanisms in ecosystems with respect to the anthropogenic effects. The objective is to attain the knowledge of the key processes and the possibilities of their application into medicinal, biotechnological, veterinary and agricultural practice and their utilisation as the background for rational management of the landscape. The research is also focused on animal biodiversity, evolutionary ecology of the vertebrates and adaptations of their behaviour, on the investigation of the evolution, structure and ecological role of biodiversity of plants (from the genetic level through the levels of organisms and communities to ecosystems). The research here also includes the study of the insect as a biological model and pest. Another area of interest covers the interactions of parasitic and symbiotic organisms, organism communities in the soil ecosystems, the functioning of the ecosystems of valley dams and lakes, the study of the global carbon cycle, energy and material flows through ecosystems, and the ecology of the landscape influenced by man. An important component of this research is the use of advanced methodologies in ecology, particularly the methods of molecular biology, remote research of the Earth and mathematic modelling with an emphasis on a systemic approach.

Humanities and Social Sciences

In the *Section of Social-Economic Sciences* five institutes work on current topical research issues. Research in economics concerns nearly all the main streams in modern economy along with the applied research. Besides other things, it throws light on the process in which bank crises precede currency and debt crises. For the research in psychology, the central topic is the study of the conditions for the optimal development of man in a variety of real-life contexts. The researchers working in this area also study the history of instrumentation in psychological research. Sociological research contributes to raising the level of scientific understanding of complex social processes, relations, connections and mechanisms and pushes forward the utilisation of sociological research in practice. Among other things, it focuses on the evolution of public opinion in relation to the political system and its players. The research in law concentrates on the general theory of law and philosophy of law, theory of legislation and its quantitative analysis. It also focuses on empirical methodology and cooperation in the development of data archives.

The Section of Historical Sciences comprises six institutes devoted to the investigation of historical sciences, archaeology and archival science. The research of history reflects contemporary theoretical-methodological procedures and relevant historiographic discourses with the accent on the role of science in preserving national memory and forming national identity and culture in the widest multicultural sense. The research focuses on the analysis, reconstruction and interpretation of historical processes from prehistory to the 20th century with the objective of giving their comparative overview. There is consistent effort to put into European context the history of fine arts and music, history of architecture, aesthetics, science and urbanism in the Czech lands. The research in archaeology is relies on the study of archaeological sources from the field research, study of artefacts and ecofacts in the context of archaeological cultures and generalised models of the past communities. Utilisation of the advanced methods of natural sciences together with the interdisciplinary cooperation within international teams has remained an integral part of the methodology of these fields.

Six research institutes belonging to *the Section of Humanities and Philology* study the issues of philosophy, oriental studies, ethnology, language and literature. The research in philosophy addresses the topical questions of philosophical thinking and deals with philosophical aspects of the related areas of science, history of Czech and European philosophy, selected subjects in logics, theory of science and the related disciplines in humanities (namely classical and Mediaeval studies). The institutes specialised in Oriental studies investigate history, religious and philosophical systems, languages, literatures and cultures of the nations of Asia and Africa. The research in ethnology focuses on the issues of migration and discovering the ways of life and culture of socio-ethnic groups at home and abroad. The core of the research in literary science can be seen in Bohemistic and Slavonic studies, research of the history of Czech literature from the remotest periods up to the contemporary times, and in the sphere of theory and sociology of literature. Also the research into the development of the Czech language is carried on – its standard and non-standard, written and spoken forms, from the synchronic and diachronic perspectives; also methods of teaching and testing foreign languages in academic environment are covered.

Strategy AV21

The Academy of Sciences is an important and indispensable part of the system of research, development and innovation in the Czech Republic. To remain a quality guarantor, the Academy must be able to identify important research and societal issues, to define in a well-founded manner the subject matter and to formulate the solutions based on the current level of knowledge.

Therefore, the Academy of Sciences started to implement the Strategy AV21 with the motto "Top research in the public interest". Strategy AV21 is formed by a set of coordinated research programmes utilising interdisciplinary and inter-institutional synergies. Its goal is to identify the problems and challenges of the present time and to coordinate the research of the individual Institutes toward their solutions. The founding participants of the research programs are the Institutes of the Academy of Sciences, but the programmes are open to partners from universities, business sector or institutions of government and regional administration, as well as to research groups and organisations from abroad.

The programme framework for Strategy AV21 was completed by the end of 2014, and Strategy AV21 was approved by the Academy Assembly in December 2014. The following 14 research programmes formed the Strategy AV21 at that time:

- ***Hopes and Risks of the Digital Era***
- ***Systems for the Nuclear Power Industry***
- ***Efficient Energy Conversion and Storage***
- ***Natural Hazards***
- ***New Materials Based on Metals, Ceramics and Composites***
- ***Diagnostic Methods and Techniques***
- ***Well-Being in Health and Disease***
- ***Foods for the Future***
- ***Diversity of Life and Health of Ecosystems***
- ***Molecules and Materials for Life***
- ***Europe and the State: Between Barbarism and Civilization***
- ***Memory in the Digital Age***
- ***Effective Public Policies and Contemporary Society***
- ***Forms and Functions of Communication***

However, the set research programmes is not closed and if necessary, it may be modified. This happened at the end of 2015 when the fifteenth research programme **Global Conflicts and Local Connections: Cultural and Social Challenges** was approved.

Since its beginning, the success of Strategy AV21 has been reflected in a wide and favourable response, such as the following:

- Positive response from government authorities, namely from Pavel Bělobrádek, Deputy Prime Minister for the Science, Research and Innovation, who appreciated the Strategy at the Session of Academy Assembly on December 15, 2015.
- Widening awareness of Strategy AV21 in the business sphere (positive assessment

at the Congress of the Confederation of Industry of the Czech Republic);
- Positive reactions from various foreign embassies with suggestions for possible international cooperation.

The results achieved within Strategy AV21

The activities of the research programmes have the following forms:

1. Conferences and workshops with direct participation of the representatives of companies (industrial, agricultural), state government bodies (ministries), and public institutions;
2. Direct cooperation with companies in addressing specific problems;
3. Cultural and educational activities.

All information about the activities of the individual research programmes and their results are available on the web of Strategy AV21 http://av21.avcr.cz/. This web site contains detailed list and description of past and future activities with links to the related documents and events.

In 2015 expenditures on the activities connected with Strategy AV21 totalled CZK 106.6 mil.

SELECTED RESULTS

Bright trions in direct-bandgap silicon nanocrystals revealed by low-temperature single-nanocrystal spectroscopy (Institute of Physics)

Single-nanocrystal photoluminescence measurements down to cryogenic temperatures performed on a novel material of strain-engineered direct-bandgap silicon nanocrystals confirm that the observed emission comes from a trion quasiparticle, consisting of an electron and two holes. This finding puts the nanocrystals under study among the few nanomaterials in which trionic emission, considered impossible in the past, has been observed.

Parallel iterative solution of the incompressible Navier-Stokes equations with application to rotating wings (Institute of Mathematics)

Researchers at the Institute of Mathematics implemented an efficient method for solving unsteady incompressible flows in three dimensions on parallel supercomputers. They use the PETSc library and present several algorithms for enhancing of the computation efficiency. They use this approach to solve the flow around a revolving model of a wing of Drosophila. The efficiency of the algorithm was verified on up to 65 thousand cores of a parallel supercomputer, while two thousand cores were used for an actual computation of one revolution of the wing.

Evaluation of the impact of air quality on human health using CMAQ-adjoint model (Institute of Computer Science)

It is a result of a long term international collaboration on the development of the adjoint chemical transport model CMAQ. The model has been used to assess the responsibility of anthropogenic sources of black carbon (soot) for premature deaths due to high concentrations of PM2.5 over the US territory. This approach may significantly contribute to understanding the relations between emissions and health effects. It may help us to find effective strategies to abate emissions, e. g. in the Ostrava region.

Searching for a possible parent crater for Australasian tektites based on review and analysis of geochemical, isotopic, geographical and other data (Nuclear Physics Institute)

Activation analysis is used in studies of tektites – glasses produced during impacts of large extra-terrestrial bodies on the Earth's surface. In the study, source materials and so far unknown location of a parent crater for Australasian tektites (AAT) are discussed based on geochemical and isotopic data. The study focuses on the criticism of the generally accepted crater location in Indochina and suggests a hypothesis of the crater in the deserts of NW China, based on similar compositions of AAT and Chinese loess.

Unsupervised detection of non-iris occlusions (Institute of Information Theory and Automation)

A precise unsupervised iris defects detection method based on the multispectral spatial probabilistic adaptively learned textural model was developed. The method was developed for high-resolution colour images of the eye taken with unconstrained mobile devices, but it was also successfully tested on the UBIRIS v2 eye database and on near-infrared spectrum measurements. Our method ranked the first of 98 alternative methods at the large colour iris database called Noisy Iris Challenge Evaluation.

Photonic biosignals: spectra and statistical properties (Institute of Photonics and Electronics)

Oxidative processes, which are often related to the onset of many diseases, generate photonic biosignals in organisms. It is therefore promising to exploit them for diagnostic purposes in biology and medicine. It was demonstrated on HL-60 leukemic cells and yeast cell culture that different organisms manifest different spectra of photonic biosignals. These results constitute a first step in the identification of typical parameters of photonic biosignals in healthy vs. diseased tissue.

High-temperature damage of superaustenitic steel Sanicro 25 (Institute of Physics of Materials)

This complex study of heat resistant superaustenitic steel covers the damage evolution and final failure at high temperatures. The study assesses the effect of high temperature cyclic loading and thermomechanical cycling on the fatigue damage leading to the initiation and crack growth, identifies the preferential oxidation and simultaneous oxide cracking at grain boundaries as the main mechanisms leading to premature fracture, and identifies and describes cracking mechanisms in thermomechanical loadings.

Optical trapping and rotation of non-spherical objects (Institute of Scientific Instruments)

It was found that laser beam can be used not only for the spatial localisation of microobjects and nanoobject, but also for the rotation or alignment of non-spherical objects. The rotation in circularly polarised laser beam was demonstrated using polystyrene spheroids; non-spherical nanoparticles showed the alignment and easier optical trapping. In the case of more trapped and rotating spheroids, it was proved that their rotations are mutually synchronised by scattered light.

Innovative strain-rate sensitive structures for strain energy absorption (Institute of Theoretical and Applied Mechanics)

Strain-rate sensitive structures for deformation energy absorption were developed and experimentally tested. The structures were designed as a sandwich based on individual layers of aluminium and polymeric porous solids, or by filling of an open-cell foam using viscous polyurethane. Furthermore, auxetic structures were also studied for their high energy absorption capabilities. All the proposed structures allow optimisation to achieve the required strain-rate characteristics.

Determination of elastic moduli of thin micro- and nanostructured layers (Institute of Thermomechanics)

The mechanical properties of few micrometres thick sputtered Al and NiTi layers were studied, both of them being promising candidates for applications in micromechanics. The spectra of vibrations of substrates with these layers were inversely analysed, which made it possible to determine the elastic moduli. For the NiTi alloy, the evolution of Young's modulus with temperature was studied. For Al layers, the correlation between the modulus and porosity was analysed. The same procedure was applied to study nanoporous semiconductors.

Mapping the maar volcanic structure Mýtina near the town of Cheb (Institute of Geophysics)

Gravity and magnetic measurements of the Mýtina explosive volcanic maar structure near Cheb disclosed the position of the volcanic chimney inside the crater. The shape of geophysical anomalies proved the impact of the Tachov fault zone on the volcano origin. At the same time the microgravity surveying around the Hartoušov Moffetes localised the zones where intensive emissions of deep CO_2 from an active magmatic chamber in the crust caused significant disintegration of the near-subsurface layers.

The origin and evolution of highly alkaline volcanic rocks from the České Středohoří complex, the Bohemian Massif (Institute of Geology)

The origin, evolution and age of highly alkaline rocks (trachyte, phonolite) in one of the largest volcanic complexes in Europe – the České Středohoří – had been a matter of speculations for a long time. Elemental and isotopic (Sr-Nd-Li) analyses showed that petrogenesis of these rocks is largely influenced by crystallisation of individual mineral phases in different evolutional stages of magmas derived from the Earth’s mantle in combination with crustal contamination.

Heat waves in climate model simulations (Institute of Atmospheric Physics)

Heat waves have substantial impacts on society and ecosystems. A future climate is projected using climate models, which still exhibit inaccuracies and errors especially when extreme events are simulated. Therefore, it is necessary to analyse the weaknesses of climate models before the characteristics of the future heat waves can be determined. The performed analysis demonstrated strong relationships between

heat waves and precipitation, the feature that has to be considered when interpreting climate change scenarios.

Utilisation of abrasive water jet (AWJ) as an efficient tool for turning hard-to-machine materials (Institute of Geonics)

Optimal procedures were designed for the utilisation of AWJ for turning hard-to-machine materials that cannot be machined by conventional methods. The research was focused on turning rock and ceramic materials, titanium and nickel alloys, and composites. Any material can be turned by AWJ with an accuracy of ± 0.1 mm. The AWJ is recommended for roughening operations during turning of hard-to-machine materials and turning of non-rotary semi-products with discontinuous process of cutting.

Ceramic foam derived from polymethylphenylsiloxane precursor with starch as foaming agent (Institute of Rock Structure and Mechanics)

A unique ceramic foam was prepared by the foaming of a preceramic polymer – polymethylphenylsiloxane resin – and subsequent pyrolysis conducted at up to 1000 °C. The foaming of the polymer precursor was carried out simultaneously with its crosslinking. Prior to foaming, a starch was blended with the diluted resin in order to achieve uniform and small-sized pores and high temperature resistance. These properties are important for the use of ceramic foams in heat exchangers, filters and biomaterials.

Hexanuclear molybdenum clusters – new class of compounds for photodynamic therapy? *(Institute of Inorganic Chemistry)*

Photodynamic therapy has emerged as a promising tool in the fight against cancer. This therapy is based on the production of reactive singlet oxygen by a compound activated by visible light; as such, it is limited to the treatment of tumours near the skin. We designed a new generation of efficient singlet oxygen producers that also act when exposed to X-rays with no limitation to the penetration depth in tissue. The compounds could allow for reducing a radiation dose needed to kill tumour cells.

Synthetic polymer vaccines for safe and efficacious prophylaxis of infectious diseases *(Institute of Macromolecular Chemistry)*

New types of fully synthetic polymer vaccines consisting of macromolecular carrier, peptide-based antigen and adjuvant derived from toll-like receptor agonists were developed to elicit the efficacious immune reaction against infectious diseases. In a collaborative study – first two authors contributing equally – it was proved that the original vaccine composition significantly increases the potency of the vaccines, prolongs their persistence in the body circulation and improves the localisation of their therapeutics effect *in vivo*.

Application of microreactor for kinetic studies of heterogeneously catalysed hydrogenations and preparation of chemical specialities *(Institute of Chemical Process Fundamentals)*

The kinetics of the 2-methylpropene hydrogenation on the Pt catalyst was studied with a fixed-bed microreactor. The unique periodic oscillation was observed that had not so far been reported in the literature. It was determined that one of the causes leading to oscillations was the presence of mass transfer limitations. The microreactor was demonstrated as the convenient and efficient tool for photo-sensitised reaction (oxidation of 4-chlorfenol).

Synthesis of "unfeasible" zeolites (*J. Heyrovský Institute of Physical Chemistry)*

We developed a new synthetic approach for preparation of zeolites (called ADOR) starting from individual zeolitic layers. They can be shifted with the help of proper organic molecules and further connected to form new zeolites. This synthesis protocol opens unbelievable opportunities in zeolite synthesis not achievable by classical solvothermal synthesis. Zeolites contain odd-ring channels and had been assumed as "unfeasible" due to a high energy of the frameworks.

The mechanism of the reaction of alkali metals with water *(Institute of Organic Chemistry and Biochemistry)*

Why does sodium explode in water? Explosion of sodium in water is accompanied by the formation of steam and hydrogen. These gases should, however, separate the metal from water and thus quench the reaction. Pavel Jungwirth and his team at IOCB discovered a hitherto unknown mechanism of the explosive behaviour of alkali metals in water. Having migrated from metal to water, the electrons acquire a huge positive charge. This causes a Coulomb instability, which facilitates effective mixing of reactants and the subsequent explosion.

Regulation of transport and function of glutamate receptors in the mammalian neurons (Institute of Physiology)

The results shed light on molecular mechanisms by which NMDA receptors, a specific type of ion channels activated by glutamate, are regulated during their transport to excitatory synapses. Our study also describes how NMDA receptor ion channels are activated and modulated by cholesterol and neurosteroid-based compounds. The data provide a unique opportunity for the development of new therapeutic approaches to treat human disorders associated with the dysfunction of the glutamatergic system.

Effects of naturally occurring base lesions on the structure and stability of the human telomere DNA quadruplex *(Institute of Biophysics)*

The study of the influence of the most frequent naturally occurring DNA damage on the structure and stability of the human telomere DNA quadruplex led to the

following conclusions: The damage to guanine tetrads prevented the sequence from adopting the quadruplex structure characteristic of physiological conditions. The damage to quadruplex loops, in dependence on the loop type and position, was able to change the topology of quadruplex folding. Such changes may have serious biological consequences.

Mitochondrial genome acquisition restores respiratory function and tumorigenic potential of cancer cells without mitochondrial DNA *(Institute of Biotechnology)*

This work documents the important role of mitochondria in carcinogenesis. In mice, cancer cells without mitochondrial DNA form tumours with a considerable lag. However, cancer cells derived from these tumours and their metastases show a reversal to the normal mitochondrial function. Their mitochondrial DNA is evidently of the host origin (from mouse) and this clearly documents that the so called mitochondrial transfer has occurred providing cancer cell with functional mitochondria.

Gastrointestinal autoimmunity associated with loss of central Tolerance to enteric alpha defensins (*Institute of Molecular Genetics*)

This study describes the newly discovered mechanism of immune destruction of Paneth cells and its impact on the complex functional gut phenotype of patients with APECED disease. Our findings suggest that the key driving element of this mechanism are self-reactive enteric α-defensin recognising T cells that, in the absence of tolerising mechanism, initiate Paneth cell destruction. This leads to microbiota dysregulation and enhanced Th17 responses, which further amplify inflammatory autoimmunity in the intestine.

Temporal and spatial regulation of translation in the mammalian oocyte via the mTOR-eIF4F pathway (Institute of Animal Physiology and Genetics)

Fully grown mouse oocyte is transcriptionally quiescent and utilises transcripts synthesised and stored during early development. We found an RNA population retained in the oocyte nucleus and containing specific mRNAs important for meiotic progression. After nuclear envelope breakdown, translational hotspots develop in the chromosomal area and in a region that previously surrounded the nucleus. This indicates the existence of a mechanism controlling temporal and spatial translation of specific RNAs.

Global exchange and continental accumulation of non-native plants *(Institute of Botany)*

This is the first comprehensive analysis of the global accumulation and exchange of alien plant species based on a unique global database of naturalised alien plant species in 481 mainland and 362 island regions. In total, 13,168 plant species, corresponding to 3.9 % of the extant global vascular flora, are naturalised somewhere

on the globe as a result of human activity. Continents in the Northern Hemisphere are the major donors of naturalised alien species to all other continents.

A calcium-accumulating region, CAR, in the channel Orai1 *(Global Change Research Centre)*

Store-operated calcium entry produces local calcium signals that not only refill intracellular calcium stores but also regulate specific downstream signalling events. The channel complexes that mediate the calcium influx are exposed to very different concentrations of extracellular calcium. Using molecular dynamics simulations and analysis of mutant proteins in cells, the research team of Prof Ettrich, together with colleagues from Austria and Germany identified a region in Orai1.

Genetic evidence unequivocally defines a receptor for juvenile hormone *(Biology Centre)*

Juvenile hormone (JH) is critical for insect development and reproduction, yet the molecular action of JH had been unclear until we characterised its receptor in 2011. Our present study in PLoS Genetics demonstrates that the ability of this intracellular JH receptor to bind its hormonal ligand is essential for the protein to sustain normal insect development. This unequivocal genetic identification of a JH receptor has profound implications for our understanding of insect biology.

Impact of invasive species on freshwater ecosystems (Institute of Vertebrate Biology)

Non-native species can cause significant ecological and economic damage to native species and ecosystems. This study examines the consequences of spreading non-native fish and large bivalves in Europe. Impact intensity is strongly affected by native and non-native species population structure (host-parasite interactions), level of anthropogenic damage to indigenous ecosystems (river canalisation) and the stability of native communities (species diversity).

Rational inattention to discrete choices: a new foundation for the multinomial logit model (*Economics Institute*)

The theory of rational inattention suggests that it is sometimes rational to ignore relevant information if its acquisition is costly. The authors study the choices of rationally inattentive agents among discrete alternatives, showing that the optimal strategy results in choosing probabilistically in line with a generalised multinomial logit model. The paper presenting entirely original results in rational inattention theory was published in one of the five most prestigious economics journals – American Economic Review (Vol. 106, No. 1).

Personality predictors of successful development: toddler temperament and adolescent personality traits predict well-being and career stability in middle adulthood (*Institute of Psychology*)

Based on unique longitudinal data from people observed for fifty years, it was found that on the basis of personality characteristics from childhood and adolescence both personality traits in adulthood and well-being and stability of career line can be predicted. On the basis of cross-sectional studies, relationships between personality and well-being and stability of career have been proved. The outcomes have implications for educational psychology in particular.

Community satisfaction in Czech rural communities: a multilevel model (*Institute of Sociological*)

The study examines factors influencing community satisfaction in small rural communities in the Czech Republic. The author focused his research on the impact of the contextual characteristics of communities on the satisfaction of their residents. The analysis shows that the subjective evaluations of community characteristics are a very good predictor of community satisfaction, while their relationship to the objective community characteristics is unclear.

BOOKS

Why We Need the Family, Work, and Friends. Sociological Perspective on Happiness *(Institute of Sociology)*

The book explores the issues of happiness and life satisfaction. It starts with the discussion on how to measure these concepts and then it focuses on the link between subjective happiness and work, money, family, and social contacts. The book is empirically based and uses the subjective measures of quality of life in the large-scale surveys, in particular the data from international comparative projects, such as the ISSP or ESS.
Hamplová, D.: Proč potřebujeme rodinu, práci a přátele. Štěstí ze sociologické perspektivy Prague: Fortuna Libri, 2015. 214 p.

The Right to Environment: Theoretical Aspects *(Institute of State and Law)*

The book deals with the new human right to beneficial environment especially from the perspective of Legal Rights Theory and Human Rights Theory. The book analyses the concept of the right, its position within the human rights system, and its possible content, construction and other elements. The author pays closer attention to three subtopics that have not yet been treated in detail in the Czech Environmental Law Theory: the problem of anthropocentrism, the concept of sustainability, and the concept of future generations' rights.
Müllerová, H.: Právo na životní prostředí: Teoretické aspekty. Prague: Ústav státu a práva, 2015. 125 p.

Great Moravia and the beginnings of Christianity. Current summary of findings about spiritual life and the origins of Christianity in Central Europe in the 8th – 10th centuries *(Institute of Archaeology, Brno)*

Two extensive narrative publications summarise our current knowledge of religious, cultural and political developments in Central Europe in the early Middle Ages. Based on a comprehensive study of the historical sources, the work outlines the spiritual and social milieu of the Slavic power formations existing at that time, their material culture and relations with neighbouring countries. Both books present an extensive series of as yet unpublished knowledge and findings.
Kouřil, P., ed.: Velká Morava a počátky křesťanství. Katalog výstavy. Brno 2014. 517 p.
Kouřil, P., et al., Cyrilometodějská misie a Evropa – 1 150 let od příchodu soluňských bratří na Velkou Moravu. Brno 2014. 387 p.

The oppidum Hradiště of Stradonice. Commented catalogue of the coin finds and evidence of the local coin production *(Institute of Archaeology, Prague)*

The book represents a significant milestone for understanding the Czech Celtic coin production of the oppida period. The publication provides a complete inventory of all the known evidence, coins and coin production coming from the oppidum of Stradonice. In the category of individual coins, the publication contains 2,481 coins. The inventory is based on the new typology systems for gold and silver coins; both systems are included in the publication.
Militký, J.: Oppidum Hradiště u Stradonic: komentovaný katalog mincovních nálezů a dokladů mincovní výroby = Das Oppidum Hradiště bei Stradonice: kommentierter Katalog der Münzfunde und Belege der Münzproduktion. First edition. Prague: Abalon s.r.o., in cooperation with Institute of Archaeology of the CAS, Prague, v. v. i., 2015. 735 p.

Resettlement of populations – a deliberate process of solving political and economic problems in the world *(Institute of History)*

Within the significant research project called Forced Migration in European and non-European Countries through Centuries, the following four titles by collectives of authors were published dealing with the topical issue of migration from the historical perspective:

Kol.: Undauted by Exile! To the Victims of Religious, Political, National and Racial Persecutions in Central Europe between the 16th and 20th Centrury with an Accent on the Czech Lands. *Praha: Historický ústav, 2015. 365 s.*

Kol.: Frontiers, massacres and replacement of populations in cartographic representation: case studies (15th-20th centuries). *Praha: Historický ústav, 2015. 101 s.*

Kol.: Resettlement and extermination of the populations: a syndrome of modern history. *Praha: Historický ústav, 2015.617 s.*

Kol.: Frontiers, minorities, transfers, expulsions: British diplomacy towards Czechoslovakia and Poland during WWII. Vol. I, Plans. *Praha: Právnická fakulta Univerzity Karlovy v Praze, 2015. 400 s.*

A Sense of Art. Prizes Given by the Czech Academy of Sciences and Arts, 1891–1952 *(Institute of Art History)*

From its establishment in 1890 until 1952, the Czech Academy of Sciences and Arts held an annual gathering of artists, authors and musicians to recognise the artistic achievements of their peers. The exhibition called A Sense of Art is the first to present the artworks that received these prestigious academic prizes in 1891–1952 and in so doing to show how Czech culture changed in that period.
Hulíková, V. (ed.) – Petrasová, T. (ed.): Smysl pro umění. Ceny České akademie věd a umění 1891–1952 Praha: Národní galerie, 2015. 223 p.

Homines Scientiarum. Thirty stories of Czech Science and Philosophy. I–V *(Institute of Contemporary History)*

The unique presentation of creative lives of scientists and philosophers based on biographic data, interviews and audio-visual documents provides a rich picture of the 20th century Czech intellectual history. Although bringing new information and views, it also has a form understandable to all. The authors made a good selection of disciplines and personalities, from philosophers to scientists studying both living and inanimate nature, active in different periods, at home or abroad.
Kol.: *Homines scientiarum. Třicet příběhů české vědy a filosofie. Part I.–V. Praha – Červený Kostelec: Ústav pro soudobé dějiny AV ČR – Nakladatelství Pavel Mervart, 2015. 1 133 p. + 5DVD*

A Guide to the Sources of Folk Songs, Music and Dances in Bohemia. *(Institute of Ethnology)*

The publication focuses on Czech folk song from the region of Bohemia and, to a certain extent, from the Czech enclaves abroad. It offers a fully-fledged account of a number of printed as well as handwritten sources from museums, archives and academic institutions. The monograph contains thousands of entries arranged according to user-friendly searching criteria. A rich index together with facsimile of front pages and extracts from manuscripts and collectors' portraits make it easy for the reader to follow.
Tyllner, L. – Traxler, J. – Thořová, V.: Průvodce po pramenech lidových písní, hudby a tanců v Čechách. Prague: Etnologický ústav AV ČR, v. v. i, 2015. 770 p.

A companion to Jan Hus (Institute of Philosophy)

Published by the eminent publishing house Brill, the book includes eleven substantial essays covering the central aspects of the life, thought and commemoration of Jan Hus († 1415), Czech theologian, reformer and martyr. Besides older experienced specialists in the Hussite studies, also younger researchers who enter the scientific discourse with new approaches participated in the volume. Experts and students alike will profit from this guide to Jan Hus, who was well known as follower of John Wycliffe and forerunner of Martin Luther. Burning of Jan Hus at the stake at the Council of Constance gave rise in Bohemia to religious and social revolt that ushered the European reformations of the 16th century. The publication is mainly directed to foreign readers.

Šmahel, F. – Pavlíček, O. (eds.): A companion to Jan Hus. Leiden: Brill, 2015. 447 s. (Brill's companions to the Christian tradition, A series of handbooks and reference works on the intellectual and religious life of Europe, 500-1800: 54).

Struggle by the Pen: The Uyghur Discourse of Nation and National Interest
(Oriental Institute)

The monograph explores the emergence of national consciousness and nationalist ideology of Uyghurs in Xinjiang in the period 1900-1949. Drawing on the texts written by modern Uyghur intellectuals, politicians and propagandists throughout this period, the author identifies diverse types of Uyghur discourse of nation and national interest, and traces the emergence and construction of modern Uyghur national identity.
Klimeš, O.: Struggle by the Pen: The Uyghur Discourse of Nation and National Interest, c. 1900-1949. Boston: Brill, 2015. 280 p.

In the Public Interest. Censorship and the Social Regulation of Literature in Modern Czech Culture. 1749–2014 *(Institute of Czech Literature)*

In its eight chronologically organised parts, the book describes, analyses and interprets the role of censorship and other institutional and socio-structural mechanisms in regulation of literature and press within the cultural sphere of the historical Czech lands (Bohemia, Moravia and Silesia), which loosely coincide with the borders of the modern Czech Republic.
Wögerbauer, M., et al.: V obecném zájmu: cenzura a sociální regulace literatury v moderní české kultuře: 1749-2014 Prague: Ústav pro českou literaturu, 2015. 1661 p.

Daniel Adam z Veleslavína: Nomenclator quadrilinguis Boemico-Latino-Graeco-Germanicus *(Institute of the Czech Language)*

The first critical edition of the 1598 humanist dictionary *Nomenclator quadrilinguis* by Daniel Adam of Veleslavín is intended for both philologists and students. In addition to the dictionary and the original prefaces, the book also includes a study on the sources and the impact of *Nomenclator* and detailed editorial rules. It includes a CD with all the texts, original indexes of Czech and Latin words and photocopies of the old print edition, all this supplemented with a search application.
Kol.: Daniel Adam z Veleslavína: Nomenclator quadrilinguis Boemico-Latino-Graeco-Germanicus Prague: Academia, 2015. 365 p.

FINANCES

Support from the State Budget

The basic component of the funding of the institutes of the Czech Academy of Sciences comes from the institutional funding from the State Budget Expenditures on Research, Development and Innovation, which is provided in the structure of outlays on the development of research organisations and on operating costs.

The substantial part of the funding of the CAS institutes comes from the targeted funding of projects mainly by the Czech Science Foundation, Ministry of Education, Youth and Sports, and the Technology Agency of the Czech Republic. In 2015, the institutes of the CAS participated in 1,740 research projects funded from the state budget. In 1,375 projects, the institutes of the CAS were recipients, and in 365 projects they were participants (co-recipients) of the funding.

The overview of the participation of the CAS institutes in the above mentioned projects (including the projects under Operational Programmes) is given in Table 1, categorised by the provider, and in Table 2, categorised by research categories.

Tab. 1: Participation of the CAS institutes in R&D&I projects in 2015

	The CAS research unit as recipient	**The CAS research unit as participant**	**Total**
Provider	Number of projects	Number of projects	Number of projects
Czech Science Foundation	869	177	1 046
Ministry of Education CR	27	3	30
Ministry of Industry and Trade CR	2	14	16
Ministry of Education CR	383	28	411
Ministry of Interior CR	7	2	9
Ministry of Health CR	22	51	73
Ministry of Agriculture CR	16	0	16
Technology Agency CR	49	90	139
TOTAL	**1 375**	**365**	**1 740**

Tab. 2: Participation of the CAS research institutes in projects in 2015 by research category

	CAS research unit as recipient	**CAS research unit as co-recipient**	**TOTAL**
Research Category	Number of projects	Number of projects	Number of projects
Basic research	1209	199	1408

Applied research	127	151	278
Experimental development	7	12	19
R&D infrastructure	32	3	35
TOTAL	**1375**	**365**	**1740**

Projects of Operational Programmes of EU Structural Funds

The year 2015 was the last year to draw subsidy from the operational programmes of the structural funds for the period 2007–2013, and it was also the year of gradual onset of the programming period 2014–2020. In 2015, the institutes of the CAS participated in 78 projects of these Operational Programmes, in 56 projects as coordinators or beneficiaries, of which 4 started and 52 completed. The overview of the participation of the institutes of the CAS in these projects, segmented into various Operational Programmes and programming periods is given in Table 3.

Tab 3: Participation of the CAS institutes in operational programmes in 2015.

Operational programme	Projects launched	Projects completed	TOTAL
Programme period 2007-2013			
OP Human Resources and Employment	0	2	2
OP Enterprise and Innovation	0	2	2
OP Prague Competitiveness	0	5	5
OP Research and Development for Innovation	1	7	8
OP Education for Competitiveness	0	32	32
OP Environment	0	4	4
Programme period 2014-2020			
OP Research, Development and Education	1	0	1
OP Enterprise and Innovations for Competitiveness	1	0	1
OP Environment	1	0	1
TOTAL number of projects	4	52	56

The projects of building European Centres of Excellence and regional centres of research and development belong among major and expensive projects that received subsidy from the Operational Programme Research and Development for Innovation (OP R&D&I) in the programme period 2007-2013 and which continued to receive subsidy in 2015.

ELI Beamlines (ELI – Extreme Light Infrastructure). This unique laser infrastructure for interdisciplinary applications has been built in Dolní Břežany by

the Institute of Physics with the subsidy of CZK 6.8 billion. The completion of *ELI Beamlines* including high-power lasers and testing is planned for years 2016 and 2017. Follow-up financing for this Centre of Excellence is provided by Operational programme Research, Development and Education. The opening ceremony attended by a number of luminaries took place on October 19, 2015.

The construction of *Biotechnology and Biomedicine Center (BIOCEV)* was completed in 2015. This Centre of Excellence, which cost CZK 2.3 billion, is operated by the Institute of Molecular Genetics in cooperation with other five institutes of the CAS and two faculties of Charles University, Prague. The Centre has completed the laboratories and arranged for the start of operation in January 2016. Its goal is to bolster the research and development in the area of new therapies, diagnostics, bioactive substances including chemotherapeutics, protein engineering, and advanced technologies.

Laser centre HiLASE: New lasers for industry and research. At the end of 2015, the Institute of Physics completed the implementation of the project of regional centre in Dolní Břežany. The main goal of HiLASE is the research and development of high-repetition lasers and laser systems for use in industry, research laboratories and particularly in such extensive facilities as ELI Beamlines.

The recently built centres, such as ALISI (Institute of Scientific Instruments), ALGATECH (Institute of Microbiology, detached facility in Třeboň) or TOPTEC (Institute of Plasma Physics, unit in Turnov), entered the period of sustainability, which means that during the following five years they must prove their financial self-sufficiency and be able to rely on their own or other private financial resources.

Some of the institutes of the CAS participate as partners in completed centres, for example the Institute of Experimental Botany (Centre of the Region Haná for Biotechnological and Agricultural Research), Institute of Physics of Materials (Central European Institute of Technology – CEITEC), or the Institute of Geonics (IT4Innovations).

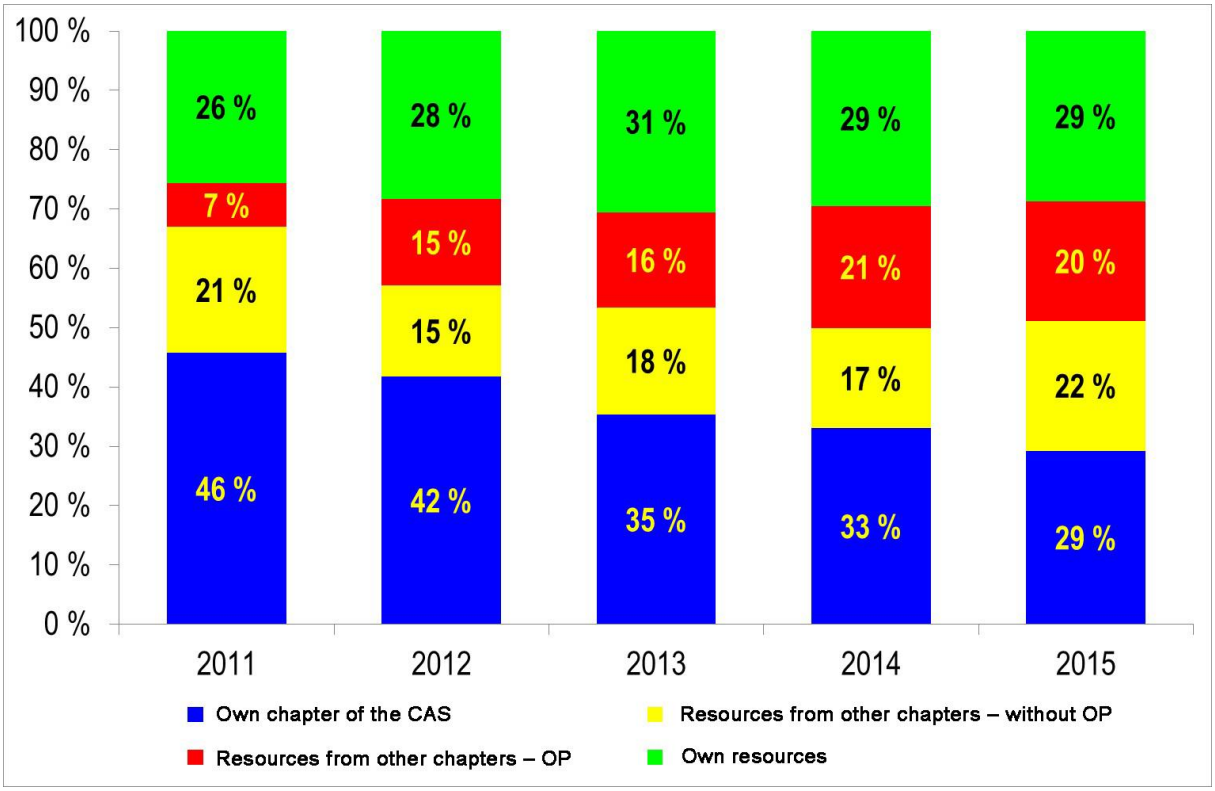
The institutes of the CAS were also engaged in the projects of the Operational Programme Prague – Competitiveness. One of the last projects completed in 2015 was *BrainView – Centre for the study of neurodevelopmental and neurodegenerative diseases* at the Institute of Physiology. The result is a new research centre specialised in the study of neurodevelopmental and neurodegenerative disorders, such as autism, epilepsy, or Alzheimer's disease and Parkinson's disease.

Financial Resources and Their Utilisation

In 2015, the CAS managed a total of CZK 16,035.6 million of which CZK 4,693.7 million came from its own budget chapter. The share of the resources from its own budget chapter in the total financial resources dropped from 46 % in the year 2011 to mere 29 % in 2015, see Graph 1. However, this relative decrease was caused by the increase of resources from other chapters of the State Budget (mainly due to drawing on the resources from operational programmes) and by the increase of the own resources of the Institutes of the CAS (predominantly revenues from the licenses of

the Institute of Organic Chemistry and Biochemistry). The resources from other chapters of the SB are not sufficient to compensate for the low level of institutional of funding of the CAS, because the resources from operational programmes are available to only a few Institutes of the CAS.

Graph 1: Financial resources of the Czech Academy of Sciences (in %)



Financial resources (for the whole CAS) coming from the budget chapter of the CAS, from other budget chapters and from its own resources are summarised in the following overview:

Tab. 4: Structure of financial resources (real resources) in millions of CZK:

Name	Non-investment resources	Investment resources	**Total**
Resources from the chapter of the CAS	**3 774.7**	**919.0**	**4 693.7**
Subsidy from other budget chapters	**3 492.7**	**3 235.7**	**6 728.4**
GA ČR grants	1 655.5	11.6	
TA ČR projects	206.8	0.0	
Projects of other providers including the operational programmes	1 630.4	3 224.1	
Own resources	**4 613.5**		**4 613.5**
Main activity orders	219.5		
Sales of publications	106.0		
Rent	86.6		
Licenses	2 997.5		
Sales of goods and services	153.6		
Conference fees	32.3		
Interests, exchange-rate profits	134.5		
Sales of material, securities	95.5		
Foreign grants and donations	353.2		
Own fund resources	133.2		
Other	301.6		
Total resources	**11 880.9**	**4 154.7**	**16 035.6**

From the total revenues of CZK 11,792 mil., the institutes of the CAS used CZK 10,025 mil. to cover their own expenses, and as of December 31,2015 posted the total profit of CZK 1,767 mil.

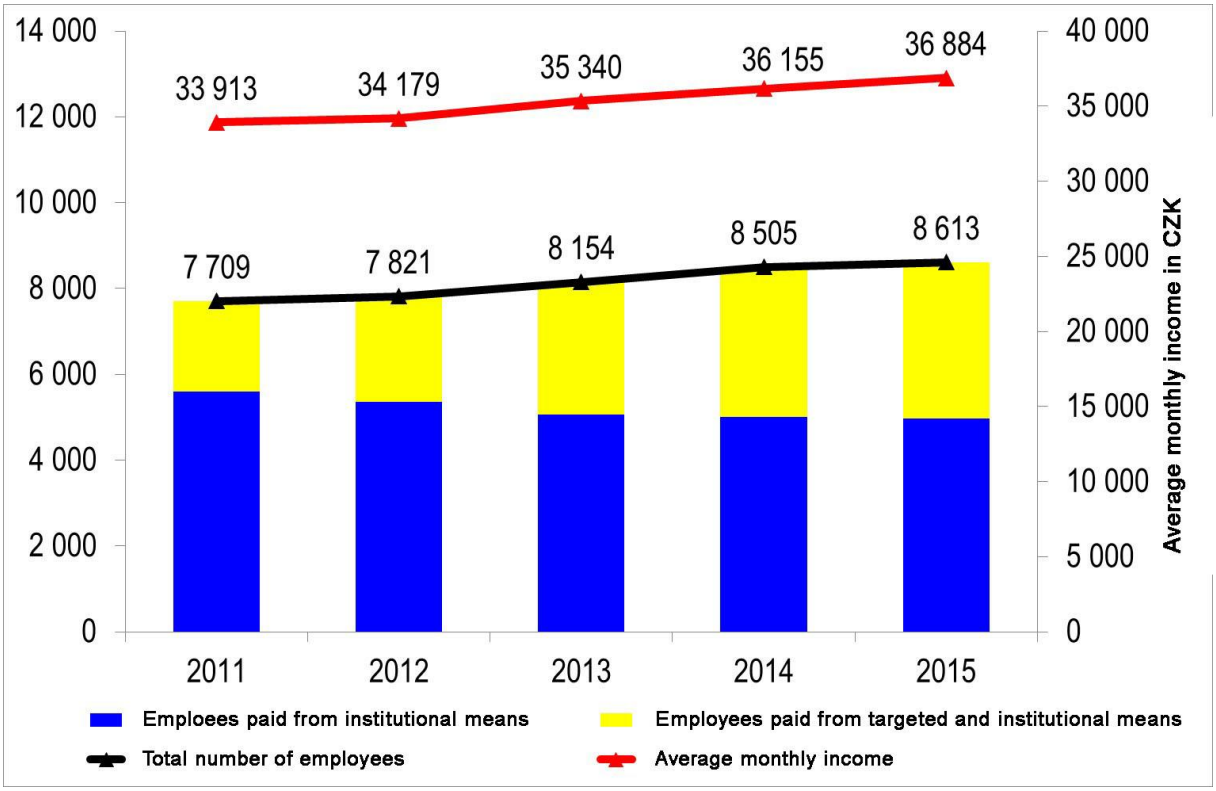
Compared to 2014, the total expense of the institutes of the CAS increased by CZK 689 mil.

Employment and Wages

The total number of employees of the CAS (in terms of the full Time Equivalent, FTE) increased in 2015 from 8,505 to 8,613. The number of university-educated employees of research units who passed the strict certification procedure following the Career Rules for University-Educated Workers of the CAS and were put in the relevant qualification grades increased from 4,935 to 5,040.

In total, CZK 3,812,285 thousand were spent on salaries and wages. The average monthly income of employees in the CAS reached CZK 36,884, with a year-on-year increase of 2.0 % compared to 2014.

Graph 2: Number of employees and average monthly earnings at the CAS for the period 2011–2015



The overview of the total number of employees of the CAS split into employees of the Head Office of the CAS and employees of all the research institutes of the CAS is provided in Table 5.

Tab. 5: Number of employees of the CAS in the period 2011–2015

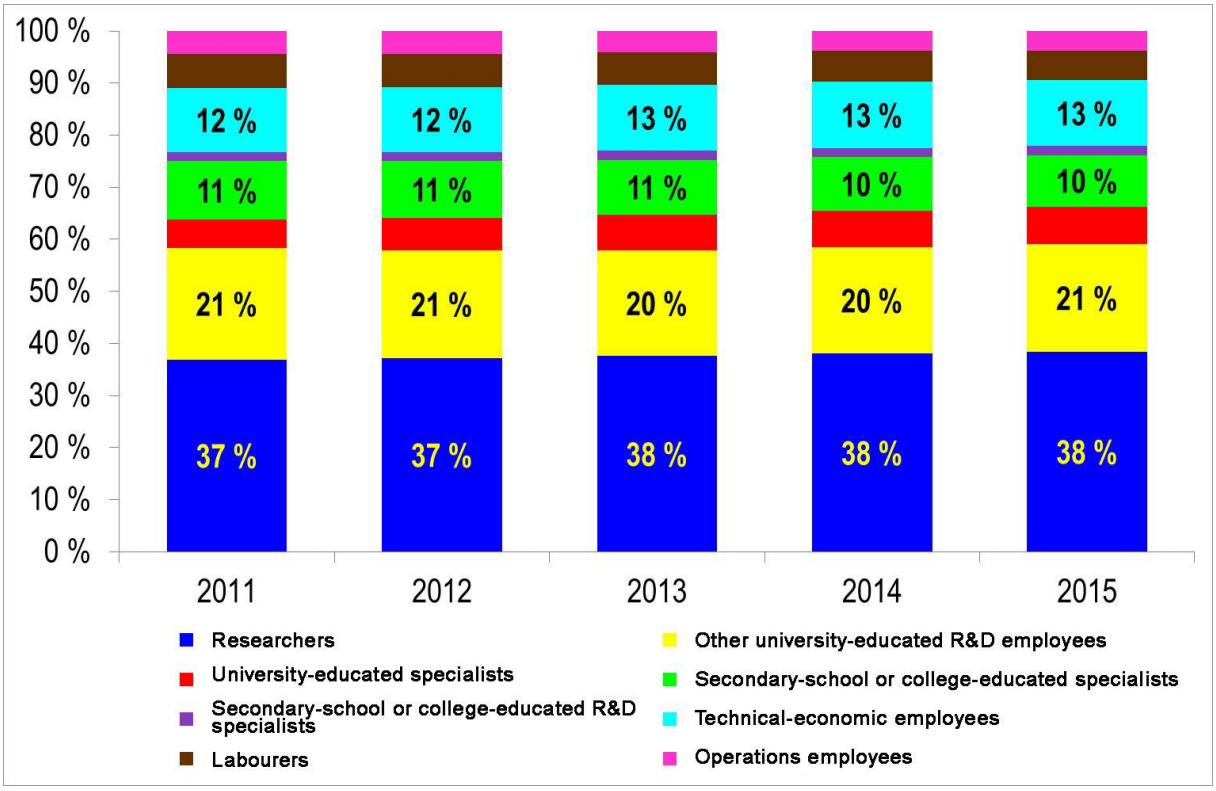
Year	**2011**	**2012**	**2013**	**2014**	**2015**
Research institutes CAS	7 645	7 752	8080	8 432	8 539
Head Office CAS	64	70	74	73	74
Total CAS	**7 709**	**7 821**	**8154**	**8 505**	**8 613**

A detailed overview of the average monthly earnings in the institutes of the Czech Academy of Sciences (including all sources: institutional, special-purpose and extra-budgetary) grouped by the employee category is provided in the following table:

Table 6: Number of employees and average monthly earnings in 2015 given by categories

Category	Adjusted average number of employees	Average monthly earnings in CZK
Researchers	3 283	48 594
Other university-educated employees at research institutes	1 757	29 399
University-educated specialists	620	36 790
Secondary-school or college-educated specialists	846	25 044
Secondary-school or college-educated R&D specialists	144	27 174
Technical-economic employees	1 078	37 682
Labourers	485	19 582
Operation employees	326	18 134
Total	**8 539**	**242 529**

Graph 3: Number of employees of the institutes of the CAS in the period 2011–2015



INTERNATIONAL COOPERATION

Organisational activities

In 2015, the institutes of the CAS organised more than 360 international scientific conferences. The international conference called *Non-University Research: Present and Future* held on the occasion of the 125th anniversary of the foundation of *Emperor Franz Josef Czech Academy for Sciences, Literature and the Arts*, predecessor of the Czech Academy of Sciences, was attended by representatives of a number of reputable foreign research institutions. The issues discussed with leading representatives of Max Planck Society, Fraunhofer Society, Leibniz Association, Helmholtz Association of German Research Centres and other concerned in particular the future of non-university research and its connection with universities and other higher education institutions and R&D in industry. The conference offered the occasion to share experience in functioning and financing of science and research.

The most important scientific gatherings organised by institutes of the CAS in 2015: *12th Conference of the European Sociological Association 2015* (Institute of Sociology), *26th IUGG General Assembly 2015* (Institute of Geophysics, Institute of Atmospheric Physics, Institute of Geonics, Institute of Geology, Institute of Rock Structure and Mechanics) a *Conference on the Ecology of Soil Microorganisms* (Institute of Microbiology and Biology Centre).

The CAS was active in the preparation and implementation of operational programmes relevant for R&D&I (OP Research, Development and Education, OP Enterprise and Innovations for Competitiveness, OP Prague – the Growth Pole). The main attention was paid to Operational Programme Research, Development and Education, which is key for R&D&I. As members of the monitoring and planning committees, the representatives of the CAS participated in drafting of the programme proposal, in setting the conditions for the First Calls, including the level of financial allocations, and in laying down evaluation criteria. Great attention was paid to the issues of human resources, funding of R&D&I in Prague, and sufficient financial support of large research centres.

Moreover, the CAS participated in the activities of European Research Area Committee (ERAC), the advisory body of Ministry of Education, Youth and Sports, – which formulates recommendations and strategies for wider integration of the Czech Republic into the European Research Area. The representatives of the CAS were active in preparing the Roadmap of the Czech Republic of Large Infrastructures for Research, Experimental Development and Innovation for the years 2016-2022. On the EU level, through the work of its delegate at the European Strategy Forum on Research Infrastructures (ESFRI), the CAS has been involved in updating of the ESFRI Roadmap on Research Infrastructures, which was also the subject of the debate at the ESFRI Meeting organised by the CAS in October 2015 in Liblice Castle.

The EURAXESS service centre at the Centre of Administration and Operations continued in 2015 in assisting foreign researchers working in institutes of the CAS, primarily by providing information on legal and administrative matters as well as on issues connected with daily life of a foreign scientist working in the Czech Republic.

Cooperation with international scientific organisations

The CAS cooperated with European and world organisations with the aim of encouraging the participation of Czech researchers in international projects and opening a long-term access to unique research infrastructures, databases and research data. Czech scientists participated in many projects within large international research organisations, such as CERN or EMBL. International cooperation was also carried out through the researchers from the Academy acting as experts in the management of international research organisations. In 2015, twenty new experts from the CAS were appointed; one to serve as chairperson and several for vice chair positions.

The CAS contributed to the formation of ERA and implementation of global scientific strategy by their active participation in European and world organisations (European Academies Science Advisory Council – EASAC, All European Academies – ALLEA, International Council for Science – ICSU and InterAcademy Partnership – IAP). Among the most significant examples of the active role of the CAS in forming European scientific strategy is the participation of the CAS representatives in the EASAC expertise.

The scientific activities of the Centre francais de recherché en sciences sociales (CEFRES) in Prague, which were supported by the CAS, started with interdisciplinary workshops in April and May 2015 until the inauguration of new site located in Na Florenci 3, Prague 1.

Cooperation within international bilateral agreements

Based on bilateral agreements between the CAS and international partner organisations from over forty countries, cooperation was realized in the form of joint mobility projects, thematic projects and study stays. The sum spent on the exchanges of researchers reached ca. CZK 3.6 million. The institutes of the CAS received about 380 foreign researchers for about 3,000 days; in turn, nearly 230 researchers from the institutes of the CAS were sent abroad for about 2,300 days. The exchanges contributed particularly to building new cooperation, sharing knowledge and utilising complementary methods and facilities. The exchanges focused on joint outcomes, publications, integration into international research community, networks and platforms including the participation in European framework programmes.

A new type of support was introduced in 2015 to subsidise international research training activities organised by the institutes of the CAS for young researchers and students with the aim to offer them opportunities to create new contacts and to open possibilities for the young researchers from abroad to participate in the research work at the institutes of the CAS. International research education was implemented in the forms of summer or winter schools, courses, workshops, seminars, and other activities, which combined education, practical training or excursions to the suitable research institutes. Foreign participants and the organisation of 11 international

research education training received the total sum of CZK 1.02 million in the year 2015.

In the framework of the Programme of Internal Aid for Projects of International Cooperation the three-year-long projects of the collaboration of researchers of the institutes of CAS with international scientific institutions continued to be supported, with 73 research projects receiving CZK 23.9 million.

Participation in EU Framework Programmes

In 2015, the institutes of the CAS participated in 95 projects of the *7th Framework Programme* (7th FP) and in 31 projects of the programme *Horizon 2020* (H2020). The total amount of contracted financial means reached EUR 7.08 million (from the 7th FP) and EUR 2.99 million (from H2020).

An overview of the participation in the main tools of the 7th FP and H2020 in the year 2015 is given in Table 7.

Table 7: Participation of the CAS institutes in the main tools of the 7th FP and H2020 in the year 2015

Tool type	**Total number of 7th FP/H2020 projects**
CP (Collaborative Projects) and RIA (Research and Innovation Actions)	30/17
MCA, MSCA (Marie (Skłodowska) Curie Actions – support for training courses and career development of researchers	27/5
CSA (Coordination and Support Actions)	9/5
CP-CSA-INFRA (Combination of Collaborative Projects and Coordination and Support Actions – support for research infrastructures)	11/0
ERC grants (European Research Council Grants)	8/3
JTI (Joint Technology Initiatives)	7/0
Euratom	3/1

The projects of the European Research Council (ERC) with participants from the institutes of the CAS in the year 2015:

- *Spintronics based on relativistic phenomena in systems with zero magnetic moment,* AdG, Tomáš Jungwirth, Institute of Physics, 2010–2016
- *Mathematical Thermodynamics of Fluids*, AdG, Eduard Feireisl, Institute of Mathematics, 2013–2018
- *Feasibility, logic and randomness in computational complexity*, AdG, Pavel Pudlák, Institute of Mathematics, 2014–2018
- *Long-term woodland dynamics in Central Europe: from estimations to a realistic model*, StG, Péter Szabó, Institute of Botany, 2012–2016

- *Bioinorganic Chemistry for the Design of New Medicines*, AdG, Viktor Brabec, Institute of Biophysics, host institution: University of Warwick, 2010–2015
- *Spin-charge conversion and spin caloritronics at hybrid organic – inorganic interfaces*, SyG, Jörg Wunderlich, Institute of Physics, host institution: University of Cambridge, 2014–2020
- *Regime and Society in Eastern Europe (1956–1989). From extended Reproduction to Social and Political Change*, AdG, Oldřich Tůma, Institute for Contemporary History, host institution: Sophia University St. Kliment Ohridski, 2011–2016
- *Origins of the Vernacular Mode. Regional Identities and European Networks in Late Medieval Europe*, StG, Lucie Doležalová, Institute of Philosophy, host institution: Die Österreichische Akademie der Wissenschaften, 2011–2016

ERC Grants awarded to the researchers of the CAS institutes in the year 2015:

- *Dicer-Dependent Defense in Mammals*, CoG, Petr Svoboda, Institute of Molecular Genetics
- *Ecological determinants of tropical – temperate trends in insect diversity*, AdG, Vojtěch Novotný, Biology Centre
- *Excitonic Magnetism in Strongly Correlated Materials*, CoG, Jan Kuneš, Institute of Physics
- *Behavioral and Policy Implications of Rational Inattention*, StG, Filip Matějka, CERGE-EI
- *Smart Biologics: Developing New Tools in Glycobiology*, StG, Milan Vrábel, Institute of Organic Chemistry and Biochemistry

REGIONAL COOPERATION

Regional cooperation of the Czech Academy of Sciences is rooted in agreements with the Association of the Municipalities of Orlicko (2003), the South Moravian Region (2008), the City of Brno (2008), Prague Discrict 1 (2009), Pardubice Region (2013), Hradec Králové Region (2013), Vysočina Region (2014), Zlín Region (2015), and Ústí Region (2015). In 2015, these agreements were successfully realized in *22 joint projects*, financed according to the agreements of the institutes of the CAS and their regional partners.

The wide scope of topics of the projects allowed for the participation of institutes from seven out of nine Sections of the Academy. The topics included the research connected with economic and societal issues of individual regions (monitoring and mitigation of drought, social enterprises), cooperation in education-popularisation, projects with immediate practical utilisation (cultural-educational facilities, infrastructure for tourism, literary topography, carbon balance in towns, conservation and identification of historical materials), or the tasks connected with basic research that would hardly be feasible for the regional institutions without the assistance of academic institutions (spectroscopy of meteors and meteorites, geophysical research of endangered archaeological localities, conservation research of exhibits prepared for exhibitions).

Natural parts of regional collaboration are annual meetings of the representatives of the CAS and the Regions of the Czech Republic, held alternately in Prague and in Brno. These meetings offer a platform for researchers and regional and local administration deputies to share the results, to inform, inspire and discuss. The working meeting to evaluate the results of the activities financed from the fund on regional cooperation in 2015 was exceptionally moved to April 2016 due to the international evaluation of the CAS institutes proceeding in 2015. The following joint projects were selected by the Commission for Regional Cooperation to represent successful cooperation and professional excellence:

- R100711501 – *Provenance of decorative stone and lime mortar raw materials* (Jan Válek, Institute of Theoretical and Applied Mechanics)
- R200401521 – *Development of meteor and meteorite observation and spectroscopy* (Martin Ferus, J. Heyrovský Institute of Physical Chemistry
- R200871501 – *A complex approach to monitoring and assessment of drought impact in South Moravia* (Zdeněk Žalud, Global Change Research Centre)
- R300281501 – *Social enterprises in Pardubice Region* (Josef Bernard, Institute of Sociology)
- R300331501 – *Mural paintings by Johann Hausdorf* (1668–1743) in Broumov region (Martin Mádl, Institute of Art History)
- R300561401 – *Poetic Brno* (Jiří Trávníček, Institute for Czech Literature)

EDUCATIONAL ACTIVITY

The Czech Academy of Sciences is primarily a research institution, but its participation in the development of education represents an essential feature of its mission in the society. It gives extraordinary weight to the fact that the institutes of the CAS contribute to education at all levels of the school system, while at the same time emphasising the education directed to the general public.

The core of educational activities of the CAS is the cooperation with universities and with special regard for the education of doctoral students, which is carried out within the co-accreditation of doctoral study programmes at individual institutes of the CAS. The researchers of the CAS are also considerably involved in the direct education and supervision of students in baccalaureate and master's degree study programmes. Various activities are oriented on education and training of secondary school students by means of specialised lectures, on extending the knowledge of secondary school teachers, on helping with organisation of student competitions or with research and professional training of secondary school students.

Cooperation with universities

Mutual relationship between the CAS and universities is monitored and coordinated by the Council for Cooperation with Universities and Graduate Study Programmes of the CAS, which is one of the advisory bodies for the Czech Academy of Sciences. In 2015, the Council primarily pursued the preparation of the amendment proposal to the Act No. 111/1998 Coll., on Higher Education Institutions. The changes in the legislation connected with the institutional accreditation of universities will also affect the institutes of the CAS in their cooperation ensuring doctoral study programmes. Adoption of this regulation will demand new negotiations with the cooperating educational institutions about framework agreements to specify the conditions for the participation of the CAS in doctoral education.

The CAS contributes to securing the quality of university education through the work of its representatives in the Accreditation Commission. The employees of the CAS are also members of scientific and study programme boards or examining boards and of appointing commissions at universities. Important part of the cooperation takes place in 55 joint research laboratories.

Teaching

The institutes and researchers of the CAS participate extensively in education of students at public and private universities. Last year, a total of 4,236 semester courses of lectures, seminars or practical exercises were provided in the total amount of 76,154 hours. In addition to the regular teaching duties, the CAS researchers prepared a number of specialized courses, seminars and series of lectures.

Education of students

Education and supervision of students in the institutes of the CAS belongs among the most important contributions to the education at universities. In 2015, the researchers from the institutes of the CAS trained and supervised nearly one thousand students in baccalaureate and master's degree study programmes. The number of PhD students trained and supervised exceeded the number of 2,000. In 2015, 264 participants of doctoral study programmes trained in the institutes of the CAS successfully completed their studies.

The CAS concluded 22 framework agreements with universities on the cooperation in implementing doctoral study programmes. These agreements will be renewed after the adoption of the new Act on Higher Education Institutions. The institutes of the CAS are co-bearers of joint accreditation in a wide range of doctoral degree specialisations. Detailed data on the participation of the CAS in higher education are given in Table 8.

Table 8: Overview of the most significant events of collaboration with universities

	2 010	**2 011**	**2 012**	**2 013**	**2 014**	**2 015**
Doctoral students trained at the Institutes	2153	2182	2 064	2 063	2 030	2 091
MA/MS students supervised at the Institutes	1 454	1 342	1 356	1 362	1 104	906
Newly accepted doctoral students	338	381	386	397	315	376
Number of doctoral dissertations completed	249	254	258	224	268	264
Number of semestral cycles of lectures, seminars and exercises	4 360	3 853	3 722	4 034	4 017	4 236
Number of hours lectured	77 379	80 600	76 939	74 198	74 747	76 154

In 2015, the institutes of the CAS further organised various specialised events focused on the education of students of universities. The following list gives some examples:

- *Joint International Physics Summer School 2015* prepared by the Institute of Physics gave students an opportunity to see closely research work at this institute and to get hands-on experience in some research procedures.

- The Institute of Macromolecular Chemistry organised the *UNESCO/IUPAC Postgraduate Course in Polymer Science*, which opens post graduate education to young scientists from economically disadvantaged countries and helps them to become involved in modern research areas and to use leading-edge apparatuses and methods unavailable in their home countries.

- The Institute of Archaeology in Brno prepared *practical field-based training in archaeological research of Mesolithic settlement* in the region of Bohemian Switzerland (České Švýcarsko). The Institute's research base in Dolní Věstonice gave the students an excellent opportunity to become acquainted with methods for processing archaeological data from a large emergency research in the world-renowned Paleolithitic locality Pavlov I (organised under EC OP).

- The Institute of Philosophy organised *CENDARI Summer School. Researching Medieval Culture in a Digital Environment*. It was a five-day interdisciplinary summer school for young historians and other researchers exploring the Middle Ages, also inviting archivist, librarians and information workers. Another event arranged by the Institute was the *11th Summer School of Medieval Studies*.
- Masaryk Institute and Archive came up with an international workshop *Soziale Gruppen und Religion im 19. und 20. Jahrhundert – Bürgertum und Arbeiterschaft in the form of Summer School for PhD students*.
- Economics Institute offered students a series of lectures delivered by emin*ent economists from abroad*.
- *The Institute of Art History in cooperation with the Getty* Conservation Institute (GCI) and the Film and TV School (FAMU) of the Academy of Performing Arts in Prague (AMU) organised an international workshop called *Photographs and Their Environment: Decision-making for Sustainability* on restoration and conservation of photomaterial. Another event produced by the Institute was the *International Summer School on Baroque Architecture and Art*.

Course in the fundamentals of research work

For many years, the CAS has fostered general education of students in doctoral study programmes by organising a successful Course in the Fundamentals of Research Work, which is a week-long course for PhD students from various fields of science. In 2015, the course held in Prague had four runs and was attended by 94 students; the course held in Brno had four runs with 147 participants. The course, enriched by new lecturers, successfully continued in fulfilling its ambition to focus the programme more and more precisely on specific research areas.

Activities at secondary and elementary schools

Teaching and lecturing on a rich variety of topics create a large part of the contribution of the CAS to the education at secondary and basic schools. The researchers of the CAS also participate in creating and publishing secondary school

textbooks or e-learning courses. The cooperation of the CAS on these educational levels is often subsidised from projects and financial means from EU funds. This allows the institutes of the CAS to cooperate with secondary or basic schools according to the specific content and focus of the individual events on the particular groups of interest.

The projects *Open Science* have been successful in education and popularisation for ten years. The current project *Open Science IV,* coordinated by the Centre for Administration and Operations, was funded from the financial support of the Operational Programme Education for Competitiveness, and from the State Budget of the Czech Republic. Its objective was to open science and technology disciplines to secondary school students and give them a unique opportunity to participate in real scientific work by means of scientific internships at the institutes of the CAS or at specialised departments of universities. In 2015, 75 such internships were supported together with stays abroad and with participation in international conferences. The internships have a tradition of enormous popularity among students, whose interest highly exceeds the capacity.

A rich offer was also directed to teachers. Educational courses for teachers are accredited by the MEYS within the system of additional education of pedagogical workers. This form of education was the objective of many other activities, such as the 5th meeting of pedagogues at the seminar called *School of Czech Language and Literature* held at the CAS.

A wide range of interesting educational events was also offered at the institutes of the CAS. *Summer school of physics* organised by the Institute of Physics concentrated on optics. High-percentage limestone deposits and the methods of mining and processing the mineral resource for lime were introduced to the visitors at the quarry of Čertovy schody in Český kras by the workers of the Institute of Geophysics. A course of meteorology was organised by the Institute of Atmospheric Physics for the students of secondary schools and lectures popularising science were provided by the Institute of Physics of Materials under the project called *Science Academy*.

The Institute of Geonics opened an opportunity for secondary school students to learn about infrared spectroscopy, a modern instrumental method widely used in analytical chemistry. The Institute of Computer Science offered lectures and discussion meetings for secondary school students and teachers through intensive schools under the project *Researchers to Students.* Nuclear Physics Institute in cooperation with Basic School Letohrad performed stratospheric balloon measurements of cosmic radiation. World's unique semiconductor detector developed at the Institute was mounted to the balloon gondola to provide measurements of the intensity of cosmic radiation in dependence on geographical location and altitude of the flight.

The researchers at the Biology Centre prepared a series of popularising lectures called *Academic Half-Hours*. The Institute of Physiology organised a series of lectures *Human Body in Health and Illness*. The Institute of Animal Physiology and Genetics in cooperation with Mendelianum Centre created *Junior Mendel Forum 2015* offering secondary school students discussion programmes on functioning of genes and cells, their disorders and diagnostics. Within the project BIOM implemented at the Institute of Vertebrate Biology, seven project days were organised, each of them focused on a different topic. In *Science with your own eyes*

lectures were presented at secondary and basic schools. The Institute also created an educational trail now installed at the Serpentinite Steppe near Mohleno (Mohelenská hadcová step). Jaroslav Heyrovský Institute of Physical Chemistry organised *NANO 2015, Summerschool on Nanomaterials and Nanotechnologies* reaching talented secondary school students interested in chemistry, physics and in new areas of physical chemistry. The Institute also kept on holding chemical workshops called *Chemistry is not a Bore*.

Numerous language courses with various aims were offered by the Institute of the Czech Language. Researchers of the Oriental Institute participated in debates with students in the event called *One World at Schools*.

Through their expert and information assistance, conducting workshops, lecturing and organising summer camps, the institutes and individuals of the CAS yet again contributed to a high-quality organisation of Olympiads in mathematics, chemistry and biology, as well as Olympiads in the Czech language. The institutes of the CAS provided expert background to these activities as well as to the events organised under Secondary School Scientific Activity; several projects advanced to National Finals of the contests. The Institute of Physiology and the Institute of Molecular Genetics opened their gates to the participants of the National Day of Secondary School Scientific Activity, who could take tours around the institutes.

TOWARDS SOCIETY

Publishing

The CAS supports financially publishing of selected research and science-popularising publications. In 2015, the CAS subsidised 54 publications by nearly CZK 11 million. Thirty-five subsidies went to the publishing house Academia and 19 to other institutions of the CAS.

Popularisation of science

From the point of view of its relationship with the public, 2015 was an important year for the CAS for several reasons. The beginning of the year was marked by the celebrations of 125th anniversary of the foundation in of *Emperor Franz Josef Czech Academy for Sciences, Literature and the Arts*, predecessor of the Czech Academy of Sciences, and by launching Strategy AV21. All events were reflected in popularising activities of the institutes of the CAS, some of the events receiving a positive feedback from abroad. For example, in *EXPO 2015* in Milan the Institute of Botany came out with an exhibition on symbiosis between fungi and plants, the Institute of Experimental Botany presented research on genetic code of wheat, Global Change Research Centre presented their work on global change and also the Institute of Organic Chemistry and Biochemistry has an exhibition stand.

The researchers of the CAS were often addressed by the public television or private TV channels to express the views on the current issues. They were regularly invited as guests to an hour long programmes of ČT24 *Hyde Park Civilisation* and *Historie.cs*, and also participated in writing the script for various relevant programmes. They spoke about basic and applied research, about the financing of science and research, about sustainability of research centres, about the condition of the environment and also about their own research accomplishments. The meaning of Strategy AV21 was explained by President of the Czech Academy of Sciences Jiří Drahoš as well as by other representatives of the CAS, directors of Institutes and coordinators of the research areas.

Cultural-political monthly Literární noviny had regularly published in cooperation with the CAS the supplement called *Science – Technology – Civilisation*. It highlighted 125th anniversary of the foundation in 1890 of *Emperor Franz Josef Czech Academy for Sciences, Literature and the Arts*, gave publicity to Strategy AV21 and brought attention to Czech science. In January, the researchers of the Institute of the Czech Language published in this journal unique course called *Czech Language Afresh from A to Ž*. In April the language course was followed by a popularising series devoted to the end of WW II where the researchers from the Institute of History introduced new facts, maps and illustrations. Also the 17th cycle of the lectures of *The Week of the Brain,* organised by the Institute of Experimental Medicine in the building of the CAS, draw attention of the media as 13 prominent experts in theoretical and clinical neurosciences gave lectures to wider public.

Opening ceremonies of the laser centre *ELI Beamlines* in Dolní Břežany near Prague and EREM laboratory at the Institute of Scientific Instruments became important media events. The views of the representatives of the CAS on sustainability of research infrastructures, global climate changes, power industry in the context of these changes, or on breaking mining limits were published by main national newspapers. A variety of popularising articles discussing topics in astronomy was published by the researchers at Astronomical Institute, who also participated in radio or TV programmes where they commented on various discoveries and current astronomical phenomena. The researchers at the Oriental institute spoke about Islam in connection with terrorist attacks in the world, about the migration wave, accepting the refugees in Europe, etc. Under the research programme *Our Society* of the Public Opinion Research Centre (CVVM) at the Institute of Sociology, the public was informed about the results of surveys of public opinion, were also regularly used and published by media. Another event that turned out telegenic was the contest at the Institute of Physics called *Expedition Universe*. The goal of this competition attended by around 200 children aged 10-15, was to promote laser centres ELI Beamlines and HiLASE.

At the beginning of 2015 the CAS launched special events to commemorate the foundation in of *Emperor Franz Josef Czech Academy for Sciences, Literature and the Arts* in the way that would show the continuity of scientific research from the past to the present. Starting January 2015, more than 300 news releases related to the celebrations were published. Most of the institutes of the CAS participated in commemorative events. The Institute of Scientific Instruments in cooperation with the Association of Moravian Institutes of the CAS prepared an exhibition *Inventions that Influenced Mankind* with the aim to introduce the CAS to the general public and make the wide scope research activities in the CAS publicly visible. The Institute of Geonics held a series of lectures called *A Tutorial with the Academy of Sciences* where the audience could learn about the research results of the scientists working at the institutes of the CAS. The Institutes of Archaeology in Prague and Brno organised representative exhibition *Great Moravia and the Beginnings of Christianity*. More than 200 artefacts illustrate the recent knowledge gained by archaeology and other research branches about the history of Europe in the early Middle Ages. The mentioned institutes also participated in preparation of the exhibition called *Science – Nation – History* held in the New Building of the National Museum. The exhibition introduced not only the history of National Museum but also the contemporary results of the work of its departments. The National Museum also hosted the Institute of the Czech Language with the exhibition *Czech Grammary (Grammatyka Česka)* documenting the development of Czech grammars from the 16th to 19th centuries. A touring open-air exhibition *Art of Science* visited six cities in the Czech Republic (Brno, Olomouc, Ostrava, Jihlava, České Budějovice, Prague), where it appeared in squares and other public places from June to November 2015 introducing all 54 institutes of the Academy of Sciences, their current research and the achievements of Czech science in the last 125 years.

The 2015 calendar of popularising events organised by the J. Heyrovský Institute of Physical Chemistry introduced as *I Experiment therefore I Am 2015* included 78 activities. Twelve thousand visitors attended workshops, saw exhibitions, engaged in practical measurements in laboratories, took traineeships, listened to lectures,

participated in excursions, frequented courses for pedagogues, the children enjoyed „chemical theatres". The Biology Centre, by participating in the initiatives connected with the *International Year of Soils* made the public aware of the critical state condition of the soil management. *The Universe in Soil* an interactive event prepared by the Biology Centre, attracted about 5,000 visitors in a single day. The annual *Earth Day* a traditional public event was held in April 2015 in cooperation with the Centre for Administration and Operations, Institute of Geophysics, and Astronomical Institute. In May and June 2015, the CAS repeated the *Spring Excursion to the World of Science,* this time organised in the cooperation with as many as 11 Institutes. As an example, let us mention the Library of the Academy of Sciences, where the visitors could see the selected exhibits of antique prints. The events were attended by more than 5,000 interested visitors.

In 2015 the CAS organised more than three dozen lectures within the cycle *Do not be Afraid of Science* and, *Ecce homo!* aiming at secondary school students throughout the Czech Republic. Traditionally, the largest scientific festival in the Czech Republic, the Week of Science and Technology of the CAS, earned the greatest attention of both visitors, and the media. Between November 1 and 15, 2015, more than 500 events – lectures, exhibitions, open days, workshops and many other activities across all the scientific disciplines took place in Prague, in regional capitals and other locations throughout the country. Nearly 125,000 people took part in this event, which included popular *Open Doors Days* of the CAS institutes and their partner organisations.

In 2015, the main building of the CAS hosted 22 exhibitions. The biggest response was earned by *The Axis of the Avant-Garde Prague,* a walk through the Prague of the period 1900-1945. Great interest was also aroused by *Posters of the Art Nouveau Period*, an exhibition of original lithographs from the private collection of Zdeněk Harapes, or by the exhibition named *Photogenic Science*. In the second edition of this exhibition, based on the photos by the researchers of the CAS, the organisers received 178 photos from 68 the authors, researchers of the 24 institutes of the CAS. Selected images were exhibited during the week of Science and Technology CAS. Additionally, a professional jury selected the pictures that were then included in the 2016 calendar of the CAS, where the Czech science is represented.

In 2015 *Academic bulletin CAS* celebrated its 25th anniversary of its existence by publishing two thematic supplements along with 11 standard issues. The website of *Academic bulletin* published over 300 pieces of news and recorded 90 000 visits. Popular educational articles about science and research at the institutes of the CAS continuously filled the website *Vědaprožívot.cz (Science for Life),* which is managed by the Centre of Administration and Operations of the CAS with the aim of promoting the interest in science and research of the CAS among the general public, but also to bring good orientation in the thematic areas and to present the results of scientific work to subjects in commercial, manufacturing and public administration areas. The newsletter *Science in Focus* informed about the CAS activities that bring science close to the public. It also forwarded invitations to lectures, excursions, exhibitions, science cafes, author readings, screenings of documentary films, etc.

The *Science Fair* became the closing symposium of Open Science IV., which was held in May 2015 at Prague-Letňany. More than 7,000 visitors were offered stimulating information, exhibitions, displays and accompanying programme in the

form of lectures and screenings – all of the events prepared by the institutes of the CAS, universities, science centres, museums and other institutions. The fair was also attended by the invited foreign experts and guests.

The exhibitions of *Open science* from the previous years continued to tour the country. There are still enough people interested in them, therefore in 2015 a new exhibition *Superheroes around us* was prepared, which presents the scientist as comic book superheroes.

The animated educational series of science named *Undistorted Science* became popular not only among the public but even in schools, where it is used as a supplement to teaching. Such success called for a continuation, so in 2015 *Undistorted Science II* appeared. The second series contains ten new parts, which were again produced by experts from the CAS and Czech universities.

For the directors of the CAS institutes, the eighth year of the successful training cycle *Management of Science* was organised. In addition to topics related to personal development of a manager, it included topics related to employment law issues or discussions over the current problems of the CAS.

SCIENCE FOR PRACTICE

The Czech Academy of Sciences has always considered as its important goal the application of research results in practice. In this way, the CAS contributes to the competitiveness of Czech economy. However, application of scientific achievements comes in a much wider variety of forms, even in the activities that are not primarily commercial or profitable, like for instance, environmental protection, where the results of research in the biological fields are utilised, or the sphere of state administration, where the expertise of professionals in social sciences is applied.

In 2015, the dialogue continued with the Department of Industrial Research and Technological Development of Ministry of Industry and Trade. Its main focus was directed to the preparation of the research part of Operational Programme Enterprise and Innovation for Competitiveness (OP PIC). For the institutes of the CAS that have built long-term partnerships with the industry and have been active in applied research, this is a good opportunity to get targeting funding for research.

Under Strategy CAS21 (Strategie AV21), an inter-sectoral activity named *Transfer of Knowledge and Technology* was approved and the *Centre of Technology Transfer of the CAS* was formed within the Centre for Administration and Operations. It aims at coordinating and sheltering the activities in this field, which had already been to some extent going on in a number of institutes. It should also help with questions of intellectual property protection and difficult questions of a legal nature in general.

In 2015 under the call of the Operational Programme Research, Development and Education (OP RDE), this newly established centre launched the preparation of a project named *Building Expert Capacities – Technology Transfer*. The project, as given by the rules of the Call, aims at educating the workers in the transfer of technologies, as well as at education of scientific public in methods and the meaning of technology transfer, and in importance of promoting it. This project will make it possible to create a functioning academic network of technology transfer, similar to what exists at Max Planck Society in Germany, based on the best combination of centralised and decentralised procedures.

Support and coordination in the sphere of practical application is provided by the *Council for Cooperation of the CAS with Business and Application Sphere*. The Council includes persons charged with the technology transfer at the institutes of the CAS as well as researchers skilled in the cooperation with industry and other areas where the results of research are applied. The Council dealt primarily with the conceptual issues of technology transfer.

Examples of cooperation with the partners in industrial sphere:

New monocrystalline material grown by EFG technology and their utilisation in hi-tech applications in electronic, optical, optoelectronic, engineering, or jewellery industries (e.g. as active jewellery stone, monocrystalline luminophore for high power all-solid state light sources based on light emitting diode LED). *Institute of Physics*, CRYTUR, spol. s r. o., and PRECIOSA BEAUTY, s. r. o.

Designing and producing the optical element prototype for traffic signal modules (*Institute of Plasma Physics* and ELTODO a. s.)

Model predicting the production of electric energy in photovoltaic and wind power stations based on numerical weather predicting is used by E.ON for 2 to 3-day forecasts of the production of electricity in photovoltaic and wind power stations in the Czech Republic. The model is applied as a company tool to predict production and cut costs connected with the weather-induced fluctuation in the production. (*Global Change Research Centre* and E.ON Energie, a. s.).

Research results that are important for practical application deserve legal protection, which is mostly provided by patents. The following is the overview of the number of the results granted legal protection in 2015.

Table 9: Overview of property rights granted to the institutes of the CAS in 2015

Industrial patents in the CR	Number	Licence
Patent applications filed in the CR	64	
Patents granted in the CR	58	7
Utility models filed in the CR	27	
Utility models registered in the CR	47	
Trade marks filed in the CR	3	
Registered designs filed in the CR	1	
Patent applications filed abroad		
International application form (PCT)	26	
National or Regional stage of the PCT	10	
National or Regional mode	1	
Patents granted abroad		
Regional (at EPO, EAPO, OAPI, ARIPO)	13	
Of which national patents	14	
National	18	
Applications for Community plant variety right filed in the CR	4	

Annotation:
PCT – Patent Cooperation Treaty
EPO – European Patent Office
EAPO – Eurasian Patent Office
OAPI – Organisation Africaine de la Proprieté Intellectuelle
ARIPO – African Regional Industrial Property Organization

Gaining legal protection granted to a scientific result by a licence is a significant success. The following are examples of the results of this demanding process:

Institute of Physiology. Patent for *Antimicrobial peptides and their use in the treatment of topical infections*, such as, such as hard-to-heal wounds, infection of the mucous membranes, infection of catheters, joint replacements and implants.

Institute of Chemical Process Fundamentals. Patent for the *method of mending damaged spots in roads* based on heating by microwave radiation.

Institute of Computer Science. Patent for *the device to determine control variable value* for multichannel evaluation of signals for the control and operation of machines, including monitoring and alerting in human interface devices (e.g. driver alertness detection systems).

Institute of Scientific Instruments. Patent for the *method of measuring straightness of holes and apparatus for such measuring*, which can be applied in measuring long bores or the barrels of firearms.

CONTROLLING AND AUDITING

Controlling and auditing oversight of the CAS and its institutes is performed by the Audit Department, directly subject to the president of the CAS. The system of controlling at the CAS is based on the requirements stemming from the decision-making and executive processes in the bodies of the CAS and meets public administration control requirements.

In 2015, the Audit Department controlled whether the objectives of the CAS and its institutes were executed in compliance with legal regulations, the Statutes of the CAS, and inner directives and decisions of the CAS bodies. It also controlled whether the units controlled executed their economic and property management in compliance with the principles of accounting correctness and verifiability.

Public administration controls are carried out according to the approved year plan. Controlling is also partly defined by the Financial Control Act and other regulations for public administration control. This determines the content and physical implementation of the duty to control the management of the State Budget Expenditures on Research, Development and Innovation distributed by the CAS as the administrator of the State Budget chapter for science and research.

The controls concentrated on adhering to the legal conditions for the utilisation of budgetary means, their recording and accounting. They also focused on the compliance with the current legislation and internal directives for the preparation, implementation and financing of investments, legislation of tendering and procurement procedures, and property management. Attention was paid to respecting labour legislation, in particular the compliance with the Labour Code. Financial and property management significantly influence efficiency and operability of the internal control system of the individual institutes, therefore special attention was also paid to this area.

Also financial and property impacts of contractual relations received major attention together with the analysis of the ascertained problems.

In 2015, ten planned controls were carried out at the research institutes of the CAS. Protocols on their results were discussed at the sessions of the Academy Council.

Inspection was carried out at the following Institutes:

- Institute of Rock Structure and Mechanics of the CAS, v. v. i.
- J. Heyrovský Institute of Physical Chemistry of the CAS, v. v. i.
- Institute of Mathematics of the CAS, v. v. i.
- Institute of Art History of the CAS, v. v. i.
- Institute of Animal Physiology and Genetics of the CAS, v. v. i.
- Institute of Slavonic Studies of the CAS, v. v. i.
- Institute of Computer Science of the CAS, v. v. i.

- Institute of Archaeology of the CAS, Brno, v. v. i.
- Institute of Hydrodynamics of the CAS, v. v. i.
- Institute of Botany of the CAS, v. v. i.

Further, nine follow-up controls at the institutes of the CAS were carried out with the aim to verify the implementation of the measures taken to eliminate shortcomings identified by the control of the management in 2014. No recurrent shortcomings were found in the controlled areas.

The follow-up controls were performed at the following Institutes:

- Institute of Archaeology of the CAS, Praha, v. v. i.
- Economics Institute of the CAS, v. v. i
- Institute of Atmospheric Physics of the CAS, v. v. i.
- Institute of the Czech Language of the CAS, v. v. i.
- Masaryk Institute and Archive of the CAS, v. v. i.
- Institute of Inorganic Chemistry of the CAS, v. v. i.
- Institute of Plasma Physics of the CAS, v. v. i.
- Nuclear Physics Institute of the CAS, v. v. i.
- Institute of Photonics and Electronics of the CAS, v. v. i.

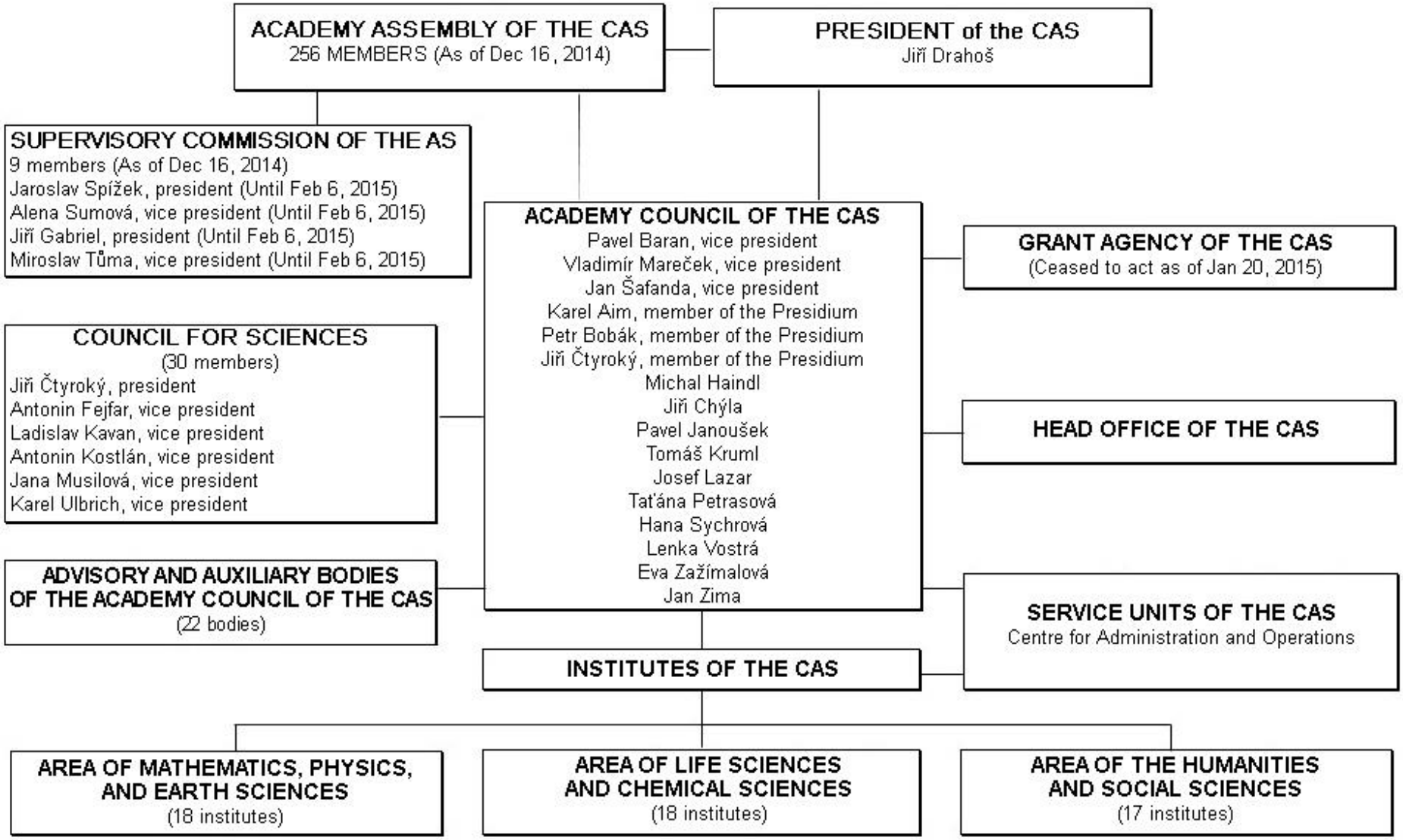
The Audit Department also inspected six scientific societies for a more detailed look at drawing subsidies granted to 20 projects and almost 20 % of the total amount of the means granted to the scientific societies from the budget of the CAS.

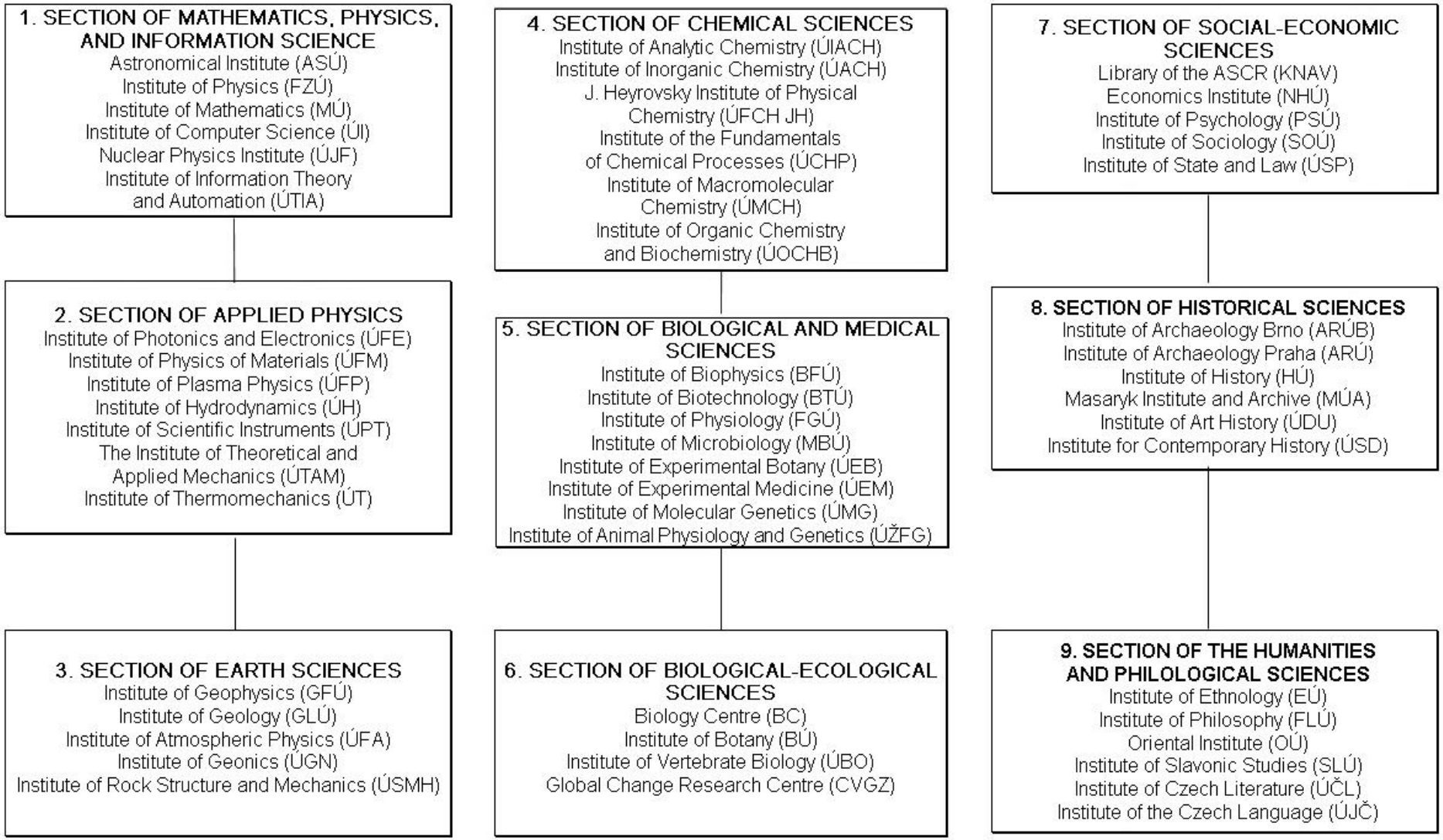
Audits were performed at the following societies:

- Union of Czech Mathematicians and Physicist
- Czech Society for Mechanics
- Czech Kinanthropology Association
- Society of Czech Classicists
- Czech Scientific Society for Mycology
- Czech Astronomical Society

Beyond the scope of regular controlling, audits of EU Framework Programmes accounts were performed. The amount of the means controlled was CZK 38,584 thousand

THE STRUCTURE OF THE CAS




1. SECTION OF MATHEMATICS, PHYSICS, AND INFORMATION SCIENCE
Astronomical Institute (ASÚ)
Institute of Physics (FZÚ)
Institute of Mathematics (MÚ)
Institute of Computer Science (ÚI)
Nuclear Physics Institute (ÚJF)
Institute of Information Theory and Automation (ÚTIA)
2. SECTION OF APPLIED PHYSICS
Institute of Photonics and Electronics (ÚFE)
Institute of Physics of Materials (ÚFM)
Institute of Plasma Physics (ÚFP)
Institute of Hydrodynamics (ÚH)
Institute of Scientific Instruments (ÚPT)
The Institute of Theoretical and Applied Mechanics (ÚTAM)
Institute of Thermomechanics (ÚT)
3. SECTION OF EARTH SCIENCES
Institute of Geophysics (GFÚ)
Institute of Geology (GLÚ)
Institute of Atmospheric Physics (ÚFA)
Institute of Geonics (ÚGN)
Institute of Rock Structure and Mechanics (ÚSMH)
4. SECTION OF CHEMICAL SCIENCES
Institute of Analytic Chemistry (ÚIACH)
Institute of Inorganic Chemistry (ÚACH)
J. Heyrovsky Institute of Physical Chemistry (ÚFCH JH)
Institute of the Fundamentals of Chemical Processes (ÚCHP)
Institute of Macromolecular Chemistry (ÚMCH)
Institute of Organic Chemistry and Biochemistry (ÚOCHB)
5. SECTION OF BIOLOGICAL AND MEDICAL SCIENCES
Institute of Biophysics (BFÚ)
Institute of Biotechnology (BTÚ)
Institute of Physiology (FGÚ)
Institute of Microbiology (MBÚ)
Institute of Experimental Botany (ÚEB)
Institute of Experimental Medicine (ÚEM)
Institute of Molecular Genetics (ÚMG)
Institute of Animal Physiology and Genetics (ÚŽFG)
6. SECTION OF BIOLOGICAL-ECOLOGICAL SCIENCES
Biology Centre (BC)
Institute of Botany (BÚ)
Institute of Vertebrate Biology (ÚBO)
Global Change Research Centre (CVGZ)
7. SECTION OF SOCIAL-ECONOMIC SCIENCES
Library of the ASCR (KNAV)
Economics Institute (NHÚ)
Institute of Psychology (PSÚ)
Institute of Sociology (SOÚ)
Institute of State and Law (ÚSP)
8. SECTION OF HISTORICAL SCIENCES
Institute of Archaeology Brno (ARÚB)
Institute of Archaeology Praha (ARÚ)
Institute of History (HÚ)
Masaryk Institute and Archive (MÚA)
Institute of Art History (ÚDU)
Institute for Contemporary History (ÚSD)
9. SECTION OF THE HUMANITIES AND PHILOLOGICAL SCIENCES
Institute of Ethnology (EÚ)
Institute of Philosophy (FLÚ)
Oriental Institute (OÚ)
Institute of Slavonic Studies (SLÚ)
Institute of Czech Literature (ÚČL)
Institute of the Czech Language (ÚJČ)

AWARDS AND PRIZES

The Academy of Sciences not only fosters scientific excellence at its institutes morally but also supports it financially. For these aims, various types of awards are given to motivate the researchers employed at the CAS and also to attract researchers from abroad:

Praemium Academiae
The Otto Wichterle Premium
The J. E. Purkyně Fellowship
The Josef Dobrovský Fellowship

Praemium Academiae (Academic Premium) – the most significant financial premium of the Academy of Sciences is given to outstanding scientists who excel in their fields in the international scale and contribute to the excellence of the CAS as a whole. Praemium Academiae awarded with the aim to endorse, both morally and financially, the excellence in science is a preeminent scientific grant in the Czech Republic.

In 2015, **Praemium Academiae** was awarded to**:**

- **Prof. Ing. Michal Hocek, CSc., DSc.**

Michal Hocek (born 1969) works in the area of bioorganic and medicinal chemistry of nucleic acid components. He is head of senior research team at the Institute of Organic Chemistry and Biochemistry of the CAS and works in the Department of Organic Chemistry at the Faculty of Science, Charles University Prague (head of the Joint Laboratory of Bioorganic and Medical Chemistry of Nucleic Acids of the IOCB and FS UK). Michal Hocek has supervised a number of doctoral students and postdoc interns (around fifty per cent foreign). In the previous year, Michal Hocek was appointed professor of Charles University. He is an author or co-author of 180 publications in impacted international journals with the reference of > 2 700 of independent citations (without self-citations), h-index 35. Michal Hocek has been an invited speaker at many international conferences and prestigious universities abroad.

The main topic of his research is the synthesis of new types of modified nucleobases, nucleosides, nucleotides and nucleic acids and their applications in various areas of biomedicinal sciences (pharmacochemistry, biochemistry, chemical biology, bioanalysis, etc.). The group of M. Hocek develops the basic methodology of the synthesis of these modified biomolecules using the most advanced methods (e.g. reactions catalysed by complexes of transition metals or enzymatically catalysed reaction), intensively studying a biological (in particular antitumor and antiviral) activity of the prepared new of nucleobases, nucleosides and nucleotides; in this work the group cooperates with several academic institutions and the pharmaceutical industry companies (the group is part of the Gilead Sciences & IOCB Research Center). Recently, the group has also been preparing nucleic acids with modified bases and studying their chemical and biological properties and application in the

diagnosis (fluorescent and redox labelling of DNA and RNA) and in chemical biology (regulation of protein binding and gene expression, cross-lines with the proteins, etc.).

The granting of Academic Premium will help to maintain and even expand the multi- and interdisciplinary team of the M. Hocek group, and in combination with the grant funds and support from the pharmaceutical industry it will give the students and doctoral students top conditions for research. The funds will be used primarily on the operational and material costs and the salaries of the members of the group. The group's aim in the field of medicinal chemistry is a thorough study of the newly discovered group of nucleoside cytostatics and moving of at least one substance into pre-clinical or clinical stage of development. In chemical biology, the aim is the conceptual study of new possibilities for the use of chemically modified nucleic acids in the regulation of biological processes (e.g. gene expression).

- **Ing. Michal Pravenec, DrSc.**

Michal Pravenec (born 1953) is the head of the Department of Genetics of Model Diseases at the Institute of Physiology of the CAS and a researcher at the Institute of Biology and Medical Genetics, 1st Medical Faculty, Charles University. Michal Pravenec belongs among internationally recognised scientists in the field of genetics of complex traits in animal models.

One of the most important objectives of biomedical research in the current postgenomic era is the detection of genes determining complex traits, such as common metabolic and cardiovascular diseases. Genome-wide association studies in humans so far have only revealed a small part of the heritability of these diseases, therefore animal models are used. Spontaneously hypertensive SHR strain of rats is among the most commonly used models of essential hypertension and metabolic disorders.

M. Pravenec was a key player in designing and creating unique biological models and analytical approaches for the detection of genetic determinants of multifactorially-contingent metabolic and cardiovascular phenotypes at the molecular level. Using linkage and correlation analyses with the use of whole gene transcriptome in tissues relevant for metabolic and hemodynamic disorders, the first genetic determinants responsible for high blood pressure, insulin resistance, and dyslipidemia were detected at the molecular level. These results, published in the prestigious journals Nature Genetics and Nature, are all the more significant when considered with the fact that similar pathophysiological mechanisms predisposing to metabolic disorders and cardiac hypertrophy have also been described in humans.

During the next six years, the research will be focused on the elucidation of the molecular nature of hemodynamic mechanisms for salt-dependent hypertension and the detection of the responsible genetic determinant. Funds associated with the award will be used for the purchase of a unique system for the measurement of hemodynamic parameters.

The J. E. Purkyně Fellowship for outstanding prospective scientific workers in the year 2015 was received by:

- Jan Burjánek, nominated by the Geophysical Institute, for the scientific activity in the research on the earthquake risk, for a period of five years
- Jiří Červenka, nominated by the Institute of Physics, for the scientific activity in the field of material research, for a period of five years
- Martin Kolisek, nominated by the Biology Centre, on the scientific activity in the research on the diversity of single-celled eukaryotes, cell culture techniques, molecular biology, sequencing methodology and bioinformatics (Python language), for a period of five years
- Marek Piliarik, nominated by the Institute of Photonics and Electronics, for the scientific activity in the research on supersensitive detection and imaging methods, for a period of five years
- Jiří Sláma, nominated by the Institute of Geology, for the scientific activity in the research on solutions of the fundamental geological problems using advanced geochemical methods, for a period of five years
- Zdeněk Starý, nominated by the Institute of Macromolecular Chemistry, for the scientific activity in the research on rheology and processing of multi-phase polymer systems, for a period of five years
- Jan Šilhán, nominated by the Institute of Organic Chemistry and Biochemistry, for the scientific activity in the research field of molecular and structural biology, for a period of five years
- Vladimír Varga, nominated by the Institute of Molecular Genetics, for the scientific activity in the research studies of microtubular cytoskeleton of eukaryotic cells, for a period of five years

The J. Dobrovský Fellowship for foreign researchers in the year 2015 was received by:

- Ionut Gradianu (Rumania) nominated by the Institute of Geology
- Nicolas Richard (France) nominated by the Institute of Philosophy
- Jana Gajdošová (Great Britain) nominated by the Institute of Art History
- Oskar Mulej (Hungary) nominated by the Masaryk Institute and Archive
- Kristina Plenk (Austria) nominated by the Institute of Botany
- Matija Ivačič (Croatia) nominated by the Institute of Czech Literature
- Tamara Scheer (Austria) nominated by the Masaryk Institute and Archive
- Marcin Jarzabek (Poland) nominated by the Masaryk Institute and Archive

The Otto Wichterle Premium for young researchers at the CAS in the year 2015 was received by:

I. Mathematics, Physics and Earth Sciences

- Jaroslav Dudík (Astronomical Institute)
- Martin Ondráček (Institute of Physics)
- Evgeniya Tereshina (Institute of Physics)
- Ondřej Kreml (Institute of Mathematics)
- Kamil Dedecius (Institute of Information Theory and Automation)

- Andriy Ostapovets (Institute of Physics of Materials)
- Jakub Urban (Institute of Plasma Physics)

II. Life Sciences and Chemical Sciences

- Martin Srnec (J. Heyrovský Institute of Physical Chemistry)
- Elena Tomšík (Institute of Macromolecular Chemistry)
- Ivana Šeděnková (Institute of Macromolecular Chemistry)
- Evžen Bouřa (Institute of Organic Chemistry and Biochemistry)
- Hana Macíčková Cahová (Institute of Organic Chemistry and Biochemistry)
- Zdeněk Kubát (Institute of Biophysics)
- Marta Vandrovcová (Institute of Physiology)
- Helena Fulková (Institute of Molecular Genetics)
- Tom Maurice Fayle (Biology Centre)

III. Humanities and Social Sciences

- Sylvie Graf (Institute of Psychology)
- Zuzana Uhde (Institute of Sociology)
- Rudolf Kučera (Masaryk Institute and Archive)
- Jan Bierhanzl (Institute of Philosophy)
- Martin Hrdina (Institute for Czech Literature)

AWARDS GRANTED BY THE CAS

As an expression of recognition for especially meritorious service in the field of science, its popularisation, raising of its social prestige, in implementation of scientific-technical knowledge and its application in the life of society and in the economic sphere, as well as in the promotion of the humanities ideas, the Czech Academy of Sciences grants a variety of awards, medals and other awards to domestic and foreign scientists.

Awards of the Czech Academy of Sciences for outstanding results of great scientific importance in the year 2015 were obtained by**:**

- Research team nominated by the Astronomical Institute, consisting of: Jan Palouš, Richard Wünsch, Soňa Ehlerová, Pavel Jáchym, Rhys Taylor, Adam Růžička, Vojtěch Sidorin, František Dinnbier, for the research result: **Star Formation in Galaxies**, with a total financial reward of CZK 160,000
- Research team nominated by the Institute of Macromolecular Chemistry, consisting of: Petr Štěpánek, Sergey Filippov, Martin Hrubý, Jan Kučka, Jiří Pánek, for the research result: **Supramolecular structures and selforganising processes in polymers**, with a total financial reward of CZK 150,000

- Research team nominated by Institute of History, consisting of: Eva Semotanová, Jiří Cajthaml, for the research result: **An Academic Atlas of Czech History,** with a total financial reward of CZK 190,000

The Award of the President of the CAS for the promotion or popularisation of research, experimental development and innovation in the year 2015 was obtained by**:**

- Helena Illnerová, the Institute of Physiology, with a total financial reward of CZK 250,000.

The following medals awarded by the CAS to Czech and foreign researchers in the year 2015 were obtained by**:**

The Honorary Medal "De Scientia et Humanitate Optime Meritis"

- Josef Syka (Institute of Experimental Medicine)
- Philip G. Zimbardo (Department of Psychology, Jordan Hall, Stanford University, USA)
- Rolf-Dieter Heuer (CERN, Geneva, Switzerland)

The Ernst Mach Honorary Medal for Merit in the Physical Sciences

- Petr Heinzel (Astronomical Institute)
- Alexander I. Lichtenstein (Institut für Theoretische Physik, Hamburg, SRN)
- Jörg Neugebauer (director Max-Planck-Institut für Eisenforschung GmbH, Düsseldorf, SRN)
- Jan Petzelt (Institute of Physics)

The František Křižík Honorary Medal for Merit in the Technical Sciences and Implementation of Results of Scientific Importance

- Karel Hrbáček (Institute of Physics of Materials)

The Jaroslav Heyrovský Honorary Medal for Merit in Chemical Sciences

- Jiří Janata (Georgia Institute of Technology, Atlanta, USA)
- Takashi Kakiuchi (Emeritus Profesor, Kyoto University, Japonsko)
- Miloš V. Novotný (Indiana Univ., Dept. Chem., Bloomington, USA)
- Pavel Jungwirth (Institute of Organic Chemistry and Biochemistry)

The Gregor Johann Mendel Honorary Medal for Merit in Biological Sciences

- Zdenka Neuhäuslová (Institute of Botany)
- Robert Neuhäusl – in memoriam (Institute of Botany)
- Bohuslav Ošťádal (Institute of Physiology)
- Karel Šimek (Biology Centre)
- Michaela Vorlíčková (Institute of Biophysics)

The Josef Dobrovský Honorary Medal for Merit in Philological and Philosophical Sciences

- Josef Hejnic (Institute of Philosophy)
- Zdenka Ribarova (Institute of Slavonic Studies)

The František Palacký Honorary Medal for Merit in Historical Sciences

- Pavel Oliva (Institute of Philosophy)

The Jan Patočka Memorial Medal

- Friedrich Stadler (Institut Wiener Kreis, Universität Wien, Rakousko)

The Vojtěch Náprstek Honorary Medal for Merit in Science Popularisation

- Radek Mikuláš (Institute of Geology)
- Daniel Stach (Czech Television moderator)
- Ivan Boháček (Head Editor at science magazine *Vesmír*)

The Honorary Medal for Merit in the Czech Academy of Sciences

- Pavel Boháček (Institute of Physics)
- Josef Matoušek (Institute of Animal Physiology and Genetics)

A Letter of Thanks for the long-lasting work at the CAS was received from the hands of President of the Czech Academy of Sciences Jiří Drahoš by 20 employees of the CAS.

1. PRESTIGIOUS AWARDS TO THE RESEARCHERS OF THE CAS

The social relevance of the work of the researchers at the CAS is manifested in a number of awards, medals and prizes to the researchers of the Academy's institutes granted by Czech and foreign institutions and state bodies. In the year 2015, the researchers of the CAS received the following distinguished awards:

The Silver Commemorative Medal of the Senate of the Parliament of the Czech Republic

- Zdeněk Havlas (Institute of Organic Chemistry and Biochemistry)
- Jiří Hejnar (Institute of Molecular Genetics)
- Josef Syka (Institute of Experimental Medicine)
- Karel Ulbrich (Institute of Macromolecular Chemistry)

The Prize of the Minister of Culture

- Jiří Traxler (Institute of Ethnology) – for the life-long activity in creating a unique interconnection of research, popularisation and art in the field of traditional folk culture and folklore

The Prize of the Minister of Education, Youth and Sports for outstanding results in research, experimental development and innovations

- Petr Baldrian (Institute of Microbiology) – for outstanding results in the research in the field of Environmental Sciences

- Jakub Brabec (Institute of Inorganic Chemistry) – the **Minister of Education, Youth and Sports** prize for outstanding students and graduates for the eminent results in research, experimental development and innovation (for the discovery of the first borane laser).

The Chevalier de l'Ordre des Palmes Academiques award (Knight in the Order of Academic Palms awarded by the Ministry of the French National Education**)**

- Karel Novotný (Institute of Philosophy) – for scientific achievements and active contributing to university and scientific cooperation between France and the Czech Republic

Chevalier de l'Ordre de Mérite du Grand-Duché de Luxembourg (The Order of Merit of the Grand Duchy of Luxembourg) bestowed by Grand Duke Henri of Luxembourg for the merits for Grand Duchy of Luxembourg)

- Klára Benešová (Institute of Art History) – for constant research effort and outstanding achievements in the field of historical and cultural relations and the exchange between Luxembourg and the Czech Republic during the reign of the kings John of Luxembourg and Charles IV.

The Neuron Award by Neuron Fund for Support of Science

- Eduard Feireisl (Institute of Mathematics) – The Neuron Award for the Contributions to the World's Science in the field of mathematics
- Anna Fučíková (Institute of Physics) – The Neuron Award in physics for the project of experimental study of semiconductor nanocrystals and their optical properties
- Hynek Němec (Institute of Physics) – The Neuron Award for Promising Young Scientists for excellent research results

The National Prize of the Government of the Czech Republic "Česká hlava" (Czech Head) in the category of Doctorandus (Technical Sciences)

- Vítězslav Jarý (Institute of Physics) – in the area of technical sciences for the results during doctoral study

The Josef Hlávka Medal (bestowed by the Foundation of Josef, Marie and Zdeňka Hlávka)

- Mojmír Šob (Institute of Physics of Materials)

The Czech Technical University Medal

- Pavel Chráska (Institute of Plasma Physics) – for the contribution to the development of Czech Technical University

The Felber Silver Medal (bestowed by the Rector of Czech Technical University)

- Jan Flusser (Institute of Information Theory and Automation) – for major pedagogical and scientific work connected with Czech Technical University

The Silesian University in Opava Silver Medal

- Jiří Kocian (Institute for Contemporary History) – for long-time cooperation with the Faculty of Philosophy and Science and the Faculty of Public Policies, for

the membership in the Faculties' bodies and for the contribution to their development

The University of South Bohemia Rector's Prize

- Daniel Heider (Institute of Philosophy) – for a prestigious scientific publication of the year 2014

The Czech Technical University Rector's Prize

- Petr Hájek (Institute of Mathematics) – the CTU Rector's Prize of the 1st grade

The Gold Commemorative Medal of Charles University

- Josef Syka (Institute of Experimental Medicine) – for the pre-eminenet scientific work

The Emil Votoček Medal (bestowed by Rector of the University of Chemistry and Technology)

- Vladimír Mareček (J. Heyrovský Institute of Physical Chemistry) – for life-long scientific work contributing to Physical Chemistry

The Visegrad Group Academies Young Researcher Award 2015 in languages and literature

- Petr Plecháč (Institute for Czech Literature) – for the achievement in the field of corpus and quantitative versology