2018
Annual Report

on the Activities of the Czech Academy of Sciences

Top Research in the Public Interest

Czech Academy of Sciences

www.avcr.cz

https://cs-cz.facebook.com/akademieved/

https://www.instagram.com/akademievedcr/

https://twitter.com/akademie_ved_cr

TABLE OF CONTENTS

Foreword

by the President of the Czech Academy of Sciences

Dear readers,

You are looking at the Annual Report of the Czech Academy of Sciences, where you will find specific information concerning our main activities in 2018. Just as in the life of our whole society, this year life at the Academy was primarily associated with commemorating the hundredth anniversary of the foundation of the First Czechoslovak Republic. We also gave exceptional attention to several other anniversary "eights", not only on a purely scientific plane but also on the plane of popularisation. Through a series of exhibitions, conferences, lectures, newspaper serials, publications and other activities, we attempted to present the public with crucial milestones in the journeys of both our peoples – Czech and Slovak – through modern history. Our activities in this regard are documented in a chapter dedicated to the Academy's promotional activities and events for the public.

As concerns scientific activities, I am delighted to be able to report that in the Nature Index, which tracks the quality of outputs primarily in natural-scientific, but also partially in technologically oriented fields, the Czech Academy of Sciences ranked 19th worldwide in 2017 in the category of non-university, government-funded institutions with an 18-percent year-on-year improvement, which is the best position among Academies of Sciences of the V4 countries and Austria. A range of awards granted to its employees also bear witness to the quality of the Academy's research. From the many of them, I would like to mention Professor Jaroslav Doležel of the Institute of Experimental Botany who received the national government prize the Czech Head for 2018. These examples and a range of other information – you will find details in the individual chapters of the Annual Report – make it clear that we strive to make use of and increase the value of everything that society invests in us.

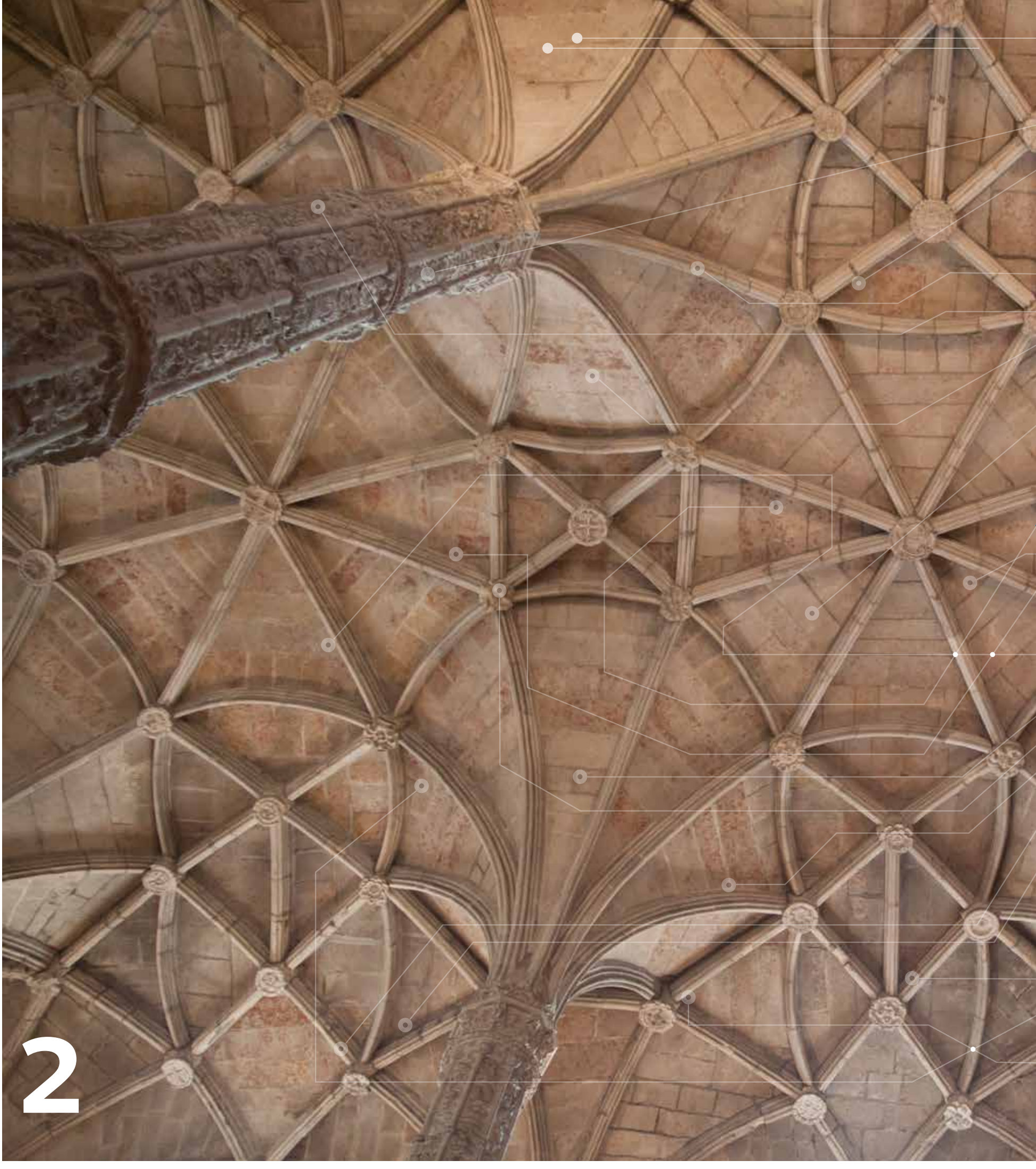
From the range of topics that form a standard part of our Annual Report, I would like to draw attention to the sixth chapter, which deals with the implementation of Strategy AV21. The response to the Strategy from the political sphere, as well as from the world of business and from the general public has been highly positive, which is something I very much appreciate. In December 2018, a Memorandum of Cooperation between the Ministry of Finance of the Czech Republic and the Czech Academy of Sciences was signed on the basis of the Strategy, which is further proof of its positive reception.

As part of Strategy AV21, we have also commenced preparation of expert opinions of the Czech Academy of Sciences for both chambers of Czech Parliament with the goal of providing legislators with a professional standpoint for their work.

Last but not least, I should also mention our newly introduced fellowship named Lumina Quaeruntur Research Fellowship. It was founded by the Academy in July 2018 as an instrument for supporting scientific excellence in institutes of the CAS. It is intended for successful researchers of the young and middle generations, with international experience if possible. The Fellowship provides them with generous financial backing for a period of up to five years and enables them to develop their research programmes with a view to applying for an elite grant from the European Research Council. I believe that this well-targeted support will help our researchers gain more ground in international grant competitions.

It is more important to look to the future than to look back at the past. The best way to ensure long-term prosperity in the Czech Republic is to encourage quality research. Unfortunately, the field of science and research in the Czech Republic, including the Czech Academy of Sciences as its most significant component, has long been underfinanced. For this reason, I consider it crucial to continue to appeal to the government in this regard, and I hope that by joining forces, we will succeed in finding and implementing measures that will support high-quality Czech science and research. This will be especially important with regard to the implementation of the new Innovation Strategy of the Czech Republic 2019–2030, which the CAS has actively helped to prepare. I believe that only stable institutions with longer-term financial security can create realistic medium-term strategies for their development and build their excellence. And only such institutions can then effectively promote cooperation with the business community.

Professor RNDr. Eva Zažímalová, CSc.



2

Mission and Structure

of the CAS

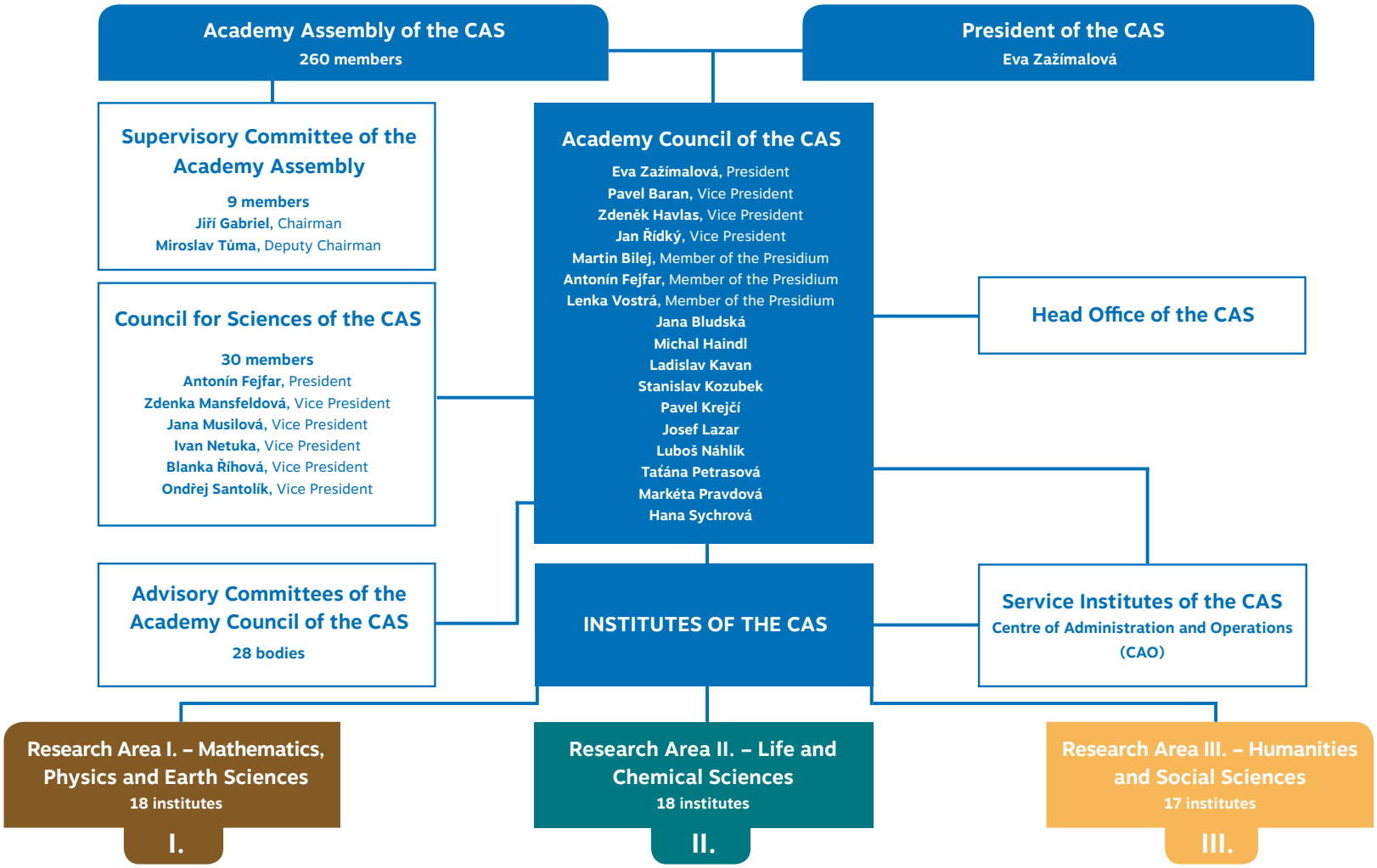
The Czech Academy of Sciences (CAS) was established by Act No 283/1992 Coll. The CAS conducts research through its institutes which are established as public research institutions. More than 11,000 employees work at the Academy, over 7,000 of whom are university-educated.

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

The institutes of the CAS participate in education, primarily by educating young researchers in doctoral study programmes, as well as through the pedagogical activities of their researchers at universities.

The CAS also develops cooperation with applied research and industry. Numerous joint international projects and exchanges of researchers with partner institutions abroad reinforce the integration of Czech science into the international framework.

The structure of the CAS is illustrated on the following page.



Section 1
of Mathematics, Physics and Computer Science

Astronomical Institute of the CAS (ASÚ)
Institute of Physics of the CAS (FZÚ)
Institute of Mathematics of the CAS (MÚ)
Institute of Computer Science of the CAS (ÚI)
Nuclear Physics Institute of the CAS (ÚJF)
Institute of Information Theory and Automation of the CAS (ÚITA)

Section 2
of Applied Physics

Institute of Photonics and Electronics of the CAS (ÚFE)
Institute of Physics of Materials of the CAS (ÚFM)
Institute of Plasma Physics of the CAS (ÚFP)
Institute of Hydrodynamics of the CAS (ÚH)
Institute of Scientific Instruments of the CAS (ÚPT)
Institute of Theoretical and Applied Mechanics of the CAS (ÚTAM)
Institute of Thermomechanics of the CAS (ÚT)

Section 3
of Earth Sciences

Institute of Geophysics of the CAS (GFÚ)
Institute of Geology of the CAS (GLÚ)
Institute of Atmospheric Physics of the CAS (ÚFA)
Institute of Geonics of the CAS (ÚGN)
Institute of Rock Structure and Mechanics of the CAS (ÚSMH)

Section 4
of Chemical Sciences

Institute of Analytical Chemistry of the CAS (ÚIACH)
Institute of Inorganic Chemistry of the CAS (ÚACH)
J. Heyrovský Institute of Physical Chemistry of the CAS (ÚFCH JH)
Institute of Chemical Process Fundamentals of the CAS (ÚCHP)
Institute of Macromolecular Chemistry of the CAS (ÚMCH)
Institute of Organic Chemistry and Biochemistry of the CAS (ÚOCHB)

Section 5
of Biological and Medical Sciences

Institute of Biophysics of the CAS (BFÚ)
Institute of Biotechnology of the CAS (BTÚ)
Institute of Physiology of the CAS (FGÚ)
Institute of Microbiology of the CAS (MBÚ)
Institute of Experimental Botany of the CAS (ÚEB)
Institute of Experimental Medicine of the CAS (ÚEM)
Institute of Molecular Genetics of the CAS (ÚMG)
Institute of Animal Physiology and Genetics of the CAS (ÚŽFG)

Section 6
of Biological-Ecological Sciences

Biology Centre of the CAS (BC)
Institute of Botany of the CAS (BÚ)
Institute of Vertebrate Biology of the CAS (ÚBO)
Global Change Research Institute of the CAS (ÚVGZ)

Section 7
of Social and Economic Sciences

Main Library of the CAS (KNAV)
Economics Institute of the CAS (NHÚ)
Institute of Psychology of the CAS (PSÚ)
Institute of Sociology of the CAS (SOÚ)
Institute of State and Law of the CAS (ÚSP)

Section 8
of Historical Sciences

Institute of Archaeology of the CAS, Brno (ARÚB)
Institute of Archaeology of the CAS, Prague (ARÚ)
Institute of History of the CAS (HÚ)
Masaryk Institute and Archives of the CAS (MÚA)
Institute of Art History of the CAS (ÚDU)
Institute of Contemporary History of the CAS (ÚSD)

Section 9
of Humanities and Philology

Institute of Ethnology of the CAS (EÚ)
Institute of Philosophy of the CAS (FLÚ)
Oriental Institute of the CAS (OÚ)
Institute of Slavonic Studies of the CAS (SLÚ)
Institute of Czech Literature of the CAS (ÚČL)
Institute of the Czech Language of the CAS (ÚJČ)


BÜCHI
SWITZERLAND
NS 29, 2/32

Czech Academy of Sciences

in the System of Research, Development and Innovation

Throughout the year, the management of the Czech Academy of Sciences concentrated on negotiating a proposal for spending of the Czech state budget for chapter 361 – the Czech Academy of Sciences for the year 2019, including a medium-term outlook for 2020–2021.

From a conceptual perspective, the preparation of several important documents concerning the area of research, development and innovation (R&D&I) was completed in 2018, with the Czech Academy of Sciences actively participating through its representatives. This primarily concerned a new law on the support of R&D&I from public funds, updates to the National RIS3 Strategy and updates to the National Research, Development and Innovation Policy 2016–2020. At the very end of 2018, a range of representatives of the CAS and prominent scientists participated in the preparation of the Innovation Strategy of the Czech Republic 2019–2030.

The CAS is also attempting to further develop the best mutually beneficial cooperation possible with universities, while creating equal conditions for training students – particularly doctoral students – at institutes of the CAS. Following an amendment to the Higher Education Act, framework agreements on the implementation of doctoral study programmes between the CAS and relevant universities have been negotiated and signed.

4

Selected Results

All 54 research institutes of the CAS, which operate as public research institutions, contributed to the representative results achieved during the past year.

The individual institutes are grouped into three main research areas. The first research area comprises Mathematics, Physics and Earth Sciences, the second research area covers Life and Chemical Sciences, and the third research area focuses on Humanities and Social Sciences.

The research in 2018 brought many positive results. The following nine results from various research areas belong among the most interesting.

SELECTED RESULTS – RESEARCH AREA I.

DISCOVERY OF THE OLDEST TERRESTRIAL VASCULAR PLANT IN THE WORLD

Institute of Geology of the CAS

A macroscopic fossil of the world's oldest terrestrial vascular plant, named *Cooksonia barrandei* in honour of French palaeontologist Joachim Barrande who worked in Bohemia in the 19th century, has been discovered in the Bohemian Karst area. This globally unique finding has shifted the boundary of colonisation of land by the first plants to 432 million years ago. It has been possible to obtain fossilised spores and prove, based on dispersion spores, that in the Silurian period 432 million years ago, a plant community with the oldest sculptured spores in the world had developed in the Czech Republic. The size of the discovered fossil provides evidence that the plant was already capable of distributing water and nutrients within its body and carry out photosynthesis. A stoma discovered on its stem also shows that it had fully adapted to life on dry land.

Bibliographic references:

Libertín, M. et al:
Sporophytes of polysporangiate land plants from the early Silurian period may have been photosynthetically autonomous. Nature Plants. 2018, ed. 4, 30 April 2018, pp. 269–271. ISSN 2055-026X.

MODEL OF TRANSPORT EFFECTS IN PLASMONIC AFFINITY NANOBIOSENSORS, ENABLING THE DESIGN OF PLASMONIC NANOBIOSENSORS WITH IMPROVED EFFICIENCY

Institute of Photonics and Electronics of the CAS

Researchers of the Institute of Photonics and Electronics have created new biosensors with high detection efficiency based on plasmonic nanostructures. Plasmonic nanostructures contain precisely defined metal motifs with dimensions in the order of nanometres, on which a special type of electromagnetic waves, called surface plasmons, can be excited by incident light. Scientists have studied their properties both in terms of optical characteristics and in terms of transport of molecules towards their active surface. They have also described the influence of the design parameters of these nanostructures on their ability to capture and detect selected biomolecules. Specifically, the researchers have developed models which describe the transport of biomolecules towards the surface of plasmonic nanostructures and the analytic capabilities of biosensors involving both the optical and transport aspects. They have demonstrated that a plasmonic biosensor with optimised parameters allows for detection of short DNA segments at concentrations of up to an order of magnitude lower than those recorded by traditional surface plasmon resonance biosensors. Biosensors that the researchers are developing at the Institute of Photonics and Electronics represent next-generation technology with a wide range of applications in molecular biology (the study of biomolecules and their interactions) and analytics (detection of chemical and biological agents).

Bibliographic references:

Špačková, B. et al: A Route to Superior Performance of a Nanoplasmonic Biosensor: Consideration of Both Photonic and Mass Transport Aspects. ACS Photonics. 2018, ed. 5, No 3, pp. 1019–1025. ISSN 2330-4022.

Lynn, N. S., Homola J.: Microfluidic Analyte Transport to Nanorods for Photonic and Electrochemical Sensing Applications. Chemistry – A European Journal. 2018, 24 (46), 12031–12036. ISSN 0947-6539 doi: 10.1002/chem.201802757.

SINGLE-STEP PURIFICATION OF RAW BIOGAS TO BIOMETHANE QUALITY BY HOLLOW FIBRE MEMBRANES WITHOUT ANY PRETREATMENT – AN INNOVATION IN BIOGAS UPGRADING

Institute of Chemical Process Fundamentals of the CAS

The Institute of Chemical Process Fundamentals has presented a new method of single-stage purification of raw biogas to biomethane quality. It is a radical innovation in biogas production, based on single-step membrane purification technology which, in the case of agricultural biogas, does not require any pretreatment steps for contaminant removal and which uses low feed pressure.

Bibliographic references:

Žák, M. et al: Single-step Purification of Raw Biogas to Biomethane Quality by Hollow Fiber Membranes without Any Pretreatment – a Radical Innovation in Biogas Upgrading. In: Program. Prague: Czech Society of Chemical Engineering, 2018, p. 32, article number C3.4. ISBN N.

Žák, M. et al: Single-step Purification of Raw Biogas to Biomethane Quality by Hollow Fiber Membranes without Any Pretreatment – a Radical Innovation in Biogas Upgrading. Separation and Purification Technology. 2018, 203 (SEP 12), 36–40. ISSN 1383-5866 doi: 10.1016/j.seppur.2018.04.024.

Equipment for biogas purification

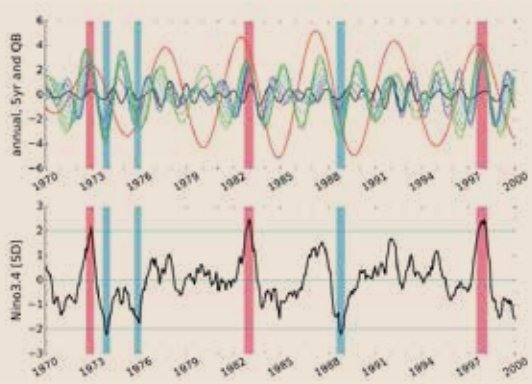
SYNCHRONISATION AND CAUSALITY ACROSS TIME SCALES IN THE EL NIÑO PHENOMENON

Institute of Computer Science of the CAS

An original mathematical approach and computational methods have helped to reveal synchronisation and causal relationships between the annual cycle and oscillations of different periods ("tones") in the dynamics of the El Niño/Southern Oscillation phenomenon, a natural climatic pendulum which swings temperatures in the tropical Pacific between a cold phase (La Niña) and a warm phase (El Niño). Amplitudes of these swings change from small to extreme values, significantly influencing the global climate, causing, for example, drought in Asia and Australia and concurrent floods in South America. The period of the pendulum is irregular, varying from two to seven years, but it always reaches its maximum values in the same part of the year. Mathematically speaking, the slow cycles of El Niño are synchronised with the annual cycle. A team led by Milan Paluš of the Institute of Computer Science, in cooperation with American researchers, have identified basic oscillation components (tones) of the El Niño phenomenon, described their interaction, and demonstrated how their synchronisation or consonance leads to the occurrence of extreme manifestations of Southern Oscillation. Conversely, dissonant tones – desynchronised oscillations – characterise quiet periods without significant deviations in temperature or precipitation from the long-term standard. The obtained results will help us to understand the occurrence of extreme events in the El Niño climatic phenomenon, to improve predictions of such events and, subsequently, forecasts of related dangerous climatic phenomena, such as drought or floods in remote areas of the Earth.

Tones of the El Niño Phenomenon

Dissonant tones (oscillations) of the El Niño phenomenon characterise normal climatic conditions. Consonant tones (synchronised oscillations) lead to extreme events such as floods on one continent and extreme drought in another part of the world.



Interaction of Different Time Scales and the Occurrence of Extreme Climatic Events

Top: *Wavelet reconstructions of the observed NINO3.4 index (1970–1999): reconstruction of the annual (black), quasi-biennial (for a range of periods from 18 to 30 months, with 2 month step; shades of blue to green) and five-year ENSO cycles (red). All of these reconstructions were computed via continuous complex wavelet transformation (CCWT).*

Bottom: *Normalised values of the observed NINO3.4 index. The years of strong El Niño and La Niña events are marked with the red and blue shading, respectively.*

Bibliographic references:

Jajcay, N. et al: Synchronization and causality across times cales in El-Niño Southern Oscillation. npj Climate and Atmospheric Science. 2018, 1 (12 November), 33. E-ISSN 2397-3722 doi: 10.1038/s41612-018-0043-7.

SELECTED RESULTS – RESEARCH AREA II.

WHEAT GENOME REFERENCE SEQUENCE.

Institute of Experimental Botany of the CAS

Researchers from the Institute of Experimental Botany have played a significant role in an international team for compiling and publishing the final version of the wheat genome sequence. The team worked as part of an extensive consortium uniting 2,400 experts from 68 countries. The researchers have successfully "deciphered" the hereditary wheat code, which is 5 times larger than the human code and is made up of 17 billion letters. Its "decryption" had therefore long been considered virtually impossible. The success is thanks in part to a new method of chromosome isolation and sorting using flow cytometry, which researchers at the Institute of Experimental Botany have developed and routinely used as the only ones in the world. These procedures have made it possible to divide hereditary information into smaller parts, to isolate individual chromosomes that have a size of only about 600–1000 million DNA bases, and to analyse them separately. Finally, a fully annotated wheat genome reference sequence was obtained. Analysis of the sequence revealed the distribution of non-coding DNA elements and identified more than 100,000 genes. The role of genes during plant growth and development has also been characterised. The obtained results will support both research and better knowledge of wheat biology while also accelerating the application of new molecular methods in breeding.

Bibliographic references:

Keeble-Gagnere, G. et al: Optical and physical mapping with local finishing enables megabase-scale resolution of agronomically important regions in the wheat genome. Genome Biology. 2018, ed. 19, August 17, article number 112. ISSN 1474-760X.

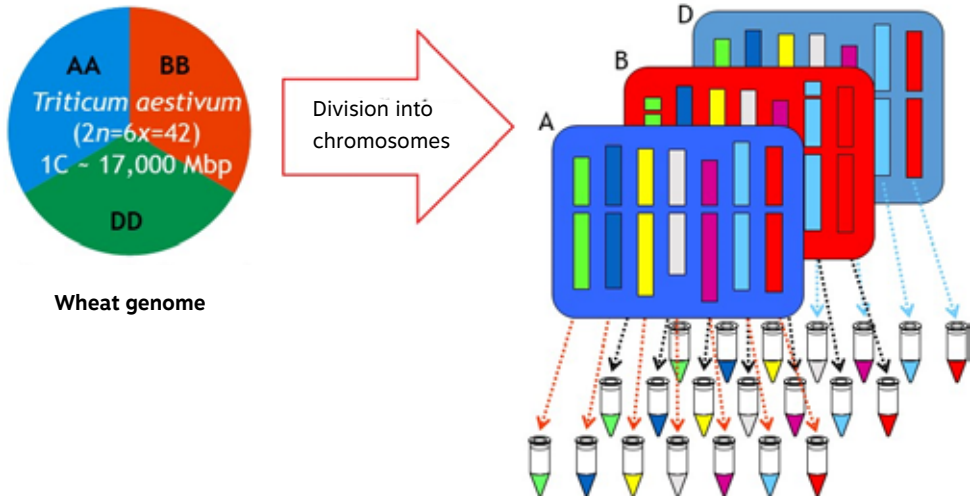
Appels, R. et al: Shifting the limits in wheat research and breeding using a fully annotated reference genome. Science. 2018, ed. 361, No 6403, article number eaar7191. ISSN 0036-8075.

International Wheat Genome Sequencing Consortium (IWGSC): A chromosome-based draft sequence of the hexaploid bread wheat (Triticum aestivum) genome. – Science 345: 1251788, 2014.

Choulet, F. et al: Structural and functional partitioning of bread wheat chromosome 3B. – Science 345 (6194): 1249721, 2014.

Šafář, J. et al: Development of chromosome-specific BAC resources for genomics of bread wheat. – Cytogenet. Genome Res. 129: 211–223, 2010.

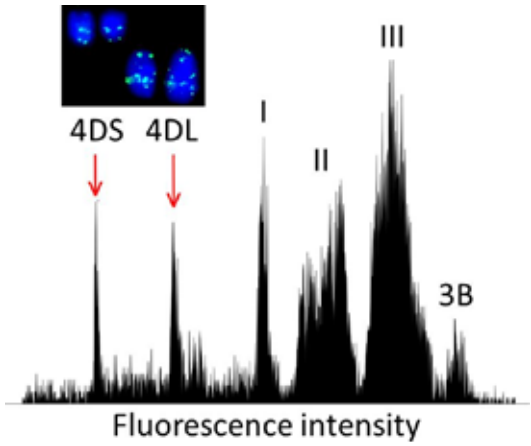
Paux, E. et al: A physical map of the 1-gigabase bread wheat chromosome 3B. – Science 322: 101–104, 2008.



Wheat genome

Simplification of the Analysis of the Complex Wheat Genome

The wheat genome is made up of three subgenomes – A, B and D, which are always formed by seven chromosomes with a similar DNA structure. Its total size reaches almost 17 billion DNA bases. Genome analysis and sequencing was simplified by chromosome isolation using flow cytometry. The individual chromosomes have a size of only about 600–1000 million DNA bases and the possibility of analysing them separately has eliminated problems caused by similarity to the DNA chromosome sequences of the other two subgenomes. An even greater reduction in complexity has been achieved by isolating chromosome arms from the so-called telosomic lines, which are roughly only 200–600 million DNA bases in size and represent approximately just 1–3% of the entire genome.



Isolation of Wheat Chromosome Arms Using Flow Cytometry

A relative fluorescence intensity histogram obtained from an analysis of mitotic chromosomes of a double ditelosomal line of dDt4D Chinese Spring variety wheat using flow cytometry. The DNA of the chromosomes was stained with DAPI fluorescent dye. The histogram can be used to distinguish the top of chromosome 3B, the three composite peaks (I–III) representing the remaining wheat chromosomes, except for chromosome 4D; in this line it is replaced by telosome chromosomes for the long and short chromosome arms (4DL and 4DS). Telosome chromosomes are smaller than ordinary chromosomes. Their peaks can be easily distinguished and can therefore be sorted with high purity using flow cytometry.

Insert: The sorted telosomes (chromosome 4D arms) can be identified using fluorescence in situ hybridisation (FISH) with a probe for Afa repetitive DNA (yellow and green signals); the chromosomes were stained with DAPI fluorescent (blue) dye.

DYNAMIC OPENING AND CLOSING OF AN ENZYME CAPTURED IN REAL TIME

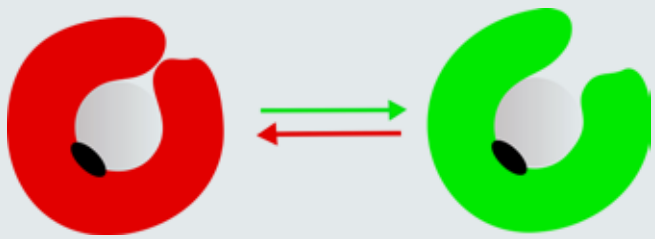
J. Heyrovský Institute of Physical Chemistry of the CAS

Researchers at the J. Heyrovský Institute of Physical Chemistry have studied a dehalogenase enzyme, which can be applied in environmental decontamination. In order to develop the most effective dehalogenases possible, we need to understand the mechanisms responsible for increasing their activity. For this reason, researchers have investigated a highly effective variant of this enzyme, which can take two different conformations – open and closed. It has been shown that the rapid transition between these two states – i.e. the dynamics of a given protein – ensures high activity of the studied enzyme. Using fluorescence spectroscopy, the researchers followed the dynamics of its opening and closing in real time. In cooperation with Loschmidt Laboratories at the Masaryk University, they then described the balance between the two dehalogenase conformations based on kinetic measurements and computer simulations. They have proved that the open form allows for efficient transport of the substrate to the active site and for the release of the product back into the solution, while the closed form is advantageous for chemical conversion of the substrate into the product.

Rapid rearrangement between these forms, reminiscent of the opening and closing of a gate, should be taken into account as an important factor when designing new, highly efficient biocatalysts.

Publication:

Kokkonen, P. et al: Molecular Gating of an Engineered Enzyme Captured in Real Time.
J. Am. Chem. Soc., Just Accepted Manuscript.
DOI: 10.1021/jacs.8b09848.



Dynamics of an Enzyme Consisting in the Transition Between the Closed and Open Conformation

A diagram of a dehalogenase enzyme which can assume two different conformations. The closed conformation (shown in red) is advantageous for chemical conversion of the substrate into the product. The open conformation (shown in green) is effective for transporting the substrate to the active site (shown in black) and for releasing the product back into the solution. The rapid transition between these two states ensures high activity of the studied enzyme. This mechanism, which is reminiscent of the opening and closing of a gate, should therefore be taken into consideration when designing new, highly efficient biocatalysts.

SELECTED RESULTS – RESEARCH AREA III.

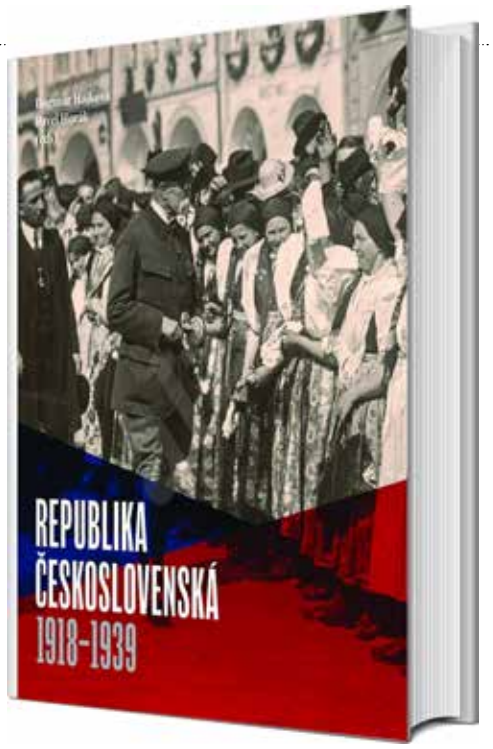
THE CZECHOSLOVAK REPUBLIC 1918–1939

Masaryk Institute and Archives of the CAS

President of the CAS E. Zažímalová with Czech Prime Minister and Chairman of the R&D Council A. Babiš and Vice-Chairman of the R&D Council K. Havlíček at the book launching ceremony

The representative publication *The Czechoslovak Republic 1918–1939* offers a structured look at interwar Czechoslovakia, its society and rhythms of life, as well as transformations of its landscape. It deals not only with the aftermath of the war, the legacy of the Austro-Hungarian Monarchy, establishment of a democratic state separate from Austria-Hungary or the constitutional order and various aspects of the new multinational state, but also transformations of property relationships, education and upbringing, the religious spectrum, women in politics and, of course, political, social and economic events leading up to Munich and the Protectorate. The book combines a chronological and thematic approach, through which it concurrently presents various ways of reading the text and covers lesser-known topics and phenomena of the era. One of the main intentions of the book, which has been created by an international team of more than sixty authors, primarily from the Masaryk Institute and Archives, is to present the Czechoslovak Republic in all its complicated diversity.

Hájková, D., Horák, P. et al: The Czechoslovak Republic 1918–1939. Prague: Lidové noviny Publishing House, 2018. ISBN 978-80-7422-643-4.



Book cover
D. Hájková – P. Horák (editors): The Czechoslovak Republic 1918–1939

ART IN THE CZECH LANDS 800–2000

Institute of Art History of the CAS

The thousand-page long publication *Art in the Czech Lands 800–2000*, written at the Institute of Art History, is the result of fourteen years of work by 33 authors and has been published in Czech and English. It presents Czech art through so-called families. These are groups of several works of art connected, for example, by the way in which they originated or by belonging to a particular style. It presents the most significant artistic output associated with the Czech lands and their most important artistic personalities, from Master Theodoric and Peter Parler, to creators of cubist and interwar avant-garde and contemporary artists such as Veronika Bromová or Federico Díaz. As well as artists of Czech origin and language, the authors have also included works of German-speaking artists, creators of Jewish origin and architects with Italian roots. The book offers examples from architecture, sculpture, painting, manuscript illumination, artistic handicrafts, photography and other types of artistic creation. The publication is divided into three basic parts, which are also distinguished graphically, while three symbols represent the art forms of three periods – Middle Ages, Early Modern and Modern Eras.

Book cover
Art in the Czech Lands 800–2000

Petrasová, T. – Švácha, R. (editors): Art in the Czech Lands 800–2000, Řevnice: Arbor vitae societas: Prague: Artefactum, 2017. 991 pages. ISBN 978-80-904534-9-4; ISBN 978-80-88283-01-0.

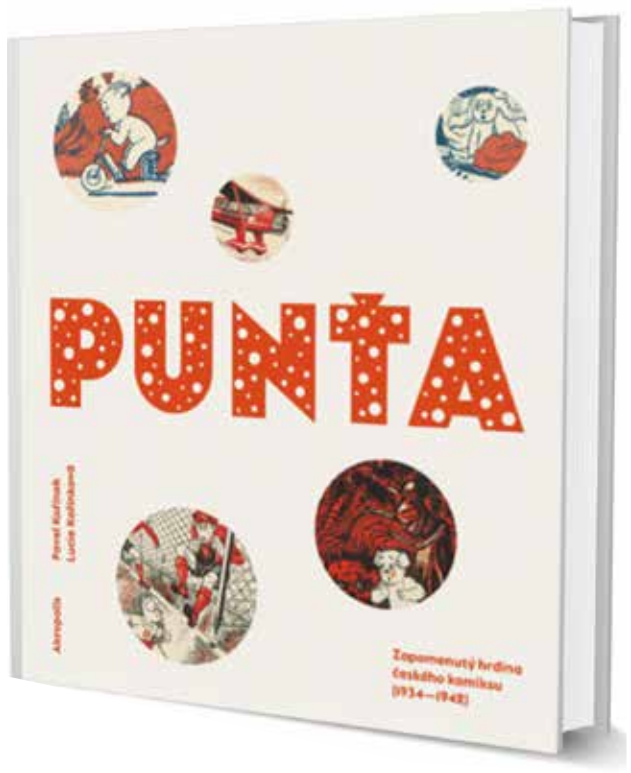
PUNŤA: THE FORGOTTEN HERO OF CZECH COMICS (1934–1942)

Institute of Czech Literature of the CAS

The box-set *Punťa: The Forgotten Hero of Czech Comics (1934–1942)* consists of two separate books. The first – "Studies" – offers a cultural, literary-historical, theoretical and interpretative examination of the entire "Punťa-centric universe". The second volume, entitled "Stories", is a rich anthology of nearly 200 episodes from the central comic series.

Kořínek, P., Kořínková, L. et al: Punťa: The Forgotten Hero of Czech Comics (1934–1942), Prague: Akropolis, 2018. ISBN 978-80-7470-170-2.

Book cover
Punťa: The Forgotten Hero of Czech Comics (1934–1942)



A LITERARY CHRONICLE OF THE FIRST REPUBLIC. EVENTS - WORKS - CONTEXTS

A Literary Chronicle of the First Republic, presented by the Institute of Czech Literature, is an illustrated and explanatory work with over five hundred pages, intended for anyone who is interested in the literature and culture of Bohemia, Moravia, Slovakia and Subcarpathian Ruthenia between the world wars. In twenty-one sections, each focusing on one year between 1918 and 1938, the book presents Czechoslovakia as a multinational state in which literature was written and read not only in Czech but also in Slovakian, German, Russian, Ukrainian, Hungarian and Polish, where not only writers but also translators, publishers and readers were a part of the literary scene.

A Literary Chronicle of the First Republic depicts this rich and diverse scene through a kaleidoscopic mosaic of literary events as they were reflected in the contemporary cultural and daily press published in different parts of the republic. It acquaints readers with key works penned by Czechoslovak writers and examines selected contexts of literary life and book culture of the time in an accessible way. The book is aimed at the general public, and its illustrative component is just as important as its explanatory part. It is compiled from over a thousand carefully selected book covers, photographs, advertisements, caricatures, samples of manuscripts and other evidence of the visual dimension of the First-Republic literary culture.

Šámal, P. et al: A Literary Chronicle of the First Republic. Events – Works – Contexts. Prague: Academia – Museum of Czech Literature – Institute of Czech Literature of the CAS, 2018, 2 volumes, 518 pages.

Book cover
A Literary Chronicle of the First Republic. Events – Works – Contexts

Strategy AV 21

Top Research in the Public Interest

Strategy AV21, approved at the December Academy Assembly in 2014, is the result of an ongoing effort of the Czech Academy of Sciences to help to solve problems of contemporary society, and is well characterised by the chosen motto “Top Research in the Public Interest”. Individual research programmes of Strategy AV21 focus on current and socially important issues. These issues require broadly-based research and multidisciplinary synergies between the institutes of the CAS and other relevant external partners. The programmes of Strategy AV21 are expected to benefit from a wide range of research concentrated within the CAS and may therefore come up with possibly exceptional combinations of findings from natural, technical and social sciences.

Ceremonial signing of a contract
in relation to the foundation of the Karel Čapek Centre for Values in Science and Technology (from left to right: O. Ševeček, Director of the Institute of Philosophy; J. Matejka, Director of the Institute of State and Law; E. Pelikán, Director of the Institute of Computer Science; and J. Zima, Dean of the Faculty of Science of Charles University in Prague)

In the fourth year of the implementation of Strategy AV21, 18 research programmes and two associated activities were addressed. During the year, proposals were submitted for two further associated activities – CiCero, which focuses on the issues of information and communication technology law, intellectual property and support of research and transfer of technologies of the CAS, has academy-wide significance, and therefore this associated activity was moved outside Strategy AV21.

In 2018, a guideline of the Academy Council on Strategy AV21 was issued, introducing uniform and simple rules for fulfilling the Strategy's objectives. It has put into place managing bodies for both Strategy AV21 and individual programmes, namely the Strategy AV21 Council and the Research Programme Coordination Council, and defined their competences. It lays down clear rules for the use of grants for supporting research programmes and associated activities, and criteria for evaluating the results of the research programmes and associated activities concerned. The guideline further establishes requirements for proposals for new research programmes or associated activities. An important simplification of the administration of Strategy AV21 is the unification of all deadlines for coordinators of research programmes and associated activities into two, within which a report is submitted on solutions for the previous period, billing and a proposal for solutions and the budget for the coming period.

The Strategy Council has dedicated great effort to a comprehensive evaluation of research programmes according to 11 qualitative criteria and three more for associated activities. In May, the period from 2015 to 2017 was evaluated, while October saw evaluations of results achieved in 2018. Based on the evaluations, the research

> Individual research programmes of Strategy AV21 are expected to benefit from a wide range of research concentrated within the CAS and may therefore come up with possibly exceptional combinations of findings from natural, technical and social sciences.

programmes were categorised in three groups according to success, which then influenced recommendations for improving their activities and funding. An application environment on the KIS information system has been created for uniform and simple submission of evaluation documents. In 2018, a new Strategy AV21 website (http://www.avcr.cz/en/strategy/) was created with Czech and English versions, where all information about the activities of research programmes and associated activities, their results and upcoming events are continuously published. Outputs of research programmes in the form of reports on the results of specific activities are published by the Strategy AV21 Editorial Board and editing and printing is provided by the Academia Publishing House. You will find information on their content and availability on the website http://www.avcr.cz/en/strategy/research-programmes/.

The year 2018 saw the publication of updated information cards on Strategy AV21 research programmes in English, several books and brochures on the results of individual research programmes, and a number of analyses of the status of research created as part of the associated activity of research and development analysis.

Expert advice for legislative bodies is another important output of Strategy AV21. The effort to provide lawmakers with expert advice for their legislative decision-making is evidenced by the preparation of several expert opinions (Large Data, Current Demographic Trends in the Czech Republic, The Current Problem of Drought in the Czech Republic).

The aims of Strategy AV21 are similar to the aims of the National Research and Innovation Strategy for Smart Specialisation of the Czech Republic (RIS3), with representatives of Strategy AV21 becoming involved in both updating RIS3 and working on individual topics of RIS3 National Innovation Platforms.

List of Research Programmes of Strategy AV 21

AND THEIR COORDINATORS

01 **Hopes and Risks of the Digital Era**
Doc. RNDr. Barbara Zitová, Ph.D.

02 **Systems for Nuclear Power Industry**
RNDr. Radomír Pánek, Ph.D.

03 **Efficient Energy Conversion and Storage**
Ing. Jiří Plešek, CSc.

04 **Natural Hazards**
RNDr. Josef Stemberk, CSc.

05 **New materials Based on Metals, Ceramics and Composites**
Prof. RNDr. Ludvík Kunz, CSc., dr. h. c.

06 **Diagnostic Methods and Techniques**
Ing. Ilona Müllerová, DrSc.

07 **Wellbeing in Health and Disease**
Doc. MUDr. Jakub Otáhal, Ph.D.

08 **Foods for the Future**
Prof. Ing. Jaroslav Doležel, DrSc.

09 **Diversity of Life and Health of Ecosystems**
Prof. Ing. Miloslav Šimek, CSc.

10 **Molecules and Materials for Life**
Ing. Jiří Brus, Dr.

11 **Europe and the State: Between Barbarism and Civilisation**
Prof. PhDr. Petr Sommer, CSc., DSc.

12 **Memory in the Digital Age**
PhDr. Luboš Velek, Ph.D.

13 **Effective Public Policies and Contemporary Society**
Doc. Ing. Daniel Münich, Ph.D.

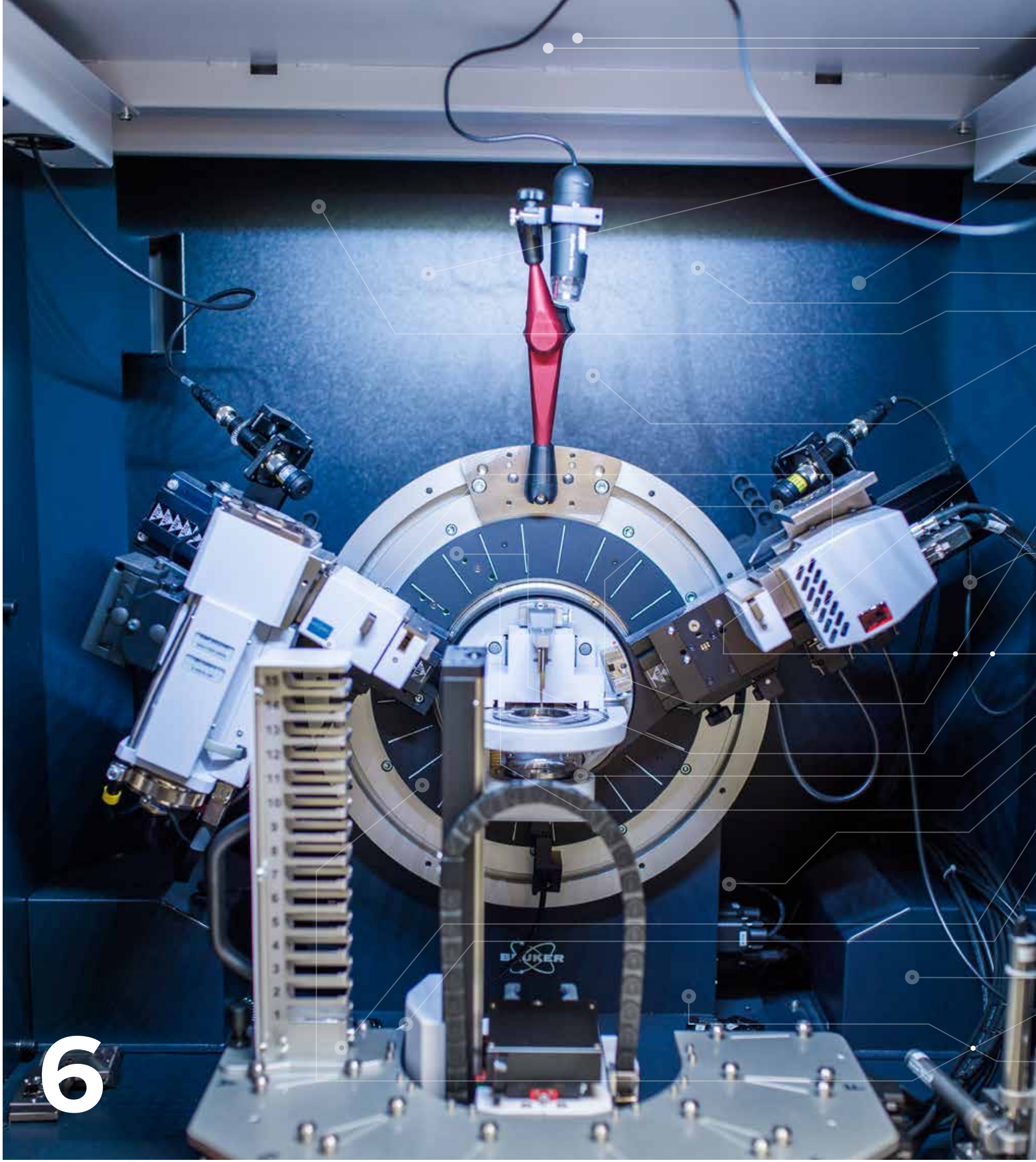
14 **Forms and Functions of Communication**
Prof. PhDr. Petr Koťátko, CSc.

15 **Global Conflicts and Local Interactions: Cultural and Societal Challenges**
Doc. PhDr. Marek Hrubec, Ph.D.

16 **Space for Mankind**
Prof. RNDr. Petr Heinzel, DrSc.

17 **Light at the Service of Society**
Ing. Tomáš Mocek, Ph.D.

18 **Preclinical Testing of Potential Pharmaceuticals**
MUDr. Jan Kopecký, DrSc.


BRUKER

Projects of Operational Programmes

of EU Structural Funds

In 2018, the institutes of the CAS were involved in the research of 140 projects of operational programmes of EU structural funds. Institutes of the CAS were coordinators or beneficiaries of 108 projects, of which 42 were launched in 2018, 59 were dealt with throughout the year, and 7 were completed during the course of the year. A summary of the participation of institutes of the CAS in the research of projects, broken down into individual operational programmes, is provided in Table No 1. More detailed information on projects launched in 2018 is presented in Table No 2. The total amount of approved aid for the entire period of work on the specified projects is CZK 3,902.1 million.

Table No 1: Participation of CAS institutes in the projects of operational programmes in 2018

Operational programme	Projects launched	Projects ongoing	Projects completed	TOTAL
International Cooperation OP INTERREG EUROPE	0	2	0	2
Transnational Cooperation OP Central Europe	0	2	0	2
Transnational Cooperation OP Danube	0	0	1	1
OP Enterprise and Innovation for Competitiveness	1	3	1	5
OP Prague - Growth Pole of the Czech Republic	1	0	3	4
OP Austria – Czech Republic	0	1	0	1
OP Free State of Bavaria – Czech Republic	0	1	0	1
OP Free State of Saxony – Czech Republic	0	1	0	1
OP Research, Development and Education	40	47	1	88
OP Employment	0	2	1	3
TOTAL	**42**	**59**	**7**	**108**

Table No 2: Projects of operational funds launched in 2018

Beneficiary/ /coordinator	Project name	Total approved aid for the project in thousands of CZK
	OP Enterprise and Innovation for Competitiveness	
MBÚ	Project for the protection of industrial property rights – MBÚ	**533**
	OP Prague – Growth Pole of the Czech Republic	
FZÚ	Effective use of waste heat	**9,843**
	OP Research, Development and Education	
ARÚ	International exchange of methodological experience in the study on the impact of emergencies on the migration and economic strategies of past human populations	**3,926**
BC	Biomanipulation as a tool for the improvement of reservoir water quality	**64,626**
BC	International mobility of researchers of the Biology Centre	**19,909**
BC	Integration of the BC into the European Research Area	**34,892**
BTÚ	International mobility of researchers of the Institute of Biotechnology of the CAS	**3,925**
FGÚ	FGÚ Mobility	**9,539**
FGÚ	Development of HR capabilities, internationalisation, popularisation and IP utilisation	**12,744**
FLÚ	Mobility enhancement in philosophical studies	**3,862**
FLÚ	Stoic rhetoric in the context of ancient philosophical rhetoric	**5,159**
FZÚ	Solid-state physics for the 21st century	**560,349**
FZÚ	International mobility MSCA-IF II IOP	**5,899**
FZÚ	IOP researcher mobility	**41,951**
FZÚ	Advanced research using high intensity laser produced photons and particles	**1,269,000**

Beneficiary/ /coordinator	Project name	Total approved aid for the project in thousands of CZK
MBÚ	International mobility of researchers of the Institute of Microbiology	**19,988**
MBÚ	International mobility of researchers – MSCA-IF (Institute of Microbiology)	**2,989**
SOÚ	International mobility of researchers of the Institute of Sociology	**3,909**
ÚBO	International collaboration in ecological and evolutionary biology of vertebrates	**3,981**
ÚČL	The limits of literary studies: Literary communication and cultural transfer	**3,966**
ÚEB	Centre for Experimental Plant Biology	**281,069**
ÚFCH JH	Implementation of state-of-the-art physico-chemical methods for studies of innovative materials and bio/chemical processes	**19,898**
ÚFCH JH	Capacity development of ÚFCH JH for research and development	**18,982**
ÚFCH JH	Carbon allotropes with rationalised nano-interfaces and nano-links for environmental and bio-medical applications	**98,980**
ÚFM	International mobility of junior researchers of the IPM	**3,914**
ÚFP	Partnership for excellence in super-precise optics	**99,775**
ÚGN	International mobility of researchers of the IGN	**3,952**
ÚI	Enhancing human resources for research in theoretical computer science	**9,666**
ÚJF	Physicists on the move	**3,438**
ÚJF	Ultra-trace isotope research in social and environmental studies using accelerator mass spectrometry	**386,299**
ÚMG	IMG international mobility	**9,976**
ÚMCH	Mobility of Eliška Mázl Chánová, Ph.D. to ISTM Keele University, UK, for realisation of the MS-CA-IF 2016 project “C-RGD”	**2,989**
ÚOCHB	Chemical biology for drugging “undruggable” targets	**497,027**
ÚOCHB	IOCB Mobility	**19,678**
ÚOCHB	IOCB MSCA Mobility	**6,985**
ÚOCHB	IOCB MSCA Mobility II	**3,669**
ÚPT	Quantum-classical ultimate transfer analogies	**4,083**
ÚT	Support of long-term foreign internships of Institute of Thermomechanics workers	**3,521**
ÚTAM	Competitiveness Boost of the Centre of Excellence in the Vysočina Region	**3,963**
ÚVGZ	Mobilities CzechGlobe	**3,790**
ÚVGZ	SustES – Adaptation strategies for sustainable ecosystem services and food security under adverse environmental conditions	**335,421**
ÚŽFG	International mobility of IAPG researchers for transfer of biomedical innovations	**3,995**

Technology Transfer

Part of the mission of the Czech Academy of Sciences is to place emphasis not only on excellence in science but also on socio-economic relevance of the research of its individual institutes in the broadest sense, as a contribution to the competitiveness of the national economy and with regard to the benefit and applicability of research results in non-commercial practice.

This most certainly includes, for example, environmental protection, where research results from biological fields are used, or state administration, where the expertise of professionals in the social sciences can be applied.

Science for Practical Use

In 2018, preparations were made for the forthcoming regular internal evaluation of the CAS. Adequate projection of criteria reflecting socio-economic relevance was a fundamental problem that was addressed and extensively discussed in the Council for Cooperation with the Business and Application Sphere, and subsequently in the Working Group for Applied Research Evaluation. The criterion of socio-economic relevance had already been taken into account in the previous evaluation, but feedback from the institutes has shown that positive evaluations of those who focus on the application potential of their results have not had the appropriate impact.

> The criterion of socio-economic relevance had already been taken into account in the previous evaluation, but feedback from the institutes has shown that positive evaluations of those who devote attention to the application potential of their results have not had the appropriate impact.

In the discussion on the evaluation, participants tried to find answers to the questions as to whether to separate so-called basic and applied research and to evaluate them separately, and according to which criteria they actually evaluate socio-economic relevance at all. The conclusion which, through the Working Group for Applied Research Evaluation, has ultimately been reflected in the principles for the forthcoming evaluation, has led to the abandonment of the division of research into basic and applied. Indeed, basic research can have and often does have significant application potential, while applied research does not always necessarily lead toward application.

The approach of the Czech Academy of Sciences, which is based on research without attributes, is also formulated in this spirit. Evaluation criteria are established in a uniform manner and cover both excellence and application potential. For the first phase of the evaluation, the criterion "application potential" has been chosen. Application potential must be identified by external evaluators based on their expertise and knowledge of the field. Evaluation according to economic criteria has been abandoned because it would lead to a preference for elementary developmental or design work at the expense of quality research, and would not take into account non-commercial applications.

Lasers for micromachining, process station – HiLASE Centre, Institute of Physics of the CAS

Intensive efforts with the long-term goal of systematising the transfer of knowledge within the CAS focus on education and increasing awareness of the academic scientific community and identification of obstacles which are preventing efforts to transfer knowledge effectively. Therefore, 2018 also saw the organisation of training and seminars for institutes on the transfer of knowledge and technology. These were conducted by the Technology Transfer Office of the CAS (CeTTAV), and the Centre of Administration and Operations of the CAS (CAO), in connection with the Operational Programme Research, Development and Education (OP RDE), and focused on the development of expert capacities in the transfer of knowledge and technology. The conclusions, which identify the main obstacles, are directed at evaluations, or rather inadequate evaluations of staff who are engaged in the transfer of knowledge. Legal uncertainty about the handling of intellectual property is strongly perceived. Prob-

lems of evaluations at the level of individual institutes and teams have been described above, but it is clear that it will still be necessary to address the issue of individual worker attestation, which has a more significant impact on individual behaviour. Identifying and removing obstacles are the initial steps of systematising the transfer of knowledge, and reaching that goal will require considerable effort.

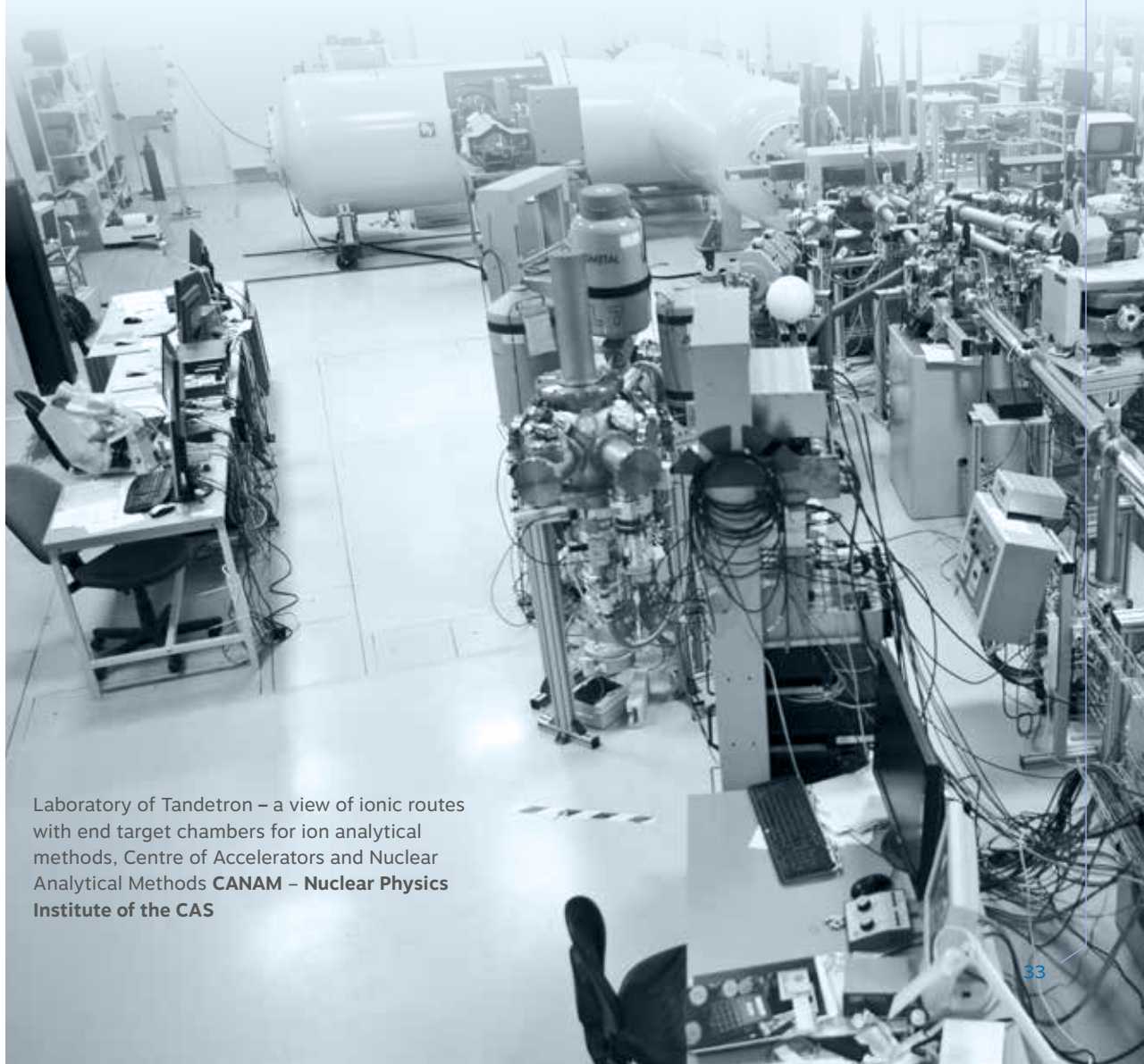
The accession of the CAS to the TTO Circle (European Technology Transfer Offices Circle), which operates as part of the Joint Research Council of the European Commission, was negotiated in 2017. It has proved to be very beneficial for the efforts of the CAS to systematise the transfer of knowledge in an international and European context. In 2018, the CAS presented itself as a new full member at the TTO Circle Plenary Meeting in France.

At the end of 2018, a kick-off meeting of the Competence Centre for Knowledge Transfer was held in Brussels with the aim of providing expert advice on EU policy. The meeting identified obstacles to knowledge transfer at European level, which are not fundamentally different from the difficulties in the Czech Republic. Implications in intellectual property management, the concept of "Open Access", the evaluation of science, and a range of other problems can be expected.

Other events in 2018 included the continuation of a constructive dialogue with the Czech business community represented by the Confederation of Industry of the Czech Republic (hereinafter referred to as the "CICR"), both at the highest level through meetings of the President of the CAS and the President of the CICR, and at the level of CICR research groups and the Council for Use of Intellectual Property of the CAS. A joint initiative is being undertaken aiming to create a modular set of model collaborative research and application agreements inspired by the British Lambert Agreements, however following the DESCA system as a model which is used in the EU. In joint negotiations, both parties reached the same conclusion that many results of successful cooperation between institutes of the CAS and various Czech companies will not come to the attention of the non-professional public or the political representation at all. Therefore, they are searching for a suitable form of promoting such cooperation.

In 2018, Professor Petr Konvalinka, whose candidature was supported by the CAS, was elected the new Chairperson of the Technology Agency of the Czech Republic. The Council for Cooperation with the Business and Application Sphere provided a platform for a meeting with the new chairman, who was informed, among other things, about the experience of the CAS institutes with programmes of the TACR, in particular the programme of National Centres of Competence, with which a number of the CAS institutes are involved. It is worth mentioning that four projects are being coordinated directly by the institutes of the CAS. The dialogue with the TACR is and will continue to be very important for cooperation with the application sphere.

The Czech Academy of Sciences has also been actively involved in the wording of key government documents concerning the research environment. In 2018, this concerned updating the national RIS3 strategy. The strategy is formulated at the level of Innovation Platforms, where the Czech Academy of Sciences is proportionately represented by a number of prominent scientific figures. Employees of the CAS have also contributed to the formulation of the strategy "Czech Republic – innovation leader 2030", preparations for which began in late 2018.



Laboratory of Tandetron – a view of ionic routes with end target chambers for ion analytical methods, Centre of Accelerators and Nuclear Analytical Methods **CANAM – Nuclear Physics Institute of the CAS**

Significant Examples of Cooperation

with Industrial Partners

Biology Centre of the CAS

New, original technology for automatic comprehensive analysis of protic metabolites in blood serum (plasma), based on metabolomic PGL MXP-S kit for automatic blood serum (plasma) sample preparation developed by robotic device MetaboAuto® controlled by the Robolab programme. In collaboration with Pragolab, s. r. o.

Institute of Botany of the CAS

A new method of producing high-polyunsaturated fatty acid oils and oleic acid using the strain of algae *Bracteacoccus bullatus*, which is deposited under number CCALA 1210 in the Culture Collection of Autotrophic Organisms of the Institute of Botany of the CAS in Treboň. Products of the algal strain – linoleic acid and α-linoleic acid, oleic acid and vaccenic acid – are useful as supplements of human and animal food. Another possible application is industrial production of high-polyunsaturated fatty acids.

Institute of Physics of the CAS

Design of fibre bundle production technology. A fibre bundle can be used to efficiently transmit a laser beam to an application site where the beam can be guided all the way to the machining head on a robotic arm. This will therefore make it easier to use pulse lasers for surface treatment of parts and materials, such as for LSP technology in the experimental hall E2. In collaboration with SQS Vláknová optika, a. s.

Institute of Physiology of the CAS

The institute has created carriers based on plant cellulose with modifications of fibrin nanofibre for potential skin cell transfer into chronic wounds. The materials promoted adhesion and growth of human dermal fibroblasts in vitro. It has potential as a suitable material for accelerating the healing of skin wounds. In collaboration with Holzbecher, spol. s r. o.

Institute of Microbiology of the CAS

Optimisation of pilot fermentation with a volume of 1000 litres for preparation of PHB on waste oils. The technology is used to process waste food oils in biotechnological production of a precursor for production of biodegradable plastics. In collaboration with NAFIGATE Corporation, a. s.

Economics Institute of the CAS

Macroeconomic forecasts for 27 most developing countries using FPAS structural macroeconomic models A "Macro Risk" is also regularly processed for 70 countries. A Macro Risk is a statistical model interpreted by a set of macroeconomic imbalance indicators. In collaboration with OGResearch, s. r. o.

Oriental Institute of the CAS

Training of members of the diplomatic corps, employees of the Ministry of Foreign Affairs and employees of public administration bodies and a specialised unit of the Ministry of the Interior on the subject "Contemporary Islam – Tendencies and Dynamics".

Institute of Sociology of the CAS

An analysis of the development of views of the population of nine locations selected for deep geological repositories between 2007 and 2018. The results will be used by state and public authorities, as well as by local governments in the selected locations. In collaboration with the Czech Radioactive Waste Repository Authority.

Institute of Inorganic Chemistry of CAS

A process of synthesis of mixed nanomaterial based on sodium metatitanate and waste matter (sawdust, wood mass, wood chips, etc.) has been developed. These are sorbents for treating potential waste from nuclear installations and for removing heavy metals from the environment. In collaboration with ÚJV Řež, a. s.

Institute of Vertebrate Biology of the CAS

On the basis of data supplied by economic subjects, an analysis of inputs and outputs of nutrients (N and P) related to agricultural interventions on ponds in the Hracholusky Reservoir catchment area has been conducted. In collaboration with Aquatis Brno, a. s.

Institute of Chemical Process Fundamentals of the CAS

Equipment for preparation of an additive for asphalt mixtures based on a eutectic mixture of plastics which is suitable for additivation of packaged mixtures for the construction of new roads. Based on microwave energy, the device makes it possible to melt a mixture of waste plastics, which subsequently join together to form a final additive with different softening points. In collaboration with Pozemní komunikace Bohemia, a. s.

Institute of Experimental Medicine of the CAS

The use of polysubstituted pyrimidines as inhibitors of prostaglandin E2 production. Since the pyrimidine derivatives under consideration are potent non-toxic inhibitors of PGE2 production, they can be considered useful agents for the development of new drugs which could be useful in the treatment of inflammatory and tumour diseases.

Institute of Photonics and Electronics of the CAS

A colloidal diffuse source of phosphorus for the preparation of doped silicon. Technology and an optimal composition of colloidal phosphorus solutions for the preparation of power semiconductor devices have been developed. In collaboration with ABB, s. r. o.

Institute of Physics of Materials of the CAS

A detailed metallographic study of the causes of strong localised corrosion attacks in the proximity of circumferential welds of stainless steel kegs after their use in a coastal environment. In collaboration with Schäfer-Sudex, s. r. o., Ledeč nad Sázavou.

Institute of Plasma Physics of the CAS

The institute has developed ceramic, primarily corundum protective coatings for key glass furnace components, such as molybdenum stirrer shafts. In collaboration with Kavalierglass, a. s.

J. Heyrovský Institute of Physical Chemistry of the CAS

Commercial microcrystalline NMC material has been mechanically and thermally treated using a procedure developed by the company HE3DA.

Researchers have studied the influence of the material's morphology on its electrochemical behaviour, particularly the charge capacity and cycle stability of batteries. In collaboration with Eaton Elektronika, s. r. o.

Institute of Macromolecular Chemistry of the CAS

A new rectal suspension for treating inflammatory diseases of the end section of the gastrointestinal tract. This new treatment, unlike previously used products, has no systemic side effects on the body. In collaboration with VH Pharma, a. s.

Institute of Organic Chemistry and Biochemistry of the CAS

The institute has worked on new compounds which act against tumour-initiating cell proliferation and which can be used against a wide range of cancers of various histogenetic origins. Means of preparing them and drugs containing them have also been in development. The substances may be useful as drugs or ingredients of drugs against cancer or solid tumours.

Institute of Scientific Instruments of the CAS

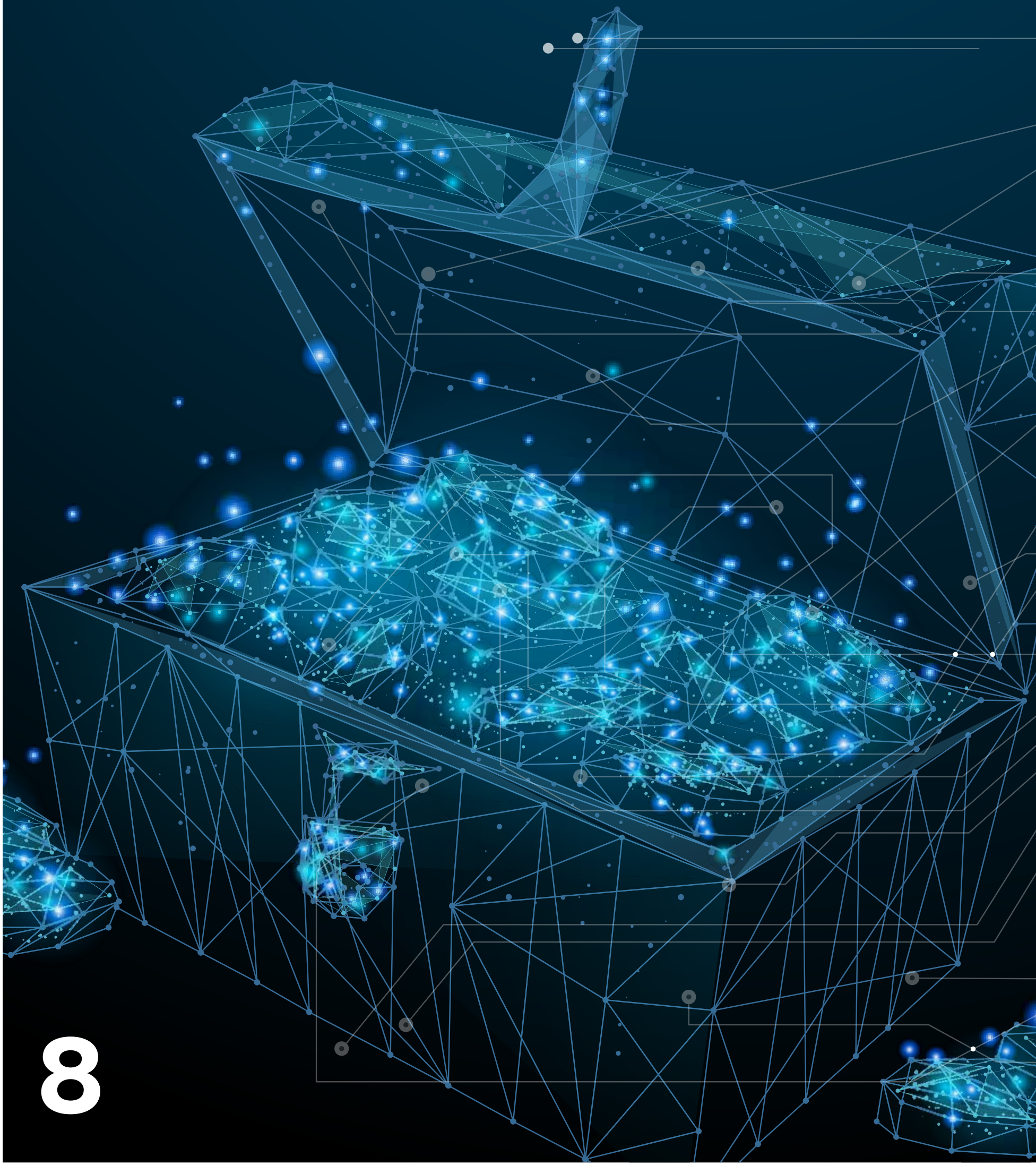
A new tried and tested technology consists of a complex of elements for transmitting super-stable time and frequency over optical fibres and a free atmosphere coupled to a functional unit that serves for long-term use in accurate time and frequency metrology. In collaboration with Network Group, s. r. o.

Institute of Thermomechanics of the CAS

Proposed optimisation of the heel section of the ultra-long circulating blade of a high-power steam turbine with a straight leg. Based on experiments and CFD simulations for basic variants, an optimised version, which will be used in real operations, was designed and tested. In collaboration with Doosan Škoda Power, s. r. o.

Global Change Research Institute of the CAS

Forecasts of electricity generation from solar and wind power plants increase electricity supply efficiency and, in some cases of overproduction of energy, prevent overloading of the transmission grid (blackouts). In collaboration with E.ON Energie, a. s.

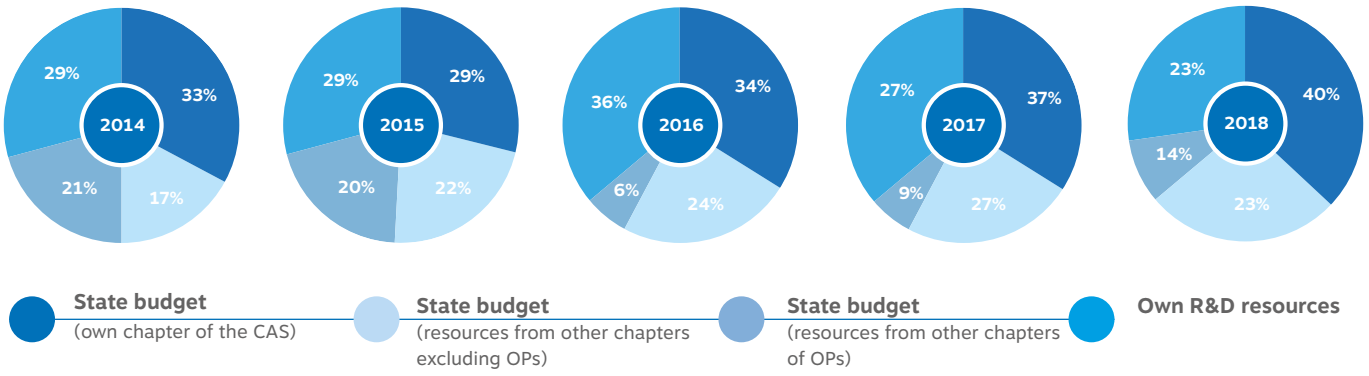


Financial Resources

and Their Utilisation

In 2018, the Czech Academy of Sciences managed a total of CZK 13,943.4 million, of which CZK 5,619.7 million came from its own budget chapter of the state budget (SB). The share of resources from its own budget chapter to the total financial resources of the CAS was 40% in 2018. The year-on-year increase in the share of resources from its own budget chapter of 3% was mainly due to the reduction of the resources of public research institutions (a decrease in income from licenses of the Institute of Organic Chemistry and Biochemistry) and a drop in resources from other chapters (without operational programmes).

Graph No 3: Financial resources of the CAS (in %)



Financial resources (for the entire CAS) originating from the budget chapter, from subsidies from other budget chapters, and from its own resources are summarised in the following overview.

Table No 5: Structure of financial resources (real resources) in millions of CZK

NAME	Non-investment resources	Investment resources	TOTAL
Resources from the budget chapter of the CAS	**4,505.8**	**1,113.9**	**5,619.7**
Subsidy from other budget chapter	**4,067.4**	**1,107.6**	**5,175.0**
GACR grants	1,634.3	0.4	
TACR projects	155.0	0.0	
projects of other providers – excluding operational programmes	1,391.3	0.0	
projects of other providers – operational programmes	886.8	1,107.2	
Own R&D resources	**3,148.7**		**3,148.7**
main activity orders	214.8		
sales of publications	108.1		
rent	98.3		
licences	1,420.1		
sales of goods and services	196.7		
conference fees	28.5		
interest and exchange-rate profits	194.2		
sales of material and securities	128.8		
foreign grants and donations	428.1		
own fund resources	182.1		
other	149.0		
Total resources	**11,721.9**	**2,221.5**	**13,943.4**

From the total revenues of CZK 11,628.5 million, the institutes of the CAS used CZK 10,710.6 million to cover their own expenses and as of 31 December 2018, had achieved a total profit of CZK 917.9 million.

> Compared with 2017, the total expenses of the institutes of the CAS decreased by CZK 127 million.

Since the institutes of the CAS are managed as public research institutions in the system of non-governmental organisations, they do not need to close their accounts until 30 June of the following year. Their financial statement must be verified by an auditor. Therefore it is necessary to regard the following analysis of their management as preliminary.

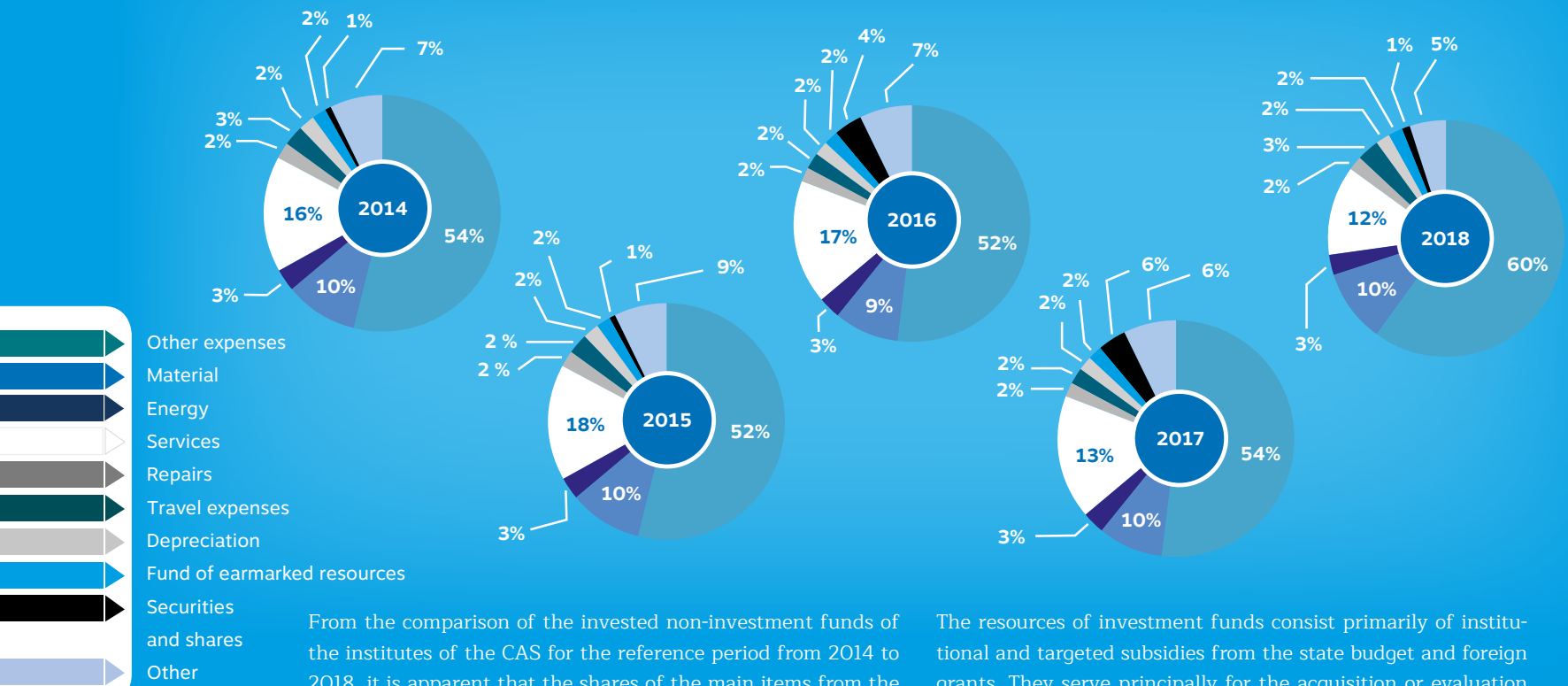
Compared with 2017, the total expenses of the institutes of the CAS (public research institutes) decreased by CZK 127 million. A detailed breakdown of the expenses of the institutes of the CAS is provided in the following table.

Table No 6: Structure of non-investment expenses of the institutes of the CAS (in millions of CZK)

NAME	2017	2018	Difference
personnel expenses (wage costs, mandatory insurance paid by the employer, refunds on sickness insurance benefits)	5,887	6,449	561
purchase of material (e.g. books, magazines, small tangible assets, material consumption and protective equipment)	1,077	1,095	18
purchase of energy, water and fuel	281	289	8
purchase of services (postal services, purchase of small Intangible assets, rent, conference fees and other services)	1,390	1,321	-69
repairs and maintenance	260	219	-41
travel expenses	244	283	39
creation of funds, total earmarked funds	187	207	20
transfers to a social fund and other social expenses	207	225	17
taxes and fees	192	212	20
depreciation of fixed assets	214	213	-1
exchange rate losses	195	33	-162
securities and shares (sale)	665	121	-544
other expenses (accident insurance, fines and damages)	109	127	18
inventory charges of own activities	-11	-14	-3
activation of material, goods, services and property	-59	-69	-10
Total	**10,838**	**10,711**	**-127**

A substantial cost item consists of accounting depreciation of assets acquired from subsidies amounting to CZK 1,502.7 thousand, which are not included in this analysis.

Graph No 4: Use of non-investment funds (in %)



From the comparison of the invested non-investment funds of the institutes of the CAS for the reference period from 2014 to 2018, it is apparent that the shares of the main items from the total sum of expended funds has changed very little.

The resources of investment funds consist primarily of institutional and targeted subsidies from the state budget and foreign grants. They serve principally for the acquisition or evaluation of buildings and instruments and, where necessary, their maintenance and repair.

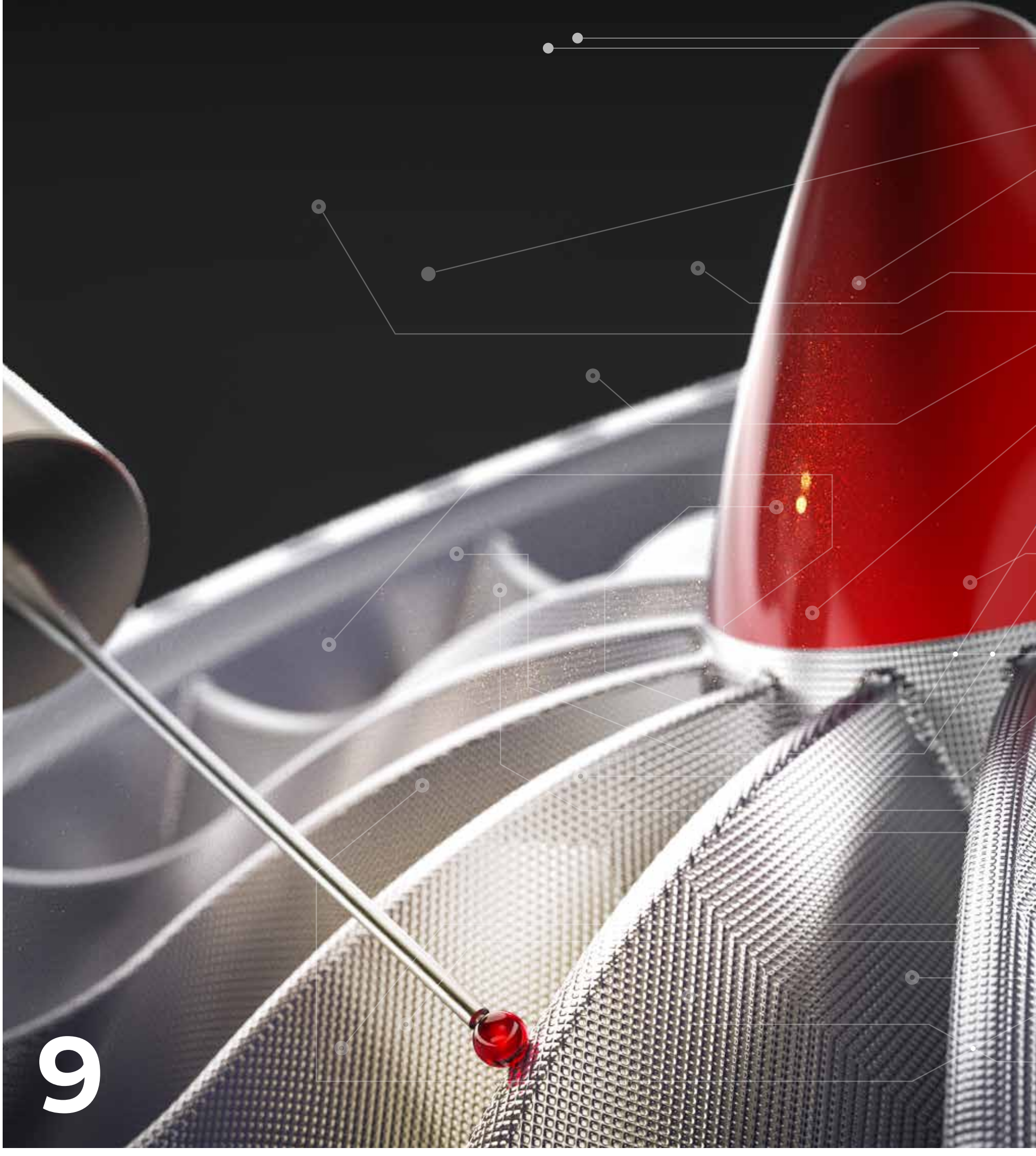
Table No 7: Investment resources of the institutes of the CAS (in millions of CZK)

NAME	2017	2018	Difference
resources from the budget chapter of the CAS	989.7	1,113.6	123.9
resources from other providers, including operational programmes	1,419.3	1,107.6	-311.7
depreciation	207.7	238.2	30.5
transfer from improved profit	60,4	57,8	-2.6
foreign grants and donations	129.6	106.3	-23.3
revenue from the sale of fixed assets	41.3	69.1	27.8
combination of funds for acquiring fixed assets	0.6	10.4	9.8
Total	**2,848.6**	**2,703.0**	**-145.6**

Table No 8: Use of investment resources in the institutes of the CAS (in millions of CZK)

NAME	2017	2018	Difference
financing of buildings	372.1	331.0	-41.1
acquisition of instruments and equipment	1,714.1	1,980.8	266.7
maintenance and repairs	136.2	81.4	-54.8
other	133.7	205.9	72.2
Total	**2,356.1**	**2,599.1**	**243.0**

In 2018, the institutes of the CAS used CZK 2,599.1 million from investment resources in the sum of CZK 2,703 million. The asset reproduction fund was increased by CZK 103.9 million.



Support of Excellence

Part of the scientific policy of the Czech Academy of Sciences is the support of excellent research in its institutes. The CAS implements this support in a number of ways. Well known is the Academic Premium (Praemium Academiae), which serves to support scientists working on excellent research in all scientific fields. Another means of support is the Otto Wichterle Award, which is aimed at prospective young researchers.

The Czech Academy of Sciences supports prominent scientists who are invited to collaborate from abroad with funding known as the Jan Evangelista Purkyně Fellowship and the Lumina Quaeruntur Research Fellowship.

The Czech Academy of Sciences also provides targeted financial support to early career scientists by way of three further programmes (the Programme to Support Prospective Human Resources, the Programme for Research and Mobility Support of Early Career Researchers, and the Josef Dobrovský Fellowship Programme). Successful scientists are annually rewarded for their outstanding scientific results with the prestigious Prizes of the Czech Academy of Sciences.

PRAEMIUM ACADEMIAE – ACADEMIC PREMIUM

The Academic Premium is the most significant financial premium of the Czech Academy of Sciences for support of scientific excellence. It is awarded to outstanding scientists who excel in their fields and provides them with both financial and moral support for further scientific work on a globally comparable scale. The financial sum of CZK 5 million a year associated with this award aims to help recipients cover the costs of their research over a period of six years and, in the longer term, to develop it both by building their own scientific teams and by acquiring required new devices or laboratory material. Thanks to its significance and prestige, as well as its financial sum, the Academic Premium is comparable with grants of the European Research Council (ERC).

IN 2018, THE PREMIUM WAS AWARDED TO:

Prof. PhDr. Pavel Janoušek, CSc., DSc.
Institute of Czech Literature

Pavel Janoušek is an expert in literary and drama theory, and the history of 20th-century Czech literature. He works at the Institute of Czech Literature.

As the editor-in-chief and co-author, he helped to write *Dějiny české literatury 1945–1989 (History of Czech Literature 1945-1989)*, which is one of the most significant works of his team and a fundamental source of information on transformations of literature in the era of communist totalitarianism.

"The award of the Academic Premium opens up the possibility of focusing more deeply on three interrelated issues. A key task for the team's literary section will be the literary and cultural history of the first half of the 20th century, aiming to look at the period from today's perspective within the context of other artistic activities. A second set of problems comes from the need to reflect contemporary literary history, i.e. to analyse emerging production and to put forward the first more synthetic interpretation of both individual works and the literary and social life from which they grow, but also to reflect transformations of artistic creation connected with the transformation of communication under the influence of new media," says Pavel Janoušek.

In the twenty-year history of the Academic Premium, he is only the second laureate from the section of humanities.

RNDr. Jiří Hejnar, CSc.
Institute of Molecular Genetics

Jiří Hejnar is a recognised Czech geneticist and group leader of the Laboratory of Viral and Cellular Genetics of the Institute of Molecular Genetics. His work focuses primarily on retroviruses and epigenetics (changes in gene expression caused by factors other than alterations in a DNA nucleotide sequence), regulation of transcription, regulation of retroviral expression with a host cell, mechanisms of retroviral latency and persistence, or retroviral integration.

Jiří Hejnar describes his research as follows: *"The subject of our interest are retroviruses, widely studied groups of viruses whose hereditary information written in RNA is transcribed into DNA, i.e. the very opposite of what we are used to in other viruses and organisms. Furthermore, retroviruses integrate this DNA into the DNA of the attacked host, creating a provirus. Proviruses work in a similar way to other host genes and serve as a template for viral proteins, which eventually form viral particles capable of attacking other cells."* According to Jiří Hejnar, the study of retroviruses is important for a number of reasons. Indeed, they cause diseases in humans such as HIV-1, and illnesses in domestic animals, such as leukaemia in cattle, cats and poultry.

RNDr. Martin Markl, DrSc.
Institute of Mathematics

Martin Markl is an internationally respected mathematician who specialises in algebraic topology, homologous algebra and mathematical physics. He has achieved fundamental results primarily in connection with operads and their applications in algebra and mathematical physics. He is the author or co-author of 82 expert articles and three monographs, including the widely quoted monograph "Operads in Algebra, Topology and Physics", for which he was awarded the 1st grade medal of the Ministry of Education, Youth and Sports in 2002.

"Research supported by the Academic Premium will also focus on the role of operads in other disciplines and their general characteristics. Our goal is to create a unifying paradigm for diverse types of operads and to use it as a platform for the formulation and proof of various results of algebra, geometry, mathematical physics and category theory," states Martin Markl, adding that his team has worked in an international set-up from the beginning. He wants to support the international dimension of the project through placements for foreign postdoctoral fellows and leading experts, who will be invited to Prague to join the project.

LUMINA QUAERUNTUR RESEARCH FELLOWSHIP

In 2018, the Czech Academy of Sciences established a new instrument to support scientific excellence – the Lumina Quaeruntur Research Fellowship. The Fellowship funds prospective researchers, who can set up their own research team and finance its activities for a period of five years. In order to be eligible for the Fellowship, the researcher must apply for a prestigious European Research Council (ERC) grant or its equivalent at the time of the research, and his/her scientific experience must not exceed 10 years since receiving his/her PhD. Support is not solely intended for Czech scientists but also for scientists from abroad.

THE FIRST WINNERS OF THE LUMINA QUAERUNTUR FELLOWSHIP WERE SIX RESEARCHERS FROM VARIOUS CAS INSTITUTES:

Mgr. Iva Mozgová, Ph.D.
Biology Centre

Together with her research team, Iva Mozgová is going to deal with plant epigenetics.

RNDr. Ondřej Kuda, Ph.D.
Institute of Physiology

Ondřej Kuda and his research team will be studying the metabolism of bioactive lipids, closely related to research of type 2 diabetes.

Mgr. Ondřej Klimeš, Ph.D.
Oriental Institute

Ondřej Klimeš and his team will focus on the connection between national and foreign policy in contemporary China.

RNDr. Hana Lísalová, Ph.D.
Institute of Physics

Hana Lísalová deals with the development of specialised functional surfaces and innovative biomaterials.

Mgr. Marie Buňatová, Dr. phil.
Institute of History

Marie Buňatová and her team will be dedicating their research to migration and mobility in Prague's Jewish community at the transition from the Middle Ages to the early modern period.

Dr. Graham J. Hill, Ph.D.
Institute of Geophysics

Graham Hill will be leading a team focusing on the problem of the emergence of andesitic volcanism. The research will take place on the volcanic land of Katmai in Alaska, the site of the most powerful volcanic eruption of the 20th century on the Earth's surface, caused by the ascent of andesitic magma.

J. E. PURKYNĚ **FELLOWSHIP**

The aim of awarding the J. E. Purkyně Fellowship is to obtain outstanding scientists from abroad for the institutes of the CAS, both scientists of Czech origin who have been working abroad long-term and top foreign scientists, generally younger than 40 years old, and to provide them with adequate funding at CAS institutes for a period of up to five years. These scientists are expected to become leading personalities of creative teams in their respective institutes. In 2018, the CAS funded 32 winners of the Fellowship with a total sum of CZK 30,921 thousand. New proposals have not been accepted since 2018. Funding for projects that have already been approved will continue until 2022 (in one case until 2023).

OTTO WICHTERLE **AWARD**

This award is intended for selected, extraordinarily talented and prospective scientists of the CAS aged up to 35 years. The award bears the name of Otto Wichterle, an outstanding Czech chemist on a global scale, who became President of the Czechoslovak Academy of Sciences after November 1989. The aim of the Otto Wichterle Award is to stimulate young scientists of the CAS whose excellent results contribute towards the development of their relevant scientific disciplines. In 2018, President of the CAS Eva Zažímalová gave the Otto Wichterle Award to the following 23 young scientists:

> The Otto Wichterle Award is intended for selected, extraordinarily talented and prospective scientists of the CAS aged up to 35 years.

I. SECTION OF LIFE SCIENCES

Mgr. Jan Ebr, Ph.D.
Institute of Physics
RNDr. Hana Lísalová, Ph.D.
Institute of Physics
Mgr. Oleksandr Stetsovych, Ph.D.
Institute of Physics
Ing. Jakub Železný, Ph.D.
Institute of Physics
Mgr. Michal Doucha, Ph.D.
Institute of Mathematics
Ing. Daniel Gazda, Ph.D.
Nuclear Physics Institute
Mgr. Petr Brož, Ph.D.
Institute of Geophysics
RNDr. Eva Pejchová Plavcová, Ph.D.
Institute of Atmospheric Physics

II. SECTION OF LIFE SCIENCES AND CHEMICAL SCIENCES

RNDr. Stanislav Musil, Ph.D.
Institute of Analytical Chemistry
Mgr. Jaroslav Kočišek, Ph.D.
J. Heyrovský Institute of Physical Chemistry
Ing. Patrycja Magdalena Bober, Ph.D.
Institute of Macromolecular Chemistry
Volodymyr V. Shvadchak, Ph.D.
Institute of Organic Chemistry and Biochemistry
Mgr. Vojtěch Novohradský, Ph.D.
Institute of Biophysics
MUDr. Helena Pivoňková, Ph.D.
Institute of Experimental Medicine
Mgr. Kateřina Sam, Ph.D.
Biology Centre
MVDr. Kateřina Jirků Pomajbíková, Ph.D.
Biology Centre
Mgr. Veronika Jílková, Ph.D.
Biology Centre
RNDr. Martin Palus, Ph.D.
Biology Centre

III. SECTION OF HUMANITIES AND SOCIAL SCIENCES

Mgr. Petr Vašát, Ph.D.
Institute of Sociology
PhDr. Mgr. Pavel Horák, Ph.D.
Masaryk Institute and Archives
PhDr. Václav Šmidrkal, Ph.D.
Masaryk Institute and Archives
Mgr. Vít Punčochář, Ph.D.
Institute of Philosophy
Mgr. Václav Smyčka, Ph.D.
Institute of Czech Literature

Support for Early Career Scientists

The Academy Council dedicates systematic and long-term support to prospective human resources and the establishment of international cooperation with the youngest scientists. In 2018, it continued its successful support programmes for early career scientists.

The Programme to Support Prospective Human Resources – Payroll support for postdoctoral students in institutes of the CAS (the PPLZ programme) is intended for post-graduate students (two years after the defence of their PhD thesis or equivalent, or four years in the case of a long-term foreign study stay or child care).

In 2018, within the scope of two calls of the PPLZ programme, 27 candidates were provided with support in the 10th call and 29 candidates in the 11th call (with funding commencing from 1 January 2018 or from 1 July 2018).

The Programme for Research and Mobility Support of Early Career Researchers supports the development of cooperation between the institutes of the CAS and major foreign science and research institutions and enables early career researchers to become involved in international cooperation. In 2018, the CAS funded work on 41 research projects with a total sum of CZK 14,860 thousand.

The Josef Dobrovský Fellowship Programme helps young foreign researchers who need to study local historical, cultural, artistic, linguistic, geographical or natural facts in the Czech Republic for their scientific work. In 2018, funding in a total amount of CZK 290,000 was provided for seven study visits at five institutes of the CAS.

Since 2015, other priorities of the CAS regarding support for early career scientists and international collaboration have included **research and educational activities** for young researchers and students from abroad, which are provided by individual institutes of the CAS with the aim of establishing contacts, training, and possible involvement of high-quality foreign participants in the research activities of institutes of the CAS. In 2018, the CAS supported 14 activities.

AWARDS OF THE CZECH ACADEMY OF SCIENCES

The Czech Academy of Sciences annually awards the following prizes to outstanding researchers for exceptional research results focusing on social priorities which have strengthened the competitiveness of Czech science on an international scale, and which were first published or implemented no more than five years ago.

In 2018, **the Award of the Czech Academy of Sciences for outstanding results of great scientific significance** was handed over by Professor Eva Zažímalová to:

Ing. Radomil Král, Ph.D.
and **Ing. Jiří Náprstek, DrSc.**
Institute of Theoretical
and Applied Mechanics

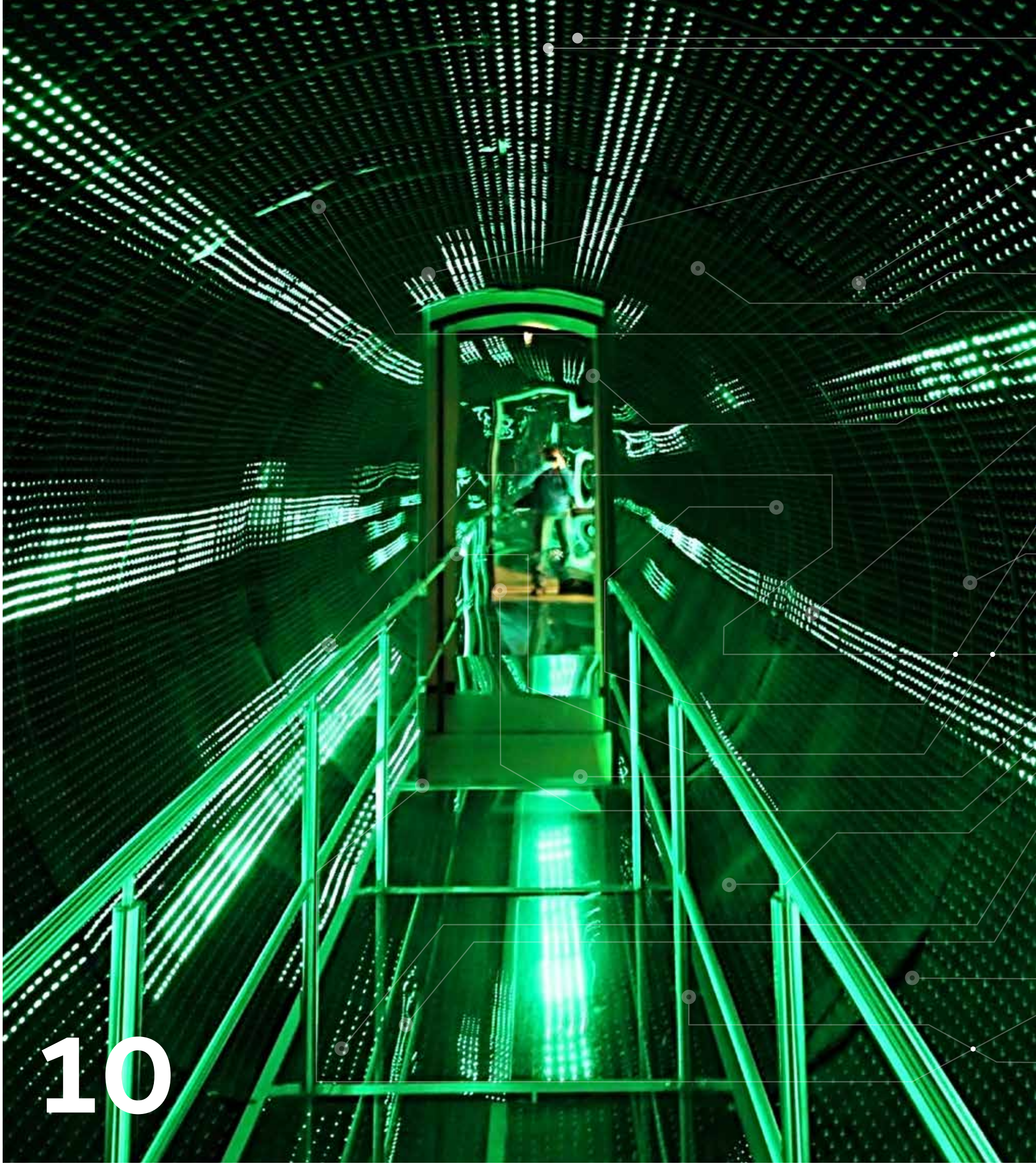
for the scientific result
Multi-Dimensional Fokker-Planck Equation Analysis Using the Modified Finite Element Method

Doc. Ing. Jiří V. Outrata, DrSc.
Institute of Information Theory and Automation

for the scientific result *Stability of Solutions to parameter-dependent optimization and equilibrium problems*

Prof. Ing. Miroslav Oborník, Dr.
Biology Centre

for the scientific result *Evolution and Metabolism of Marine Phytoplankton*



International Cooperation

In the field of international cooperation, the CAS works on the basis of the Concept of Support of International Cooperation of the CAS, which was approved in November 2014. The main objective of the concept is to integrate the CAS, the most significant research organisation in the Czech Republic, into a network of research organisations at European and global level, to present the CAS abroad and to support the involvement of CAS institutes in international research activities. The approach of the CAS to international cooperation in science reflects global, societal and geopolitical challenges and current transformations in the global system of research, development and innovation, which have to be faced primarily by ensuring free movement of researchers, knowledge and ideas. The CAS significantly contributes to the support of internationalisation and research quality, not only through activities of its institutes focused primarily on international bilateral or multilateral cooperation, but also, for example, through the programmes of Strategy AV21.

Programmes of the CAS that support the mobility of researchers are particularly aimed at early career researchers. This support is crucial for their integration into the international research community and for ensuring the future form and quality of research at institutes of the CAS.

> By taking part in international projects, institutes of the CAS carry out top research and gain access to unique scientific infrastructures, instruments, platforms and scientific information sources and data.

The CAS is also traditionally involved in activities of **international non-governmental organisations** whose purpose is to create a global scientific strategy, to seek out a joint approach to common scientific and societal challenges, and to address pan-European and worldwide research and development problems (especially the European Academies Science Advisory Council – EASAC, All European Academies – ALLEA, the International Council for Science – ICSU, and the Inter Academy Partnership – IAP). Within the scope of international organisations and platforms, the CAS has the opportunity to share findings and experience; these need not only be scientific, but can also be political. The CAS also regularly participates in challenges of the SAPEA project, which is part of the programme Horizon 2020. One of the most important international partnerships for the Academy is **cooperation between the Academies of the V4 countries**, whose joint meeting in 2018 was hosted by the CAS. Representatives of the Austrian Academy of Sciences and the Slovenian Academy of Science and Arts also accepted invitations to the meeting, which was held in September 2018 in Liblice.

The CAS considers it to be its duty to not only develop international scientific cooperation but also to publicly support foreign partner organisations in the face of problems brought about by their domestic political situations, and to actively oppose the suppression of academic freedoms and human rights of researchers around the world. The Academy strives to draw the attention of the political representation and the public to such matters, and thereby to cultivate an international scientific environment. Based on a request by the **International Human Rights Network of Academies and Scholarly Societies (IHRNASS)** in 2018, the CAS made statements supporting a number of academics in such countries as Turkey, Vietnam or the United Arab Emirates. It joined the call addressed to the Nicaraguan authorities to ensure freedom of expression and assembly, and to put an end to injustice against people advocating different attitudes. The President of the CAS has also signed an ALLEA statement expressing its alarm at infringements by the Hungarian government into the academic freedoms of the country's universities and a statement of the Academies of the V4 countries on the status of transformations of institutes of the Slovak Academy of Sciences.

In 2018, institutes of the CAS also received numerous foreign delegations; at the request of the public administration (e.g. the Office of the Government or ministries), or foreign representative offices, 46 institutes were visited. The management of the CAS itself received more than two dozen foreign delegations and representatives of foreign representative offices in Prague. The traditional reception Academic Prague, to which the President of the CAS invites representatives of Czech universities and foreign representative offices in Prague, was held in June.

Cooperation within the ERA

At European level, a long-term priority of the CAS remains its further integration into the European Research Area (ERA). By taking part in international projects, institutes of the CAS carry out top research and gain access to unique research infrastructures, instruments, platforms and scientific information sources and data. For some disciplines, a basic prerequisite for their development is the involvement of the Czech Republic in intergovernmental scientific organisations (e.g. CERN, EMBL and ESO). The CAS actively takes advantage of opportunities offered by the framework programme for research and innovation EU Horizon 2020, as well as other EU initiatives in the field of R&D&I, both through the participation of teams from institutes of the CAS in research projects and by participation in related coordination activities. A number of scientists also act as evaluators within each individual call, participate directly in strategic management (e.g. through membership of the European Research Council) or contribute with their expert advice to strategic and political decisions of European research and development institutions (e.g. thanks to participation in the European Research Area Committee – ERAC).

In 2018, the institutes of the CAS participated in research on **90 projects of the Horizon 2020 programme** with funds totalling EUR 7.48 million. At the same time, the CAS participated in **900 projects funded under the 7th EU Framework Programme** for Research and Technological Development, with a total budget of EUR 2.47 million. The CAS regularly applies for renowned grants of the European Research Council (ERC), which are awarded to support top scholarly research directed beyond the bounds of knowledge in a given field. In 2018, three CAS projects received this support: two in the category **ERC Starting Grants** and one in the class **Consolidator Grants**.

A sign of great recognition for work to date on the ground of the **European Strategic Forum for Research Infrastructure (ESFRI)** was the election of a delegate of the Czech Republic and representative of the CAS to the position of its Chair in June 2018. As the very first representative of a Central European country, Jan Hrušák (J. Heyrovský Institute of Physical Chemistry) assumed the position on 1 January 2019.

The CAS also continues to strengthen its ties with the **European Commission's Joint Research Centre (JRC)**. In the first half of 2018,

Carlos Moedas

the CAS and the JRC signed a Memorandum of Understanding on the accession of the CAS into the TTO Circle networking platform (European Technology Transfer Offices Circle), which concerns cooperation in technology transfer. For a better overview of cooperation to date, the joint activities of the JRC and institutes of the CAS were mapped in 2018. The results of this investigation will serve as a starting point for further development of mutual relationships.

One of the most significant events of 2018, not only for the CAS but also for the Czech Republic itself, was the June **visit to the Czech Republic of European Commissioner Carlos Moedas**, a representative of the European Commission responsible for creating and implementing EU policies in the field of research and innovation. During his stay, he visited the CAS, spoke to its representatives and visited the ELI Beamlines laser centre. He pointed out, among other things, the potential of this research infrastructure for European research and highlighted it as an example of good practice for successfully combining structural funds with the framework programme funding. In October 2018, the management of the CAS met another important representative of European scientific policy, the new Director General of the European Commission for Research and Innovation (DG RTD) Jean-Eric Paquet.

Bilateral and Multilateral Cooperation

In 2018, the CAS continued to strengthen bilateral and multilateral relationships with partner organisations from around the world. As regards bilateral relationships, the CAS has long monitored the interests of its institutes and mapped their existing and potential partners abroad. In 2018, bilateral international activities were implemented with **28 partner organisations from 24 countries**. Contractual documents with 12 partner organisations have been updated and one new cooperation agreement has been entered into. Within the scope of bilateral cooperation, **127 projects** were addressed to support the mobility of researchers, whose funding exceeded CZK 6 million.

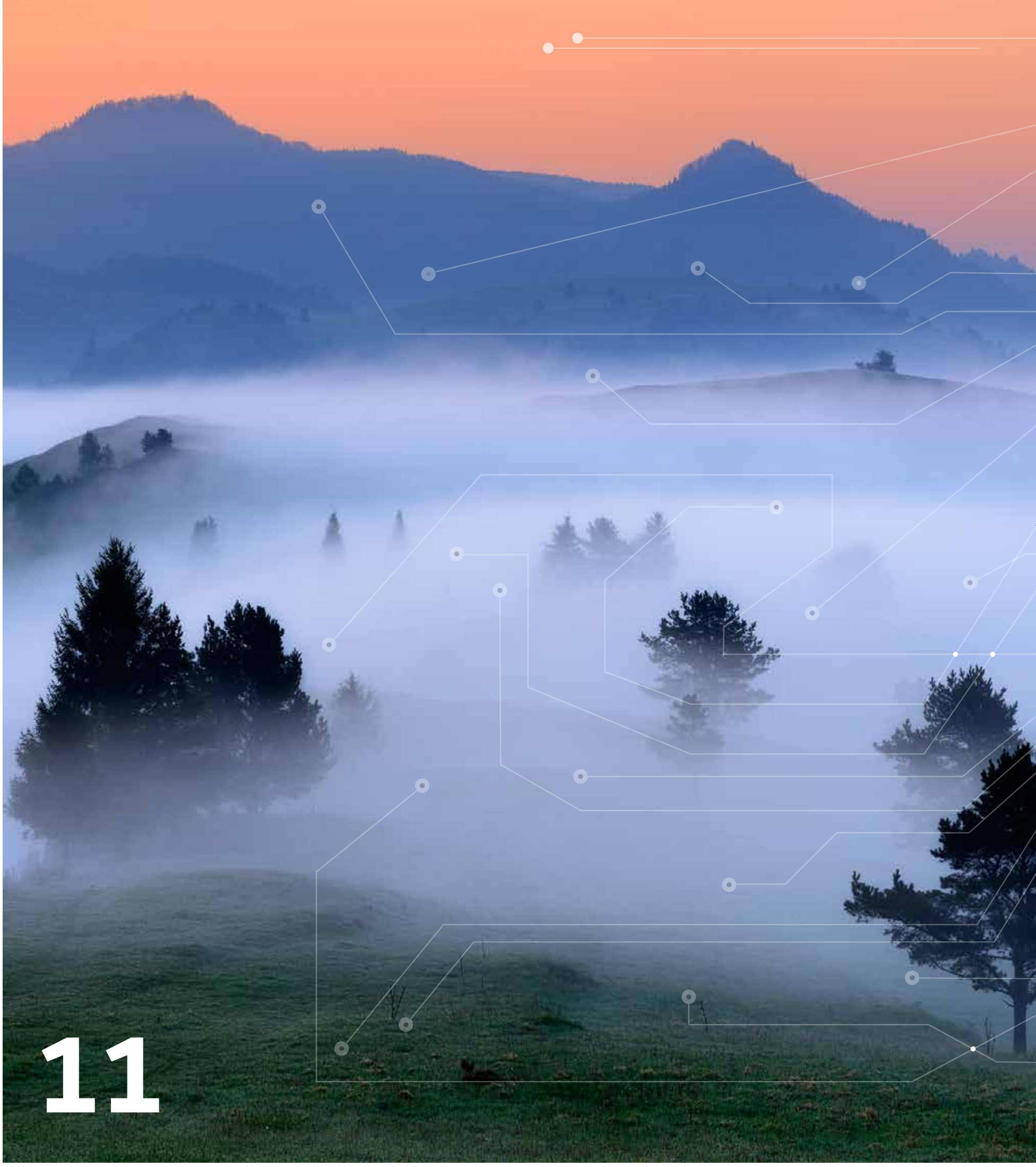
For the purposes of establishing or strengthening bilateral relationships, 2018 also included important journeys **of CAS representatives to Taiwan and the USA**. In both countries, delegations headed by the President of the CAS visited partner organisations of the Academy, expressed their interest in mutual cooperation and, together with foreign partners, sought new opportunities and fields. While visiting the USA in October 2018, President of the CAS Eva Zažímalová signed new long-term cooperation agreement with the University of Memphis.

The CAS continues to develop multilateral cooperation by engaging in joint research programmes within the **HERA** and **NORFACE** partnerships founded on a broad initiative of member states supported by the European Commission. A specific example of successful cooperation within the NORFACE partnership is the three-year project DAISIE, commenced in January 2018. The researcher is the Institute of Sociology, which was provided with a grant of CZK 1.25 million for 2018. In 2018, the CAS also joined the call Governance or "Democratic Governance in a Turbulent Age", opened by the NORFACE programme. Success was also achieved in the HERA research programme, where the VICTOR-E project, researched by the Institute of Contemporary History, succeeded in its fourth run. In 2018, the CAS also joined the 5th call for joint multilateral projects in the platform **EIG Japan**.

A total sum of almost CZK 800,000 was used to fund 19 activities, implemented with the help of an extraordinary subsidy which the CAS obtained from the Office of the Government of the Czech Republic, for the development of cooperation with leading scientific research institutes in Israel. On the basis of another extraordinary subsidy from the Office of the Government, this time for the **development of cooperation with leading research institutes in Taiwan**, the CAS implemented and funded 24 activities with a total value of CZK 1.1 million. 2018 also saw the next stage of the **Programme for Research and Mobility Support of Early Career Researchers**, launched in 2016 (see p.47).

A further programme to continue in 2018 was cooperation of the CAS with the French National Centre for Scientific Research (CNRS), Charles University in Prague and the French Embassy in the Czech Republic within the framework of the **CEFRES Platform**.

The establishment of the CEFRES Platform was made possible by a treaty signed on 21 November 2014 by by representatives of the The French Embassy in the Czech republic, the CEFRES, the Czech Academy of Sciences and Charles University in Prague. It has therefore created a common foundation for scientific collaboration that has opened up space for research in the social sciences at a qualitatively higher level than before. The strengthening of non-university research in the structure of CEFRES activities by the Czech Academy of Sciences has enabled the opening of the TANDEM programme, which is based on cooperation between scientists of the CAS, the CNRS and postdoctoral fellows or PhD students of CEFRES and Charles University. In the first year, a project entitled Bewildering Boar Project gained funding; anthropologist Mgr. Luděk Brož MPhil., PhD of the Institute of Ethnology and anthropologist Virginie Vaté, PhD of the CNRS, Groupe Sociétés, Religions, Laïcités, are involved in its research. It is a scientific incubator for researchers preparing an ERC grant with the ability to build teams that will develop topics for further collaboration.



11

Regional Cooperation

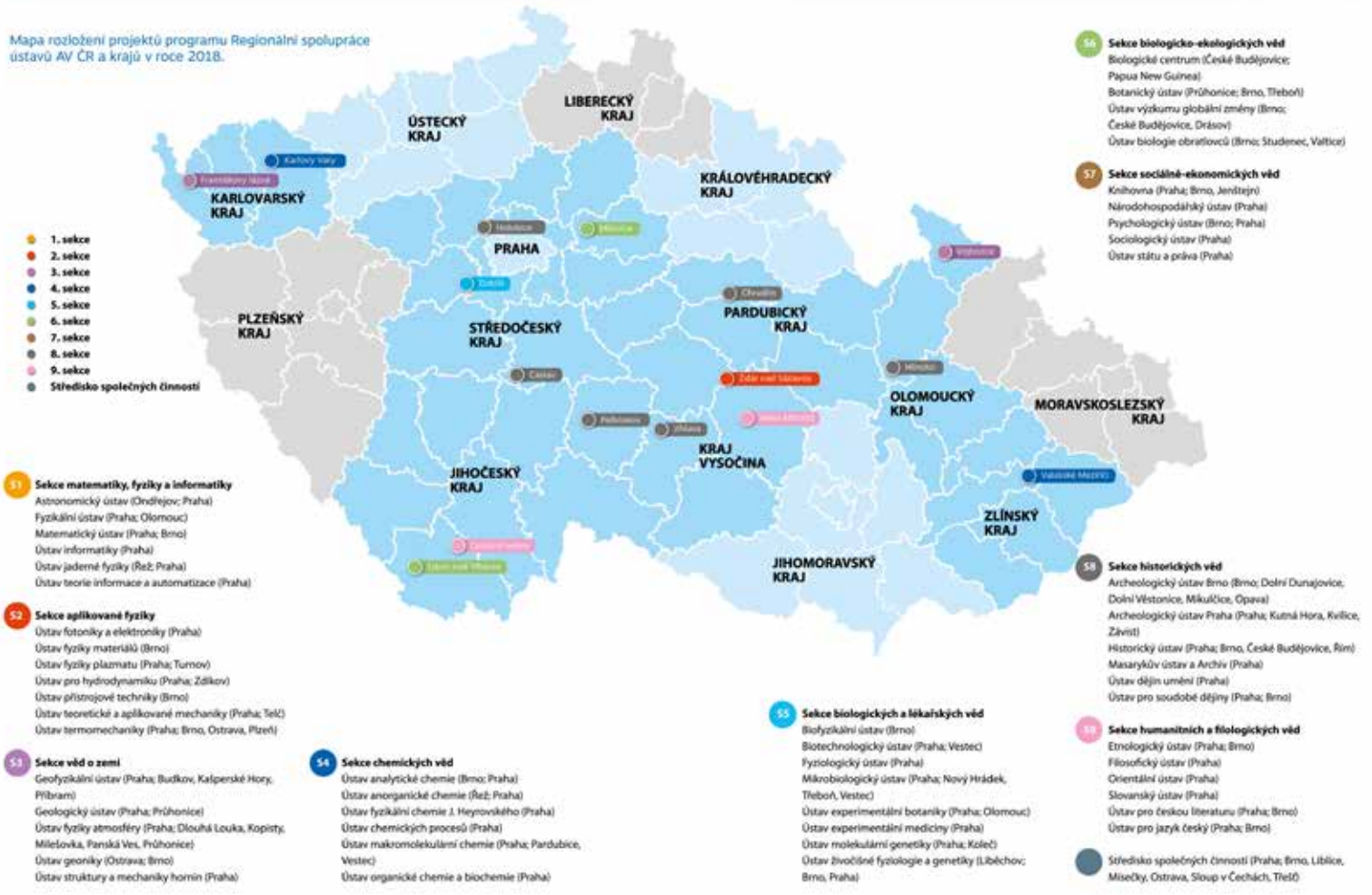
The Czech Academy of Sciences helps regions and microregions of the Czech Republic to improve their quality of life through jointly funded research projects and their application. This is rooted in agreements progressively entered into with the Association of the Municipalities of Orlicko (2003), the South Moravian Region (2008), the City of Brno (2008), Prague Urban District 1 (2009), the Pardubice Region (2013), the Hradec Králové Region (2013), the Vysočina Region (2014), the Zlín Region (2015), the Ústí nad Labem Region (2015), the Central Bohemian Region (2016), the Karlovy Vary Region (2016), the Olomouc Region (2017) and the South Bohemian Region (2018). In 2018, the majority of these agreements were successfully performed in 16 joint projects, financed according to the agreements of the institutes of the CAS and their regional partners.

Based on a proposal of the Committee for Regional Cooperation, the Academy Council decided to finance projects submitted for the first call at its 9th session on 28 November 2017 and, at its 14th session on 22 May 2018, it approved subsidies for projects proposed by the specified committee for support from the second call.

> Regional cooperation projects of institutes of the CAS in 2018 dealt with topics of cooperation with observatories, research of changes in the landscape (lake management or species organism diversity), and health and economic issues in regions (use of biochar in agriculture and environmental protection).

Fig. 1.
Map of the distribution of projects of the programme Regional Cooperation of Institutes of the CAS and Regions in 2018

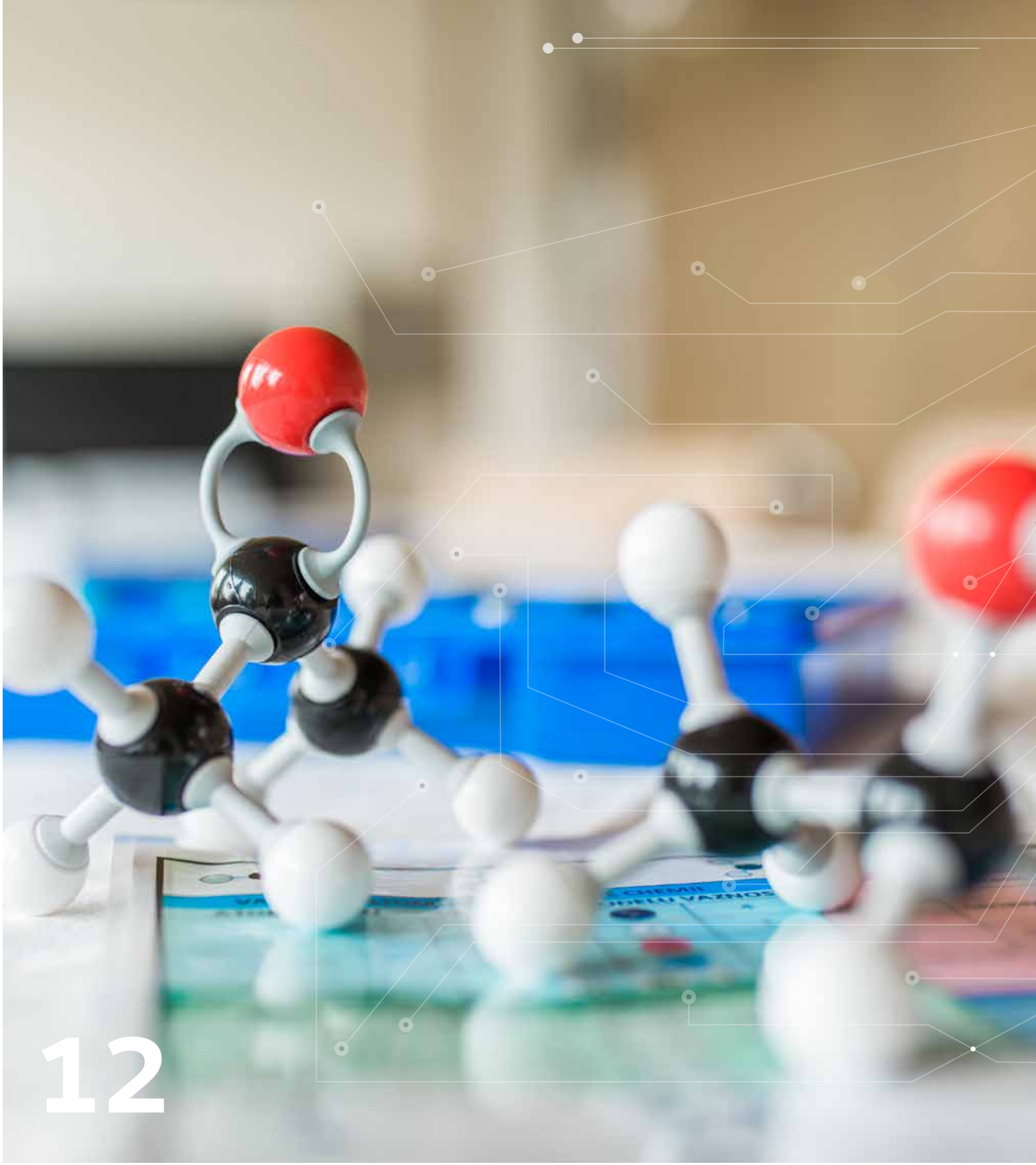
In 2018, institutes of the CAS from the Sections of Applied Physics, Earth Sciences, Chemical Sciences, Biological and Medical Sciences, Biological-Ecological Sciences, Historical Sciences, and Humanities and Philology became involved in regional cooperation. Projects dealt with the following topics: cooperation with observatories, research of changes in the landscape (lake management or species organism diversity), and health and economic issues in regions (use of biochar in agriculture and environmental protection). They also focused on support of research in regional cultural heritage (ancient history, archaeological research, conservation research of building materials and medieval works of art, research of baroque musical culture, and current philosophical themes).



At the European regional level, 2018 saw progress of research and reopening of the Historical Goethe's Adit in the Komorní hůrka Volcano, which, thanks to the efforts of researchers and support from the CAS and the Karlovy Vary Region, has been funded since 2018 by, among others, European Regional Development Fund (ERDF) and the Free State of Bavaria.

Part of the resolution of joint tasks are regular annual meetings, which are held alternately in Prague and Brno in the presence of representatives of the CAS and representatives of regions of the Czech Republic. They serve as an informational, inspirational and discussion platforms for researchers and representatives of regional and local self-governments. For the presentation and evaluation of the results of the subsidy provided for regional cooperation in 2018, which was held in Brno on 9 April 2019, the Committee for Regional Cooperation selected six out of 16 jointly submitted projects and one project for cooperation between archaeologists in the South-Moravian Region, which will commence in 2019:

1. *Reopening of the Historical Goethe's Adit in the Komorní hůrka Volcano*, Institute of Geophysics, the town of Františkovy Lázně and the Czech Geological Survey;
2. *Analysis of space-time changes and a comprehensive focus on the Hraničná underground mine using 3D laser scanning in order to provide safety for making the mine accessible to the general and professional public*, the Institute of Geonics and Rychlebská báňsko-historická, z.s.;
3. *SeLOS – Joint Laboratory of Observational Spectroscopy*, J. Heyrovský Institute of Physical Chemistry and Valašské Meziříčí Observatory, p. o.;
4. *Monitoring the influence of large herbivores on selected groups of organisms in the SAC Milovice – Mladá*, Biology Centre and Česká krajina o.p.s.;
5. *13th-century silver mining site at Havírna near Štěpánov nad Svratkou – survey, documentation, presentation and protection*, Institute of Archaeology, Brno and the Vysočina Region;
6. *Reconstruction of the physical form and living conditions of an inhabitant of a fortified settlement from the late Stone Age near Hlinsko using modern natural scientific methods*, Institute of Archaeology, Brno, and the Komenský Museum in Přerov;
7. *Joining forces to discover a joint archaeological heritage*, Institute of Archaeology, Brno and the South-Moravian Region.



Educational Activity

Education of a young generation of scientists and quality improvement of the national education system at all levels are considered to be a crucial part of the mission of the CAS. Cooperation with universities stands at the centre of attention, particularly the doctoral study programmes.

Employees of the CAS also directly teach or supervise university students and manage variety of educational and training programmes aimed at secondary school students and teachers.

COOPERATION WITH UNIVERSITIES

> In 2018, employees of institutes of the CAS trained 1,995 doctoral students and also participated in the supervision of bachelor and master programme students.

An amendment to Act No 111/1998 Coll., on Higher Education Institutions requires the National Accreditation Bureau to accredit doctoral programmes which are implemented by individual institutions in cooperation with universities. A mandatory part of applications for accreditation consists in cooperation agreements between the Czech Academy of Sciences and the relevant university during the implementation of doctoral programmes. The Academy Council has drawn up a model of such an agreement and is gradually negotiating with the competent officials of individual universities on its specific wording. Agreements have already been signed with sixteen universities and negotiations with others are being conducted correctly and in mutual trust. Together with the Division for Administration of the Head Office of the CAS, several specimen "partial" agreements have also been prepared. Institutes of the CAS will enter into such agreements with university faculties which are applying for accreditation of a study programme. An Agreement on Exchange Stays has also been entered into with Masaryk University, further expanding possibilities for collaboration between Masaryk University and institutes of the CAS.

Mutual relationships between the CAS and universities are monitored and coordinated by the Council for Cooperation with Higher Education Institutions and the Preparation of the Scientific Employees of the CAS, which is one of the advisory bodies for the management of the CAS. The Council met for its annual session on 20 November 2018. The session was also attended by its new member, Prof. Ing. Tatiana Molková, PhD, of the Praesidium of the Council of Higher Education Institutions. Long-standing good relationships between the Council of Higher Education Institutions and the Council for Cooperation with Universities also documents the fact that, conversely, the Chair of the Council for Cooperation with Universities, RNDr. Pavel Krejčí, CSc., is regularly invited as a guest to meetings of both the Praesidium and the Assembly of the Council of Higher Education Institutions.

The institutes and employees of the CAS participate extensively in the education of students at both public and private universities. In 2018, employees of the CAS provided more than 5,247 semestral cycles of lectures, practical exercises or seminars with a total scope of approximately 71,335 hours. Institutes of the CAS contribute significantly to the education of students and to the management of students' qualification work. In 2018, employees of institutes of the CAS trained 1,995 doctoral students and also participated in the supervision of bachelor and master programme students. Among them, 264 students trained at institutes of the CAS successfully completed their doctoral study programmes.

For many years, the CAS has supported the general education of students of doctoral study programmes by organising a successful and sought-after weekly course on the basics of scientific work, which is intended for students of doctoral study programmes in various fields and whose aim is to cultivate the necessary skills in students to help them to cope with challenging international competition. Courses are held in Prague and in Brno, with 171 students (Prague) and 158 students (Brno) attending courses in 2018. The lecturers are renowned and experienced specialists, mainly employees of the CAS, and the focus of lectures is chosen so as to be useful for doctoral students across all disciplines. In 2018, the main subjects included science methodology, ethical principles in scientific work and bioethics, evaluation of scientific work and Methodology M17+, scientific communication and its written genres, presentation of scientific results, publication in a magazine from the perspective of editorial practice, scientific writing techniques, rhetoric and the culture of the spoken word, lecturing skills, information resources for science, research and education, research funding, targeted funding, intellectual property and its commercialisation, technology and knowledge transfer, English writing course, and more. Feedback which the Academy Council obtains from students proves the sense and significance of holding these courses.

Table No 9: Overview of the most significant activities of cooperation with universities

	2012	2013	2014	2015	2016	2017	2018
Doctoral students trained at the institutes	2,055	2,063	2,030	2,091	2,019	2,175	1,995
Newly accepted doctoral students	391	397	315	376	348	323	376
Number of doctoral dissertations completed	259	224	268	264	263	260	264
Number of semestral cycles of lectures, seminars and exercises	3,980	4,025	4,046	4,246	5,547	4,949	5,247
Number of hours lectured	75,739	74,198	75,342	76,348	75,978	76,423	71,335

PROJECT **OPEN SCIENCE**

The Czech Academy of Sciences offers students of secondary, higher vocational and higher education institutions an opportunity to participate in scientific work through a one-year placement at one of the institutes of the CAS under the guidance of experienced teachers. Student science placements as part of the Open Science project have been running since 2005, and the Czech Academy of Sciences fully finances them. The placements last at least eight hours a month. Travel costs are also covered for students who commute. Some placement courses are available in English. In addition to natural sciences and technical disciplines, since 2016 the humanities and social sciences have also been incorporated. In 2018, more than 120 students of annual study placements at the Czech Academy of Sciences came together from 22 to 23 November 2018 at a two-day Student Science Conference on the premises of the Institute of Molecular Genetics. In front of an expert panel and an audience, they presented the results of their projects in three sections depending on the scientific disciplines. The first section covered biology, chemistry, medical sciences, biophysics and agriculture, while the second included physics, astronomy, mathematics, geography, geology and robotics. The third section concerned the humanities and social sciences, particularly history, art history, philology and sociology. Besides the first three places in each discipline, the panel also awarded special prizes for outstanding creative performances. For 2019, a further 110 topics have been announced covering a wide range of scientific fields and disciplines in all areas represented at the Czech Academy of Sciences.

ACTIVITIES AT SECONDARY AND PRIMARY SCHOOLS

The CAS participates in educational activities at secondary and primary schools through teaching and delivering a wide variety of lectures. An important role is played by the project “Don’t Be Afraid of Science!”, a cycle of lectures given by experts from the Czech Academy of Sciences to both secondary school students and teachers. It focuses on topics closely related to school subjects, mostly about biology, physics, chemistry, mathematics, geography and social sciences.

As part of the Open Science project, the Czech Academy of Sciences is also devoted to the education of teachers of sciences and humanities, especially chemistry, physics, biology, and Czech language and literature.

Media Communications

and Promotion

Continuous, regular and systematic work on popularisation of research results among the widest public is an inherent part of the activities of the CAS.

Employees of the CAS make an effort to bring science closer to non-professionals, to present their specific research activities and research institutes.

They try to raise interest in scientific work not only among the general public, pupils and students, but also in young children.

CZECH ACADEMY OF SCIENCES – MEDIA PARTNER

In 2018, the already established and tested cooperation between the media and employees of the CAS continued. Journalists contacted CAS representatives whenever they needed a profesional opinion on issues not only regarding science and research, but also on the current situation in the Czech Republic and abroad.

These representatives have answered questions about basic and applied research, commented on funding and evaluation of science and research, spoken about the sustainability of scientific centres, Strategy AV21 and the state of the environment, and spoken about their own scientific achievements. Presenters of radio stations, public service television and private television channels have contacted them with requests for interviews or appearances. CAS researchers have also published their own articles in the media.

The result of this cooperation is a number of appearances in the media. In 2018, more than 44,664 outputs featuring the keyword AV ČR (CAS), its variations and other selected keywords and topics relating to the Academy were monitored in the printed media, on the internet and in other media (compared to 28,016 appearances in 2017). The keyword AV ČR and its variations (AV, ČAV, ČSAV, ČAVU) appeared more than 21,248 times (there were 11,760 mentions in 2017). Public-service and private television stations broadcast almost 770 reports, while Czech Radio mentioned the CAS by name 938 times, both during live broadcasts and in reports on Czech Radio's website.

The name of the President of the CAS, Eva Zažímalová, was mentioned on 535 occasions. Strategy AV21 was referred to 198 times. Significant media attention was given to, for example, the Intersucho portal, whose operation supports precisely Strategy AV21, or the signature of a Memorandum of Cooperation between the Ministry of Finance and the CAS. Thanks to support of Strategy AV21, it has been possible to launch a web portal about the Swedish book plunder at the end of the Thirty Years' War.

> One of the key elements of the communication strategy of the Czech Academy of Sciences is cooperation with public-service media – Czech Television and Czech Radio – as well as with other media. In 2018, 21,248 media outputs on the CAS were monitored.

Year 2018 marked a rich round-number anniversary, which the CAS became involved in through numerous activities. In cooperation with the **Masaryk Institute and Archives** and the **Centre of Administration and Operations** the travelling exhibition *The Czechoslovak Republic 1918–1939*, which was mentioned in the media on 178 occasions, was created to mark the 100th anniversary of the First Czechoslovak Republic. 100 years of Czech science were commemorated in the Czech Television series **Hyde Park Civilizace** by Honorary President of the CAS Rudolf Zahradník and current President Eva Zažímalová. In the series of *90' ČT24* titled "Science and Technology in a Hundred Years of the Republic: Foundation of the Czech Academy of Sciences and Arts", appearances were made by former President of the CAS Helena Illnerová and Antonín Kostlán from the **Institute of Contemporary History**.

The editorial office of the newspaper *Lidové noviny* followed up on tried and tested cooperation from previous years to prepare a series to mark 50 years of the occupation of Czechoslovakia with historians from the **Institute of Contemporary History** (Jaroslav Cuhra, Jiří Hoppe, Oldřich Tůma). The newspaper *Mladá fronta Dnes* published a series of articles for the 100th anniversary of the First Republic, which was prepared by the **Institute of History**.

Another "round-number" anniversary to which the media devoted significant attention fell on 24 October, which marked 40 years since the launch of the first Czechoslovak satellite, Magion 1. One of 77 appearances in the media was the TV programme *Hyde Park Civilizace*, which hosted Magion designer Jaroslav Vojta, a researcher from the **Institute of Atmospheric Physics**, and Ondřej Santolík from the same institute.

From October 2018, the magazine *Týden* began to publish the series *Česká věda zblízka (Czech Science Up Close)*, where readers can get acquainted with the CAS through interviews with directors of individual institutes. The series provided interviews with, for example, Martin Pivokonský (**Institute of Hydrodynamics**), Jiří Homola (**Institute of Photonics and Electronics**) and Jiří Kotek (**Institute of Macromolecular Chemistry**).

In 2018, the most significant Czech science award, the National Government Prize, the Czech Head, was awarded to plant geneticist Jaroslav Doležel. This respected scientist from the **Institute of Experimental Botany** has a large share in a breakthrough discovery which helped an international team of scientists to successfully decipher the hereditary code of one of the world's most common crops, bread wheat. The discovery, published in the respected magazine *Science*, will play a large role in the breeding of more resilient varieties. And it was precisely Doležel's team, years ago, who created a strategy for compiling the genome. He also played a part in deciphering the genome of barley, and is currently working on a description of the DNA of rye. 75 media outputs covered the topic and Jaroslav Doležel alone was mentioned 160 times over the course of the year.

The scope of popularisation activities and media outputs regarding individual researchers, their activities, successes and awards, as well as all institutes of the CAS, is so extensive that only a few brief examples can be given in the following text.

RESEARCH AREA I. – MATHEMATICS, PHYSICS AND EARTH SCIENCES

Probably the most cited institute of the CAS in 2018 were the **Institute of Physics** (239 mentions) and its departments ELI Beamlines (391) and HiLASE (180); a total of 810 records. With regard to ELI Beamlines, discussions often focused on possibilities for its funding, which it is guaranteed from national sources until 2021. Czech Radio broadcast a report with the name *V Dolních Břežanech se chystají na spuštění nového superlaseru (Launch of a New Super Laser Planned in Dolní Břežany).* The media also dealt with ELI Beamlines and HiLASE in connection with a visit of the newly appointed advisor of the Czech government research council, Orna Berry, former advisor to the Ministry of Industry of the State of Israel.

The name of Tomáš Jungwirth from the **Institute of Physics**, who has has received the Neuron Award for a significant scientific discovery, appeared 57 times. One of the founders of antiferromagnetic spintronics, he found that so-called antiferromagnets allow data to be written up to a thousand times faster than conventional storage media. In addition, he participated in the creation of a prototype chip that can be interconnected with conventional microelectronics.

The **Astronomical Institute** appeared in the media 376 times in 2018, while its press secretary appeared in the media another 184 times. There were also a number of interviews on various astronomical topics across television and radio stations (ČRo Plus, Radiožurnál, Dvojka), and programmes in cooperation with the editorial science staff of Czech Television, FTV Prima and others. The Institute also published 310 posts on Facebook, the most in its history. It also prepared a series of lectures entitled *Where and How Can We Search for Life in the Universe and How Might It Have Been Created?*, which the Czech Academy of Sciences broadcast on its Facebook page.

In 2018, the **Institute of Hydrodynamics** also captured the attention of the media (102 appearances), providing, among other things, information on the occurrence of microplastics in drinking water. On this subject, Czech Television produced several reports – about their harmfulness, their occurrence in drinking water, and plastic islands in the ocean. It filmed a report on cyanobacteria in Czech waters and an interview

on groundwater reserves. An interview about how water quality in the Czech Republic is deteriorating was broadcast by Radio Prague. Reports on the above topics were also written by national and regional newspapers, and were also published on their websites.

The **Institute of Geophysics** was mentioned in the media 183 times in 2018. Researchers from the Insitute spoke about earthquakes around the world and tremors in Western Bohemia. Its information appeared on the pages of all printed and online newspapers, and in radio and television broadcasts. Journalists also took an interest in uncovering Goethe's Gallery or an underground laboratory which seismologists would like to build underneath the extinct volcano Komorní hůrka.

On Czech Television, Prokop Závada talked about the activity of the volcano Mayon, director Aleš Špičák and Jan Zedník spoke about an earthquake in Alaska, and Petr Brož commented on the launch of a probe to Mars. Josef Horálek reported on the tremors in West Bohemia. Petr Brož appeared on Czech Radio on the programme *An Idea of Jules Verne: Will People Move to a Floating Island?* and also spoke about the topic "Mars: a Planet of Volcanic Giants". On the Institute's website, Jaroslava Plomerová published the article *Scientists Measure Seismic Activity in the Alps: There are also sensors in the Czech Republic*.

RESEARCH AREA II. – LIFE AND CHEMICAL SCIENCES

Early last year, scientists from the BIOCEV Centre at the **Institute of Biotechnology** announced that, in cooperation with the Czech company Smart Brain, s. r. o., they had developed the substance MitoTam, that was capable of completely destroying tumour cells in one of the most aggressive forms of breast cancer. Its discovery is the work of Jiří Neužil, who began working on the project several years ago at Griffith University in Australia. 40 media reports were published on the subject. MitoTam, the treatment of the future became the topic for an interview on Czech Television. A report entitled *Testing a New Cure for Cancer* was broadcast on the main news programme *Události (Events)*, and Jiří Neužil himself appeared on other Czech Television programmes. Czech Radio produced a number of reports on the treatment developed by Czech laboratories.

During 2018, staff of the **Biology Centre** popularised the results of their work and events in their fields in over 1,000 articles, interviews and contributions in print and online media, radio and television reports, and personal appearances. For example, there was great media response to reports on research into fish breeding in the Lipno reservoir and the creation of floating islands made of PET bottles (this topic appeared more than 50 times in the media), reports on research on ticks and their activity during the season (more than 50 appearances), on newly described species of stonefly named after members of the Rolling Stones (mentioned more than 40 times), the discovery of a new beetle, the Moravian Skin Beetle (more than 40 times), an ERC grant awarded to Kateřina Sam (more than 30 times), and reports on new laboratories at the Biology Centre, specifically in ecosystem research infrastructure laboratories (SoWa, almost 30 times) and in the Entomology Institute of the Biology Centre (more than 25 times).

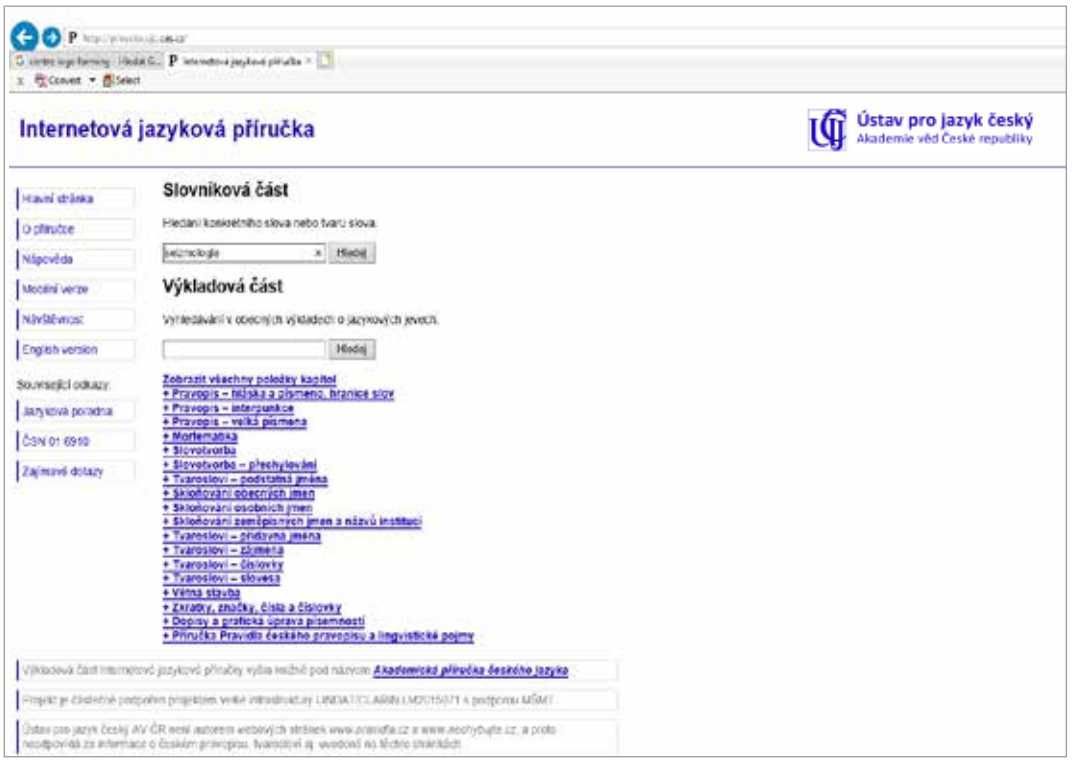
Other subjects widely covered by the media, included news related to the life of large hoofed animals (wild horses, bison and aurochs) at a reservation in Milovice. Researchers from the Centre also contributed to the production of Czech Television documentary programmes – *Magické hlubiny (Magical Depths)*, *Češi zachraňují (Czech Rescuers)* – while the Biology Centre was even mentioned in the 4th episode of Czech Television's six-part original detective series *Vzteklina (Rage)*.

In 2018, the **Institute of Physiology** appeared in the media a total of 218 times; it was mentioned 35 times on Czech Television, 22 times on Czech Radio, 108 times in online publications, 27 times in printed newspapers and lifestyle publications, and 26 times in professional periodicals. As part of the Strategy AV21 programme *Qualitas* the Institute also appears actively in the media on the subject of epilepsy research (International Epilepsy Day). The discovery that epileptic seizures do not occur like lightning bolts out of the blue caused a significant media response, mentioned more than 40 times. Jakub Otáhal, for example, talked about epilepsy on the TV programme *Studio ČT24*. An article on the new discovery was published in *Nature Neuroscience* magazine and in a popular-educational version in *Vesmír (Universe)* magazine – *Epileptické záchvaty a věštění z křišťálové koule (Epileptic Shocks and Fortune-Telling from a Crystal Ball)*, Přemysl Jiruška, Petr Marusič, Jakub Otáhal.

A satisfying topic for the media has been the debate on whether to introduce "winter" or "summer" time on a permanent basis, as evidenced by almost 70 mentions in the media. On the topic of putting an end to setting the clocks backwards and forwards, Alena Sumová appeared on the Czech Televisions programmes *Události* and *Studio ČT24*, as well as on the channel TV Nova, while Helena Illnerová spoke about alternating between summer and winter time on the programmes *Události* and *Události, komentáře*.

RESEARCH AREA III. – HUMANITIES AND SOCIAL SCIENCES

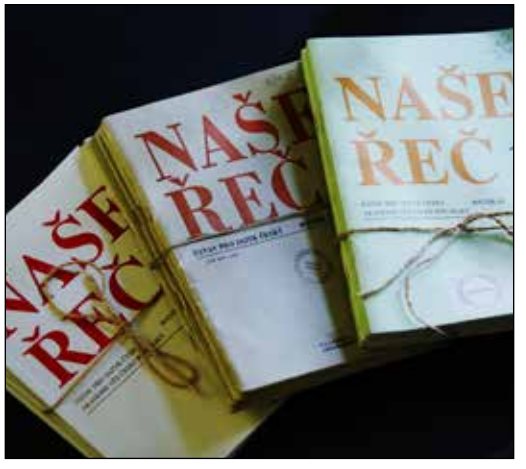
Within the framework of the joint workplace CERGE-EI, researchers of the **Economics Institute** actively participate in popularising and promoting science and regularly contribute to debates on current affairs in the form of media articles and interviews. In 2018, they contributed to the popularisation of science in 20 original articles in the press and more than 400 appearances and quotations in the mass media. They continuously commented on pension reforms, the level of education, and the quality of teachers and their remuneration. They published a study on a proposal to abolish insurance waiting times, while Daniel Münich published comments on methodology for evaluating research organisations according to *Methodology 2017+*. The media also showed an interest in a study on the difficulties on finding employment on the labour market for mothers with young children or a study by Filip Pertold and Jiří Šatava entitled *Obesity in the Czech Republic*.



The media also frequently featured the **Czech Language Institute** – in the monitored period, the media mentioned the Institute 464 times, for example, in connection with expert opinions on a debatable question which appeared in a Czech Language school-leaving exam (26 times). The newspaper *Lidové noviny* traditionally published its regular "Jazykové okénko" (Language Window), where contributions were provided by researchers from the Institute's language advisory centre, and the column "Slovo" (Word) in its Friday insert, dealing with neologisms in Czech.

Director of the Institute, Martin Prošek, appeared in a regular programme of Czech Radio Plzeň entitled Language Window. On the Czech Television programmes *Události* and *Události, komentáře* Kamila Smejkalová discussed the issue of listed words. On the programme *Události* Pavel Štěpán also spoke about the names that parents most frequently give to their children.

The Internet Language Reference Book (prirucka.ujc.cas.cz), one of the most extensive, authoritative and up-to-date databases of Czech vocabulary and grammar, was accessed more than 52,000 times a day in 2018 – annual traffic of this website by the Czech Language Institute exceeded 19 million visits.



POPULARISATION OF SCIENCE

through the Centre of Administration and Operations of the CAS

The Czech Academy of Sciences considers the systematic popularisation of the results of research conducted at its institutes and the dissemination of scientific knowledge to students, pupils, their teachers and the general public to be an essential part of its mission.

Not only individual institutes of the CAS, but also the Centre of Administration and Operations, as a service institute for the CAS, participated in popularising research results. Through the Division of External Relations and its branches, the Centre provided activities that, in the monitored year 2018, covered not only current scientific events, but also drew attention to events with a society-wide reach – above all in connection with celebrations of the 100th anniversary of the foundation of the united Czech and Slovak state. The keyword SSČ (Centre of Administration and Operations, CAO) was cited in the media over 299 times in 2018.

Events of the Czech Academy of Sciences, in the organisation of which the Centre of Administration and Operations systematically participates, have been popularised, among other ways, via the web portal **www.avcr.cz** – particularly through the section "For the Public", which recorded 85,000 visits during the monitored period.

Information on popularisation activities of the Centre of Administration and Operations was also provided by the independent websites of individual projects. The website **www.tydenvedy.cz** recorded 81,000 visitors and, over the same period, web traffic of the website **www.veletrhvedy.cz** reached almost 40,000 visits.

Significant support in the popularisation of science is also provided by social networks (namely Facebook, Twitter and Instagram). During the monitored period, the number of followers on social network pages of the CAS increased by 16,313 (specifically from 5,506 to 21,819 fans). Facebook remains the most visited social network with 16,224 fans; it is followed by Instagram (3,431) and Twitter (2,164). The reach of Facebook posts between 1 January 2018 and 1 January 2019 exceeded the boundary of 4.4 million views.

For the anniversary year 2018, the CAS prepared a wide range of activities through the Centre of Administration and Operations, primarily for the general public. Celebrations of the foundation of the independent nation culminated on 28 October 2018, while just a day before, a vernissage of the travelling exhibition **The Czechoslovak Republic 1918–1939** was held on Jan Palach Square in Prague (in cooperation with the Masaryk Institute and Archives). From 3 September to 29 November 2018, it was presented in 24 Czech towns and cities. With the management of the CAS in attendance, a vernissage of the exhibition was also organised in Brno – it was conceived as an outdoor event illustrating the "bustle of the streets" in the period of the First Republic.

In relation to the anniversary of the foundation of Czechoslovakia, from 7 May to 20 August 2018,

The Gallery of Science and Art in the building at the address Národní Street 3 in Prague held the exhibition **18–18: A Century of a State Holiday**. The exhibition presented unknown exhibits and records from the archives and collections prepared by the Institute of History of the CAS, Masaryk Institute and Archives of the CAS and the Institute of Contemporary History of the CAS. President Masaryk's signature was extraordinarily displayed on the *First Draft of the Czech Declaration of Independence*.

On 24 September 2018 a sixth, this time "Czechoslovak", **ceremonial lecture** *Czechoslovakia – Our Common Home* was held at Žofín Palace, within a cycle titled "Czech Academy of Sciences – Top Research in the Public Interest". The lecture was a part of centennial anniver-

T | Ý | D | E | N | V | T

sary celebrations of the foundation of the independent state. It was written by Jan Němeček from the Institute of History and Roman Holec from the Slovak Academy of Sciences. The previous lecture was held on 26 March 2018 with the title *Drugs for Targeted Tumour Treatment* – it was written by respected scientists Blanka Říhová and Karel Ulbrich.

The largest scientific festival in the Czech Republic – **the CAS Week of Science and Technology** – reached adulthood in 2018. Lectures, laboratory tours, film screenings, theatre performances, exhibitions, science shows and much more were prepared for the public throughout the week. The central theme of the festival was "A Century of Czech Science 1918–2018". Guided by scientists from the CAS, those who were interested discovered what science looked like when Czechoslovakia was founded 100 years ago and how disciplines have evolved since then. 54 institutes of the CAS and 11 university departments worked together to create a rich programme, which was visited by a total of 44,385 people.

Three days, 80 exhibitors, 8000 m² of exhibition space and 24,800 visitors – that is the fourth annual **Science Fair of the CAS** in numbers. From 7 to 9 June 2018, the biggest popular-educational event of its kind in the Czech Republic presented results of the work of Czech scientists at the PVA EXPO Prague Exhibition Centre in Letňany. The Science Fair is not only a way to present science to the young generation. Institutes of the CAS present their visitors with much more – modern technology, innovative and successful products, manufacturing programmes, development results, as well as less common aspects of research. The largest scientific institutes of the CAS, universities and innovative companies presented themselves at the Science Fair.

In 2018, four issues of the official journal *A / Science and Research* were published. The main theme of the March issue (1/2018) was lasers, the June issue (2/2018) dealt with sight, the September issue (3/2018) was dedicated to the hundredth anniversary of the foundation of Czechoslovakia and the so-called "anniversary eights", and the December issue (4/2018) focused on the matter of ethics. 3,000 copies of the magazine are printed. Two issues of the magazine *AΩ / Science for Everyone*, which is targeted at pupils, students and the public were published. The main theme of the May issue was the phenomenon of fake news, while the October issue was dedicated to the primacy of Czech science against the backdrop of historical milestones – 10,000 copies of the magazine are published. 10 issues of the internal newsletter *AB / Academic Bulletin* were released. The newsletter is published as an electronic periodical for the needs of employees of the institutes of the CAS. Unified editing of all academic periodicals is provided by the External Relations Division of the Centre of Administration and Operations.

OTEVŘENÁ VĚDA
AKADEMIE VĚD ČR

The fifth annual photography contest **Photogenic Science** took place from 1 May to 22 June 2018. Photographs were presented in an exhibition and in the official representative calendar of the CAS. The submitted photos have been added to the official photo bank and are further used for presentation purposes.

Last year, the project **Open Science of the Czech Academy of Sciences** continued to encourage increased interest in science and research among secondary school and university students. For another year, not only natural and technical sciences, but also humanities and social sciences were included in the offer of internships. Thirty-four institutes of the CAS organised internships, with a total of 160 students taking part in 100 internship programmes. Presentations of internship results in front of an expert jury and audience at the two-day Student Scientific Conference, which was held from 22 to 23 November 2018, were attended by 120 students. The portal **www.otevrenaveda.cz** welcomed 43,000 visitors.

Three dozen primary and secondary school teachers took part in the **Summer Science Camp** – an educational project of the Open Science programme of the Czech Academy of Sciences, which aims to expand practical education in schools and to complement this with illustrative experiments. The camp focused on chemistry, biology, physics and mathematics, and the role of teachers was assumed by scientists from academic institutes and university educators. The aim of the courses is to shift the way of teaching so that the curriculum is presented in a more attractive manner and the professional content is interpreted more comprehensively with emphasis on experiments and practical use.

How does the brain work and control our bodies, and what are the latest procedures in neurosurgery and treatment of mental illnesses? These topics and more were presented during the latest annual lecture cycle **Brain Week** on trends in research into the brain and neuroscience. In 2018, the CAS held the event for the twentieth time. The event has traditionally been part of the Brain Awareness Week – a global public awareness campaign on the benefits of brain research.

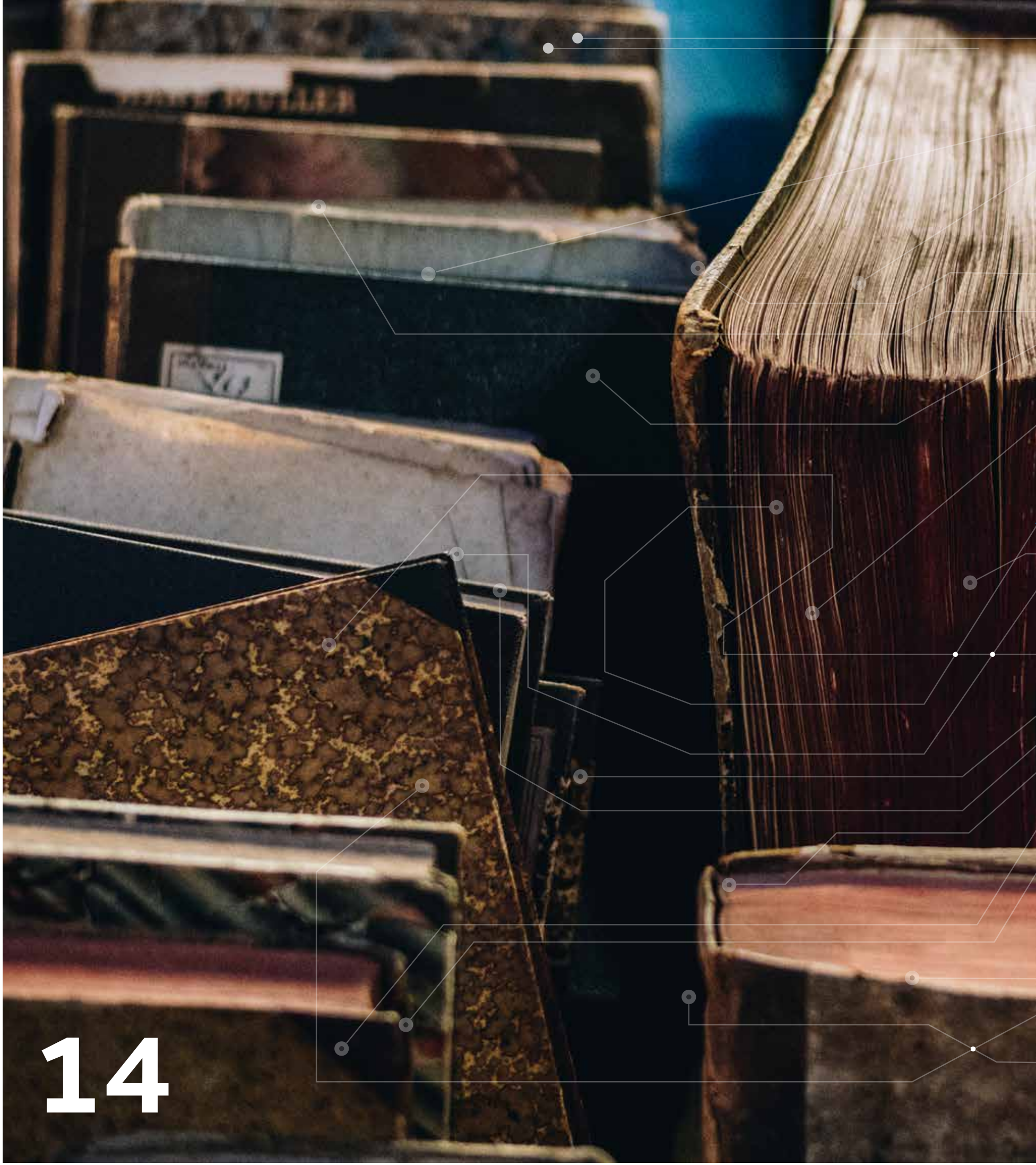
The popular cycle of professional science lectures aimed at secondary school students **Don't Be Afraid of Science!** also continued. Lecturers were researchers from institutes of the CAS. In 2018, 138 lectures were held at 68 secondary schools in 42 towns and cities – a total of 78 lecturers from various institutes of the CAS took part in the project.

YouTube is a proven media channel, which regularly airs reports from popularisation events and educational projects. A documentary film produced by the CAS was presented at both national and international level. Viewers watched the magazine show **Czech Science** on four television channels with a daily audience of over 200,000 households. Reports on the work of Czech scientists were presented on social networks and on the web – viewing figures exceed 100,000.

Success has been recorded by a set of educational videos **Undistorted Science**, which has reached three million views. In 2018, it was expanded with another series (10 parts), which is based on research programmes of Strategy AV21. At present, *Undistorted Science* is the most successful video format that promotes the Czech Academy of Sciences. For schools, the creators have also prepared DVD-ROMs of individual series and placed videos on selected learning portals.

Since September 2018, as part of the service *Online Postcard*, caricatures of Czech Scientists have appeared on postcards and stamps of the Czech postal service. The project is based on the exhibition *Czech Scientists and Their Inventions*, which was established as part of the successful project Open Science.

Another traditional part of the activities of the CAS is organisation of exhibitions which, in particular, present scientific projects or successes. The main exhibition programme is represented by activities in the **Gallery of Science and Art**; in 2018 four exhibition projects enjoyed the attention of visitors: *Son of the Desert: Traveller and Photographer Alois Musil* (21 February 2018 – 12 April 2018), *18–18: A Century of a State Holiday* (7 May 2018 – 20 July 2018), *Waves of the Universe: 40 Years of the Magion Satellites* (5 September 2018 – 27 October 2018), *A Philosopher's Being and Time: Jan Patočka* (29 November 2018 – 18 January 2019).



Publishing Activity

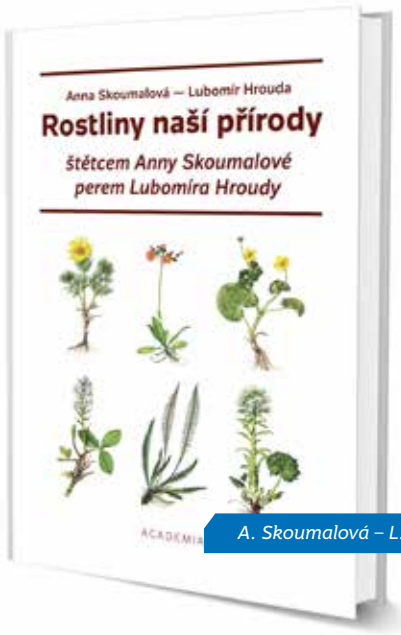
The Czech Academy of Sciences promotes the release of selected scientific and science-popularisation publications from all scientific disciplines, both at the Academia Publishing House, which is part of the Centre of Administration and Operations, and at other institutes of the CAS. Book titles of authors from the CAS are also published at other publishing houses of Czech provenance, as well as at prestigious international publishing houses. In 2018, authors from the CAS published a total of 32 titles abroad.

> The Czech Academy of Sciences promotes the release of selected scientific and science-popularisation publications from all scientific disciplines.

A unique position among publishing houses in the Czech Republic is held by the Academia Publishing House. It publishes original scientific monographs and works of Czech scientists, classic scientific works, translations of foreign authors, popular-educational literature, factual books, encyclopaedias, dictionaries, language textbooks, manuals and university textbooks, and high-quality Czech and translated fiction. The company also publishes the popular-educational magazine *Živa*, which features contributions from biological disciplines. In 2018, the Academia Publishing House published a total of 110 book titles.

With a sum of CZK 9 million, the Editorial Board of the CAS funded the publication of 65 book titles – of which 43 were published at the Academia Publishing House and 22 were published at institutes of the CAS, specifically at the Institute of Art History (Artefactum Publishing House), the Institute of Philosophy (Filosofia Publishing House and Oikoymenh Publishing House), the Institute of Czech Literature, the Institute of Contemporary History, the Institute of Archaeology in Prague, the Institute of Archaeology in Brno and the Astronomical Institute.

Among the significant achievements supported by the Editorial Board of the CAS, we can name the following publications: *Plants of Our Countryside* by A. Skoumalová and L. Hrouda (Academia), *Atlas of Fauna of the Czech Republic* by M. Anděra and J. Sovák (Academia), a publication of a team of authors under the leadership of M. Přibáň *Czech Literary Samizdat 1949–1989* (Academia), *With God for the Emporer and the*



A. Skoumalová – L. Hrouda: Plants of Our Time

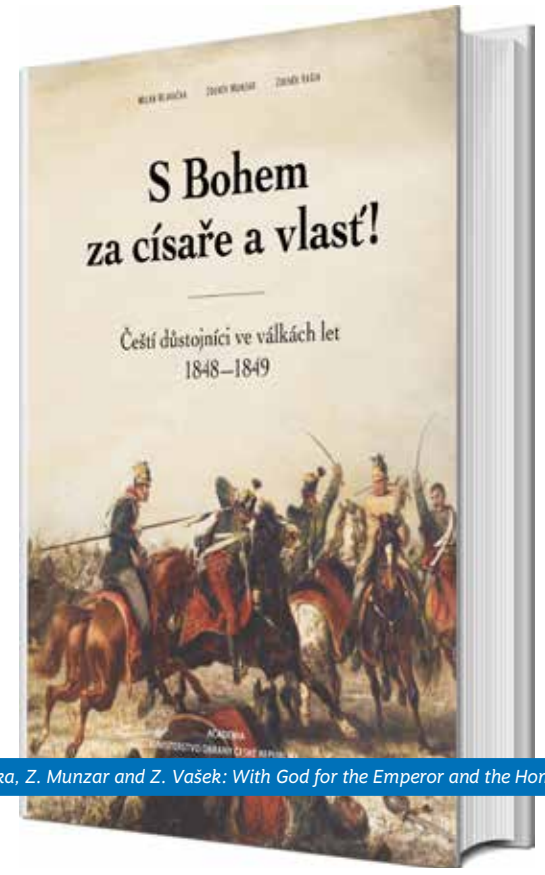
M. Studničková – M. Theisen: Art in an Unsettled Time

M. Anděra – J. Sovák: Atlas of Fauna of the Czech Republic

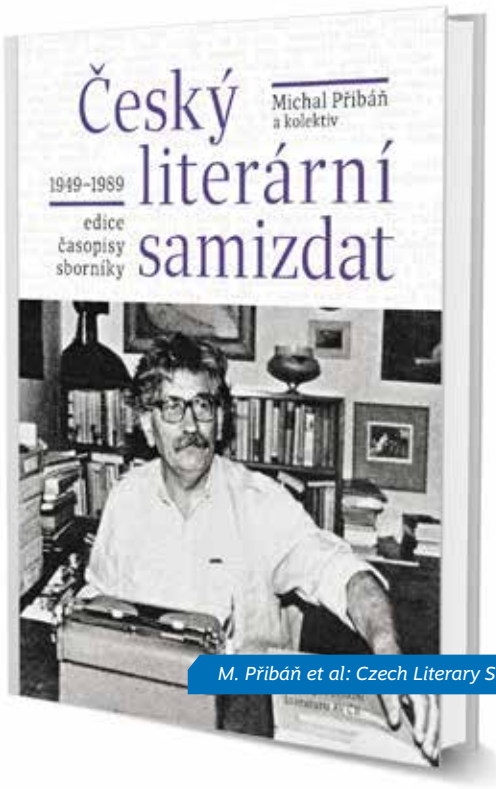
Homeland! penned by M. Hlavačka, Z. Munzar and Z. Vašek (Academia) and *Art in an Unsettled Time* by M. Studničková and M. Theisen (Artefactum). The publication of six monographs was supported as part of the programme Strategy AV21, such as the monumental book by Š. Vácha and R. Heisslerová *In the Shadow of Karel Škréta* (Academia) on 17th-century painting in Bohemia.

In 2018, the Academia Publishing House also printed seven brochures of the Editorial Board *Strategy AV21* and 14 brochures of the Editorial Board *Science around Us*.

Š. Vácha – R. Heisslerová: In the Shadow of Karel Škréta



M. Hlavačka, Z. Munzar and Z. Vašek: With God for the Emperor and the Homeland!



M. Přibáň et al: Czech Literary Samizdat 1949–1989

Cooperation

with Scientific Societies

The Czech Academy of Sciences has long supported the activities of scientific societies operating in the Czech Republic. Scientific societies link renowned experts of universities, the Czech Academy of Sciences and departmental research institutes, as well as students and other individuals interested in relevant scientific disciplines. At the same time, they are an important link between the professional public and international scientific organisations – through their members, they are currently involved in 168 international scientific organisations.

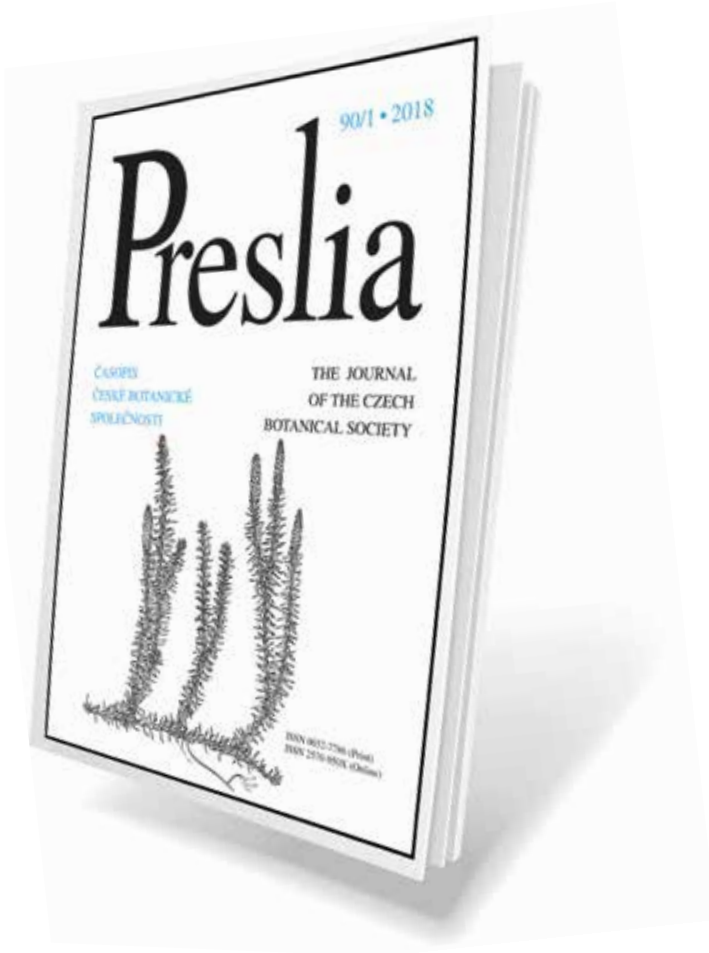
The Czech Academy of Sciences has long supported the activities of scientific societies operating in the Czech Republic.

At present, the **Council of Scientific Societies of Czech Republic** coordinates 85 scientific societies with more than 25,000 members.

Many scientific societies are interdisciplinary in nature and some scientifically-oriented societies are not represented in academic or other scientific institutions. In 2018, the Council of Scientific Societies of the Czech Republic admitted the Czech Society for Slavonic, Balkan and Byzantine Studies, z. s., the Czech National Committee of Geodesy and Geophysics, z. s., the Czech National Committee for Logic, Methodology and Philosophy of Science, z. s., the Czech Arachnological Society, z. s., and the Czech Association for African Studies, z. s. The Metals Science Society ceased its activities.

In 2018, the societies published a total of 31 internationally significant journals, seven of them with an impact factor, e.g. *Preslia* (Czech Botanical Society – IF 2,71), *Fottea* (Czech Algological Society – IF 1,48) or *Journal of Geosciences* (Czech Geological Society – IF 1,41); in addition, 39 national professional journals, 18 web magazines and 39 newsletters were published. Another important publication platform for scientific societies was publications of books and anthologies: in 2018, a total of 22 books and 55 anthologies were published.

Scientific societies report admirable annual statistics on organised symposia, conferences and other meetings. The year 2018 saw the organisation of 107 international conferences, seminars and workshops where a scientific society was the main organiser or co-organiser, as well as 84 Czech and Slovak, and 137 national professional and scientific meetings with hundreds to thousands of attendees. International conferences and congresses included, for example, *Vulnerability and Resilience: Adaptive Strategies and Global Change* (Czech Association for Social Anthropology), *Host Pathogen Interaction Forum 2018* (Czech Immunological Society), *ESID Spring School – Primary Immunodeficiency* (Czech Immunological Society), *Morphology 2018*, *55th Lojda Symposium on Histochemistry*



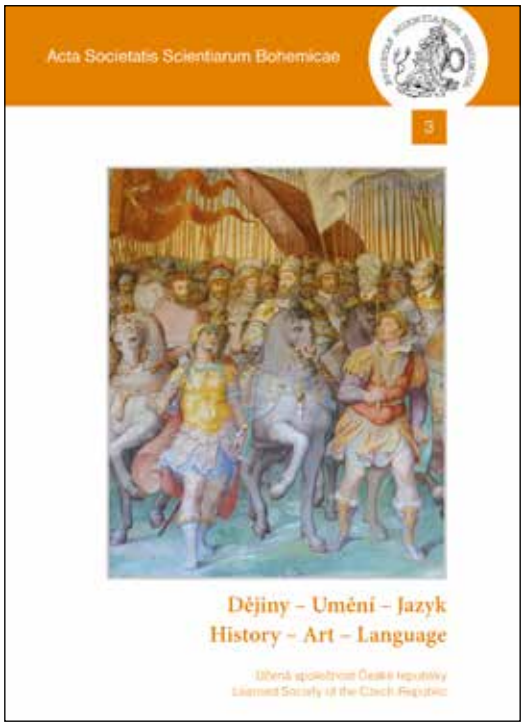
President of the CAS, Professor E. Zažímalová with the Chairman of the Council of Scientific Societies of the Czech Republic, Doc. L. Hrouda, while signing a Memorandum of Cooperation between the CAS and the Council

(Czech Society for Histo- and Cytochemistry), *34th FEBS Congress 2018* (Czech Society for Biochemistry and Molecular Biology), *Global Biodiversity Conservation Conference* (Czech Society for Ecology), *XV Discussions in Structural Molecular Biology* (Czech Society for Structural Biology), *FEBS Advanced Lecture Course and 33rd European Cytoskeletal Forum Meeting: Biology and Pathology of the Cytoskeleton: the crossroads of three cytoskeletal systems* (Czech-Slovak Biological Society) and *XXIII Polish-Czech Seminar Structural and Ferroelectric Phase Transitions* (Union of Czech Mathematicians and Physicists).

In the past year, scientific societies actively supported elementary, secondary and university education in a total of 143 events such as mathematical, chemical, natural-science or astronomical olympics, specialised field courses for secondary school and university students, doctoral seminars, and various competitions. Natural-science societies develop particular activity in this respect: Union of Czech Mathematicians and Physicists, Czech Astronomical Society, Czech Chemical Society, Czech Botanical Society and the Czech Algological Society.

The focal point of most scientific societies lies in lectures, popularisation and other social activities. In 2018, societies organised 526 lectures, excursions or seminars, 15 exhibitions and 116 media inputs and broadcasts to stimulate public and, especially, student interest in scientific work, and to promote the application of new findings. The website of the Czech Astronomical Society, www.astro.cz, has been very successful; in 2018 it registered over two million visitors.

The Learned Society of the Czech Republic unites prominent scientists from all disciplines. Its aim is to encourage the free cultivation of science in all its manifestations, to disseminate scientific knowledge among the public and to promote an increase in the level of education and a creative, rational and humanly responsible social environment in the Czech Republic. Members of the Society are elected by outstanding local scientific figures from universities, the Czech Academy of Sciences and departmental institutes. Other categories include foreign fellows, elected from the ranks of significant foreign researchers who have extraordinary links to the Czech scientific community. In 2018, the Society had 103 regular fellows, 49 foreign fellows and 14 emeritus fellows.



The Learned Society has organised a number of lectures on current scientific issues, a competition for secondary school students, it has represented the Czech scientific community at meetings with foreign learned societies and scientific institutes, released the publication *History – Art – Language*, and published three statements on current public affairs. In addition, it has awarded two prizes to prominent researchers. It has also rewarded three educational workers for the promotion of interest in science and research at secondary schools, the creation of conditions for the individual activities of students, and for the outstanding work of students in competitions (Joint Award of the Learned Society of the Czech Republic and the Neuron Benevolent Fund).

The most significant prizes that the Learned Society awarded in 2018 were two Numisha Honoris Societatis Scientarium Bohemiacea medals of the Learned Society of the Czech Republic for merit in science.


BER
NARD
BOL
ZANO

Awards Granted

by the CAS

The Czech Academy of Sciences annually rewards leading personalities for results achieved in excellent research focusing on social priorities, which have strenghtened the international prestige of Czech science and were first published or implemented no more than five years ago. Last year, the results of the scientific and popularisation work of CAS researchers were recognised with many specific prizes, medals, honours and other awards. Laureates received prizes not only from the CAS but also from other national and foreign organisations and institutions. You will find a summary of the most important awards on the following pages.

The President of the Czech Academy of Sciences handed out the following awards in 2018:

The Award of the Czech Academy of Sciences for outstanding results in science, experimental research and innovations, achieved while resolving research tasks:

Doc. Ing. Jiří V. Outrata, DrSc.,
from the Institute of Information Theory and Automation, for the scientific result *Stability of solutions to parameter-dependent optimization and equilibrium problems*

Ing. Jiří Náprstek, DrSc., and **Ing. Radomil Král, PhD.**, from the Institute of Theoretical and Applied Mechanics, for the scientific result *Theoretical background and implementation of the finite element method for multi-dimensional Fokker–Planck equation analysis*

Prof. Ing. Miroslav Oborník, Dr., from the Biology Centre, for the scientific result *Evolution and metabolism of marine phytoplankton*

The Award of the Czech Academy of Sciences for Young Scientific Employees for Outstanding Results of Research, Experimental Development and Innovations, achieved in CAS-supported research tasks before reaching the age of 35, was accepted by:

Tommaso Moraschini, Ph.D., from the Institute of Computer Science, for the scientific result *A collection of papers on algebraic logic*

Mgr. Ondřej Vild, Ph.D., from the Institute of Botany, for the scientific result *Restoration of plant biodiversity of traditionally managed forests*

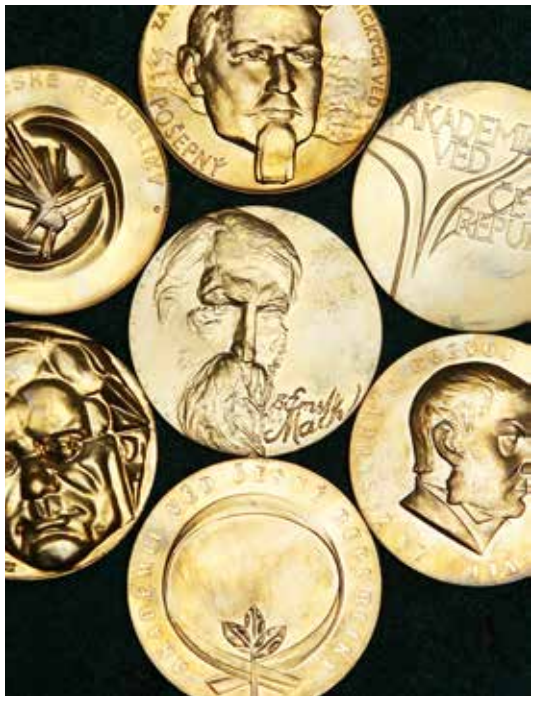
Mgr. Vojtěch Szajkó, Ph.D., from the Institute of History, for the scientific result *Railways, postal services and telegraphs of the Austrian army in the years 1848–1914*

The Award of the President of the CAS for the Promotion or Popularisation of Research, Experimental Development and Innovation
awarded in 2018 to:

Ing. Libor Juha, CSc.
proposed by the Institute of Physics

Prof. RNDr. František Vyskočil, DrSc., prof. h. c.
proposed by the Institute of Physiology

Prof. PhDr. Jan Bažant, CSc.
proposed by the Institute of Philosophy



HONORARY MEDALS AWARDED TO CZECH AND FOREIGN RESEARCHERS IN 2018:

Honorary Medal of the CAS "De Scientia et Humanitate Optime Meritis"

Prof. Dr. Harald Rose
University of Ulm, Germany

Prof. Gérard Roland, Ph.D.
University of California, USA

Prof. Ing. Václav Sklenička, DrSc.
Institute of Physics of Materials

The Bernardo Bolzano Honorary Medal for Merit in the Mathematical Sciences

Prof. RNDr. Miloslav Feistauer, DrSc., dr. h. c.
Faculty of Mathematics and Physics, Charles University in Prague

Prof. RNDr. Antonín Novotný, CSc.
Université de Toulon, France

The Ernst Mach Honorary Medal for Merit in the Physical Sciences

Prof. RNDr. Jiří Bičák, DrSc., dr. h. c.
Faculty of Mathematics and Physics, Charles University in Prague

RNDr. Jiří J. Mareš, CSc.
Institute of Physics

Doc. RNDr. Dušan Bruncko, CSc.
Slovak Academy of Sciences

Prof. Dr. Hubert Ebert
Ludwig-Maximilians-Universität München, Germany

Prof. RNDr. Ivan Hubený, CSc.
University of Arizona, USA

Prof. RNDr. Jiří Zahradník, DrSc.
Faculty of Mathematics and Physics, Charles University in Prague

The František Pošepný Honorary Medal for Merit in the Geological Sciences

Prof. Ing. Zdeněk Vašíček, DrSc.
Institute of Geonics

The Jaroslav Heyrovský Honorary Medal for Merit in the Chemical Sciences

Prof. RNDr. Zdeněk Samec, DrSc.
J. Heyrovský Institute of Physical Chemistry

The Johann Mendel Honorary Medal for Merit in the Biological Sciences

Prof. Dr. med. Hans-Georg Kräusslich
Universitätsklinikum Heidelberg, Germany

Doc. Ing. Jan Krekule, DrSc.
Institute of Experimental Botany

RNDr. Marcel Rejmánek
University of California, USA

RNDr. Jaroslav Kuneš, DrSc.
Institute of Physiology

The Jan Evangelista Purkyně Honorary Medal for Merit in the Biomedical Sciences

Prof. MUDr. Jiří Forejt, DrSc.
Institute of Molecular Genetics

Prof. RNDr. Václav Hořejší, CSc.
Institute of Molecular Genetics

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

Prof. Bryn Greer-Wootten
York University, Canada

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

PhDr. Vladimír Svoboda, CSc.
Institute of Philosophy

The František Palacký Honorary Medal for Merit in the Historical Sciences

Prof. dr hab. Michal Pułaski
Instytut Historii Uniwersytetu Jagiellońskiego Kraków, Poland

Prof. Dr. Gary B. Cohen
University of Minnesota, USA

The Jan Patočka Memorial Medal

PhDr. Josef Zumr, CSc.
Institute of Philosophy

Doc. PhDr. Jiří Pechar
Institute of Philosophy

The Vojtěch Náprstek Honorary Medal for Merit in Science Popularisation

Mgr. Jana Maříková Kubková, Ph.D.
Institute of Archaeology, Prague

RNDr. Jiří Sádlo, CSc.
Institute of Botany

Ing. Dana Sephton
British Council Prague

The Honorary Medal for Merit for the Czech Academy of Sciences

Doc. PhDr. Radomír Vlček, CSc.
Institute of History

Prof. Ing. Pavel Kratochvíl, DrSc.
Institute of Macromolecular Chemistry

OTHER MAJOR AWARDS GRANTED TO SCIENTISTS OF THE CAS

The National Prize of the Government of the Czech Republic "The Czech Head"
for life-long contribution was awarded to:

Prof. Ing. Jaroslav Doležel, DrSc.
Institute of Experimental Botany

The Hlávka Medal for Life-Long Contribution to Science was received from the Fund of Josef, Marie and Zdenka Hlávka by:

RNDr. Jan Květ, CSc.
Global Change Research Institute

The Award of the President of the Grant Agency of the Czech Republic for the role of haemoglobin in the metabolism of ticks and transmission of tick pathogens was received by:

RNDr. Petr Kopáček, CSc.
Biology Centre – Institute of Parasitology

The Neuron Award for discovering how information is recorded in anti-ferromagnetic materials with the use of particle spin was awarded to:

Prof. Tomáš Jungwirth, Ph.D.
Institute of Physics

The Medal of the Learned Society was received by:

Prof. MUDr. Helena Tlaskalová-Hogenová, DrSc.
Institute of Microbiology

Gold Medal of Charles University for lifetime contribution to the development of immunology and microbiology was awarded to:

Prof. MUDr. Helena Tlaskalová-Hogenová, DrSc.
Institute of Microbiology

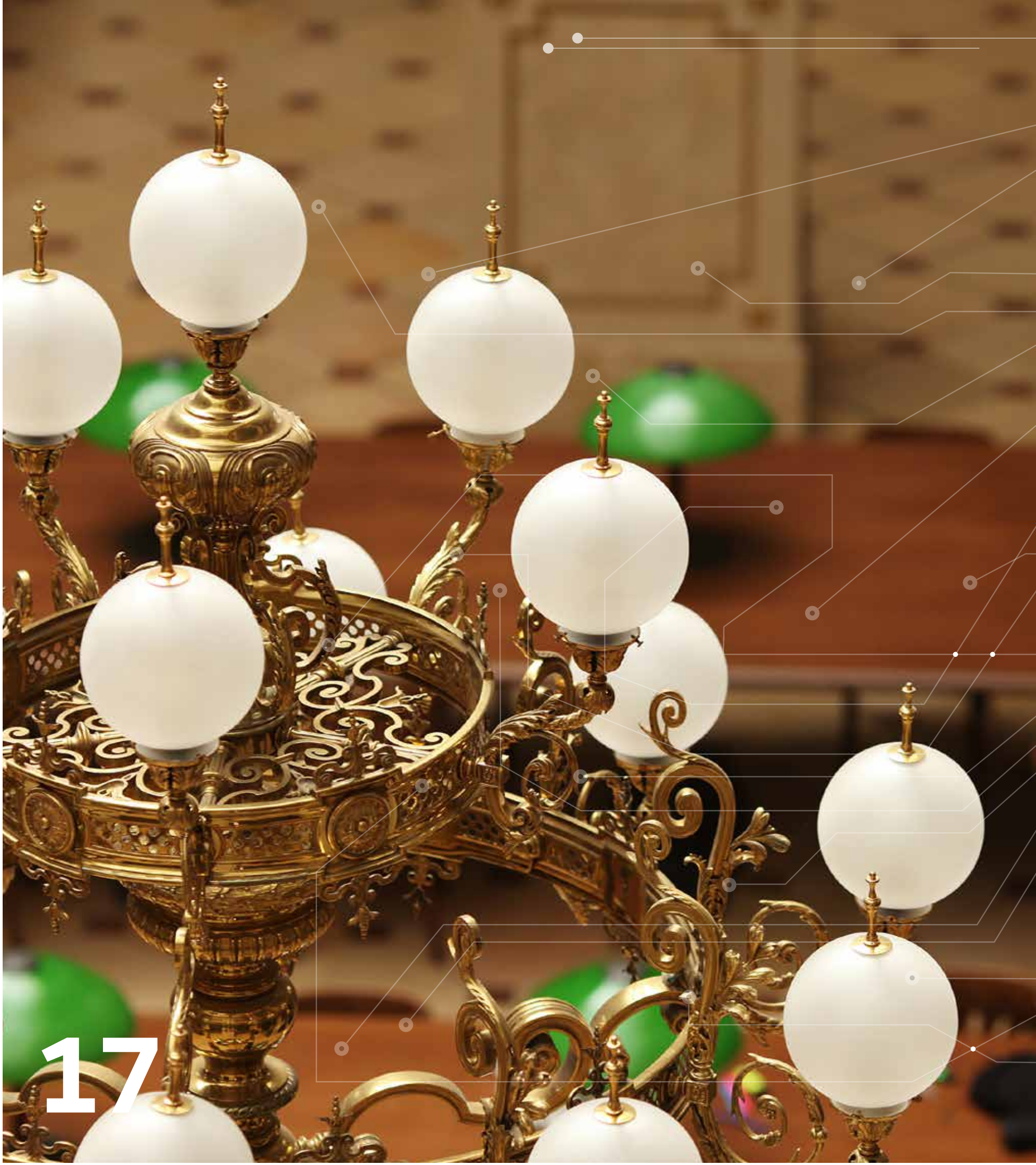
The Golden Linden Decoration of the Minister of Defence of the Czech Republic for outstanding contribution to the development of defence and security in the Czech Republic was awarded to:

PhDr. Oldřich Tůma, Ph.D.
Institute of Contemporary History

The Magnesia Litera Award 2018 in the category Litera for Educational Literature was awarded, for the title "Paneláci 1, 2" (Museum of Decorative Arts in Prague), to:

Prof. PhDr. Rostislav Švácha, CSc.
Institute of Art History

For long-standing practical work at the CAS, a **Letter of Thanks** was handed over by the President of the CAS, Eva Zažímalová to 11 employees from four institutes of the CAS.



Granted Scientific Titles

“Research Professor”

The scientific title “Research Professor” was established by Decision XXI. at a session of the Academy Assembly of 18 December 2002 and has been repeatedly confirmed by resolutions of the Government of the Czech Republic on the Statutes of the Czech Academy of Sciences, last in Resolution No 614 of 24 May 2006. The award of the scientific title is governed by the provisions of Art. 62 of the Statutes of the Czech Academy of Sciences. In order to implement this provision, the Academy Council adopted the Rules for Awarding the Scientific Title “Research Professor” at the Czech Academy of Sciences.

The Czech Academy of Sciences awards the scientific degree of Research Professor to scientists in recognition of their outstanding and original scientific work, contributing to the advancement of research in a specific scientific field and characterising the awardee as a scientist of recognising stature.

At its 10th session on 30 January 2003, the Council for Sciences of the CAS established a Committee for the Research Professor Degree as an auxiliary and advisory body for matters related to the award of the scientific title. The award of the scientific title is decided solely on the basis of a proposal by Commitee for the Research Professor Degree.

At its 11th session on 10 April 2003, the Council for Sciences of the CAS approved a sectoral structure for defence committees. There are currently 32 established permanent committees for fields in research areas I., II. and III. A total of 388 members have been appointed to the committees: 168 members from institutes of the CAS, 185 members from universities and 35 members from other institutions.

Between 2003 and 2018, a total of 166 scientific titles were awarded: 95 of them were awarded to scientists of the CAS and 71 to scientists from universities and other institutions.

In 2018, the Council for Sciences of the CAS awarded the title to the following researchers:

Doc. Ing. Petr Klusoň, Dr., DSc.
Institute of Chemical Process Fundamentals

dissertation: *Photochemical and photoanalytical processes and materials*.
committee: Chemical Engineering
awarded the scientific title: "Research Professor in Chemical Sciences"

Nina V. Shevchenko, Ph.D., DSc.
Nuclear Physics Institute

dissertation: *Antikaon-nucleon interaction and different properties of the KNN and KKN systems*.
committee: Nuclear, Subnuclear and Mathematical Physics
awarded the scientific title: "Research Professor in Physico-Mathematical Sciences"

Doc. RNDr. Martin Kružík, Ph.D., DSc.
Institute of Information Theory and Automation

dissertation: *Weak lower semicontinuity in problems of variational calculus*.
committee: Mathematical Analysis and Related Fields awarded the scientific title: "Doctor of Physics and Mathematics"

Prof. RNDr. Svatopluk Civiš, CSc., DSc.
J. Heyrovský Institute of Physical Chemistry

dissertation: *Heterogeneous carbon dioxide reactions to oxygenated minerals*.
committee: Analytical Chemistry
awarded the scientific title: "Research Professor in Chemical Sciences"

Doc. RNDr. Elena Dzifčáková, CSc., DSc.
Astronomical Institute

dissertation: *Non-Maxwell Electron Energy Distribution in the Solar Corona and Transition Areas: Diagnostics and Imbalance Effects*.
committee: Astronomy and Astrophysics
awarded the scientific title: "Research Professor in Physico-Mathematical Sciences"

Doc. Ing. Vít Šmilauer, Ph.D., DSc.
Faculty of Civil Engineering, Czech Technical University

dissertation: *Multiscale Hierarchical Modeling of Hydrating Concrete*.
committee: Theoretical and Applied Mechanics
awarded the scientific title: "Research Professor in Technical Sciences"

Prof. PhDr. Pavel Janoušek, CSc., DSc.
Institute of Czech Literature

dissertation: *The subject of the expert in thoughts about literature as a theoretical and literary-historical problem*.
committee: Literary Science
awarded the scientific title: "Research Professor in Philological Sciences"

Ing. Ludmila Martínková, CSc., DSc.
Institute of Microbiology

dissertation: *Microbial Enzyme Transformations of Cyano and Phenolic Compounds: Advances, Challenges and Perspectives*.
committee: Botany and Experimental and Ecological Biology
awarded the scientific title: "Research Professor in Biological-Ecological Sciences"

PhDr. Petr Kitzler, Ph.D., DSc.
Institute of Philosophy

dissertation: *From Passio Perpetuae to Acta Perpetuae. Recontextualizing a Martyr Story in the Literature of the Early Church*.
committee: Philosophy
awarded the scientific title: "Research Professor in Philological Sciences"

Mgr. Vojtěch Pravda, Ph.D., DSc.
Institute of Mathematics

dissertation: *Algebraic classification of tensors in Lorentzian geometry and its applications*.
committee: Nuclear, Subnuclear and Mathematical Physics
awarded the scientific title: "Research Professor in Physico-Mathematical Sciences"

Annexes:

The Annual Report of the Czech Academy of Sciences for the provision of information pursuant to Act No 106/1999 Coll., on Free Access to Information, as amended, for the period from 1 January to 31 December 2018

a)	Number of submitted requests for information	6
	Number of issued decisions to reject a request	1
b)	Number of submitted appeals against a decision to reject a request	0
c)	Number of court judgments examining the legality of a decision to reject of a request	0
d)	Number of exclusive licences granted	0
e)	Number of complaints submitted pursuant to Section 16a of the Act	0

List of Abbreviations Used

CAS	Czech Academy of Sciences
CEFRES	French Research Center in Humanities and Social Sciences
ERC	European Research Council
EU	European Union
GACR	Czech Science Foundation (Grant Agency of the Czech Republic)
TACR	Technological Agency of the Czech Republic
R&D	Research and Development
R&D&I	Research, Experimental Development and Innovation

The names of the institutes of the CAS appear in abbreviated form and do not contain the letters “CAS R&D&I”.

Annual Report on the Activities of the Czech Academy of Sciences 2018

Published by the Head Office of the CAS in cooperation with the Centre of Administration and Operations in 2019.
Národní 1009/3, 110 00 Prague 1

Responsible editor: Markéta Pravdová, Jana Cmarková, Viktor Černoch
Editorial cooperation: Jana Olivová, Markéta Wernerová, Luděk Svoboda
Proofreading: Jana Trnková, Milan Pohl
Graphics: Josef Landergott

Photographs and illustrations: Czech Academy of Sciences, scientific institutes and departments of the CAS, Photogenic Science (p. 48 – Martin Braun, Institute of Rock Structure and Mechanics of the CAS, p. 52 – Tomáš Tichý, Institute of Organic Chemistry and Biochemistry of the CAS, p. 81 – Petr Zinke, Institute of Art History of the CAS), Shutterstock, iStock

Czech Academy
of Sciences

The Czech Academy of Sciences (CAS) was established by Act No 283/1992 Coll.

The CAS carries out research through its institutes which are established as public research institutions. More than 11,000 employees work at the Academy, over 7,000 of whom are university-educated.

The primary mission of the CAS and its institutes is to conduct research in a broad spectrum of natural, technical and social sciences and the humanities. This research, whether highly specialised or interdisciplinary in nature, aims to advance the development of knowledge at an 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 through the implementation of doctoral study programmes, as well as through the pedagogical activities of their researchers at universities.

The CAS also develops cooperation with applied research and industry. A range of joint international projects and exchanges of researchers with partner institutions abroad reinforce the integration of Czech science into the international framework.

Czech Academy
of Sciences

Czech Academy of Sciences
Národní 3, 117 20 Prague 1
Organisation ID Number: 60165171

Phone: +420 221 403 111
E-mail: info@cas.cz
www.avcr.cz