# 2022
# Annual Report

## 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

**Dear Readers,**

You have before you the Annual Report of the Czech Academy of Sciences, in which you will find specific information about its main activities in 2022. It was not the easiest of years, above all because we – like all of Czech society – were forced to grapple with the impacts of the energy crisis. This had an adverse effect on the budgets of all the institutes of the Czech Academy of Sciences, despite the adoption of many cost-saving measures. High energy costs forced us to limit purchases of new instrumentation for example, which may have a negative impact on the quality and scope of research at the Czech Academy of Sciences in the years to come.

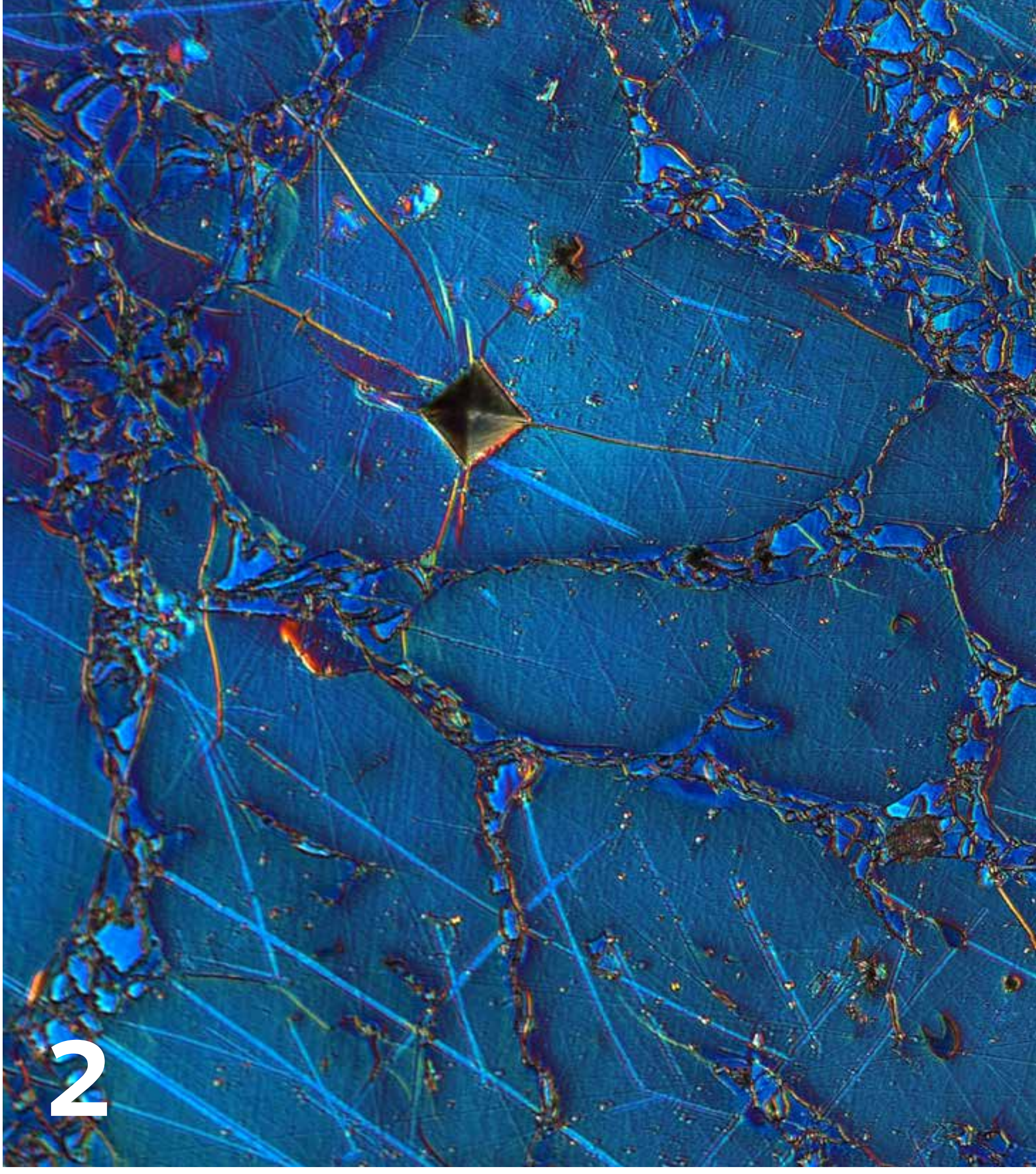
Despite all of the issues it faced, the Czech Academy of Sciences (CAS) continues to maintain its position as the most productive Czech scientific research institution. According to the latest data from the Research, Development and Innovation Council (R&D&I Council), we contributed to approximately 38% of the excellent scientific results in the Czech Republic per Methodology M17+, even though the CAS has less than 12% of the country's full-time equivalent research staff. The quality of research at the Czech Academy of Sciences is also evidenced by its numerous award-winning researchers. As one example of many I would like to mention Professor Petr Pyšek from the CAS Institute of Botany, who received the Czech Government's National Czech Head Award for 2022. From these examples and many other data – you can find the details in the chapters of the Annual Report – it is clear that we strive to use public funds in the best way possible and to increase their value.

Of the many topics that are standardly included in our annual reports, I would like to highlight Chapter 8 on Practical application of research. In this context, a new CAS Strategy for Knowledge and Technology Transfer was prepared. The strategy envisions interconnections between transfer activities and the priorities of our Strategy AV21 programmes, and further links are foreseen in the implementation of the new Concept for the development of the activities of the Czech Academy of Sciences. One of the other topics I would like to emphasise is our work during the Czech Presidency of the Council of the European Union, which is discussed in Chapter 12. In these efforts we focused on three priority areas: new genomic techniques, energy and a resilient society. These priorities were selected based on the focus areas of the Strategy AV21 platform, which responds to current societal challenges in line with our vision to deliver "top research in the public interest". The many other activities organised by CAS institutes are also noteworthy. I would like to therefore thank all the CAS institute scientists whose efforts contributed to the success of the Czech Presidency of the Council of the European Union. Likewise, I extend my thanks to the CAS staff providing media support to the Czech Academy of Sciences.

The transfer of the ELI Beamlines Facility to the international Extreme Light Infrastructure European Research Infrastructure Consortium (ELI ERIC) was a key event of 2022 and represents a unique opportunity for further advancement of Czech science in the European research area. As a pan-European legal entity, ELI ERIC will enable Member States to collaborate transnationally within the legal environment of the European Union in a number of fields – such as optics and photonics, the semiconductor industry, energy, new materials and medical applications. On behalf of the Czech Academy of Sciences, I can say that we are fully aware of the significance of this consortium and are ready to create an enabling environment to maximise use of the scientific opportunities and potential it embodies for research teams at CAS institutes in various disciplines. However, a fundamental prerequisite for the consortium's successful development is stable and predictable funding, which will fall wholly under the responsibility of the Ministry of Education, Youth and Sports beginning next year. At this juncture I would like to thank and express my great appreciation to the CAS Institute of Physics, which built one of the pillars of the ELI infrastructure, namely ELI Beamlines, and which has hosted it to date.

I am certain that science and research can play a distinct role in addressing the pressing problems of the contemporary world, both through the potential of research itself and by providing expertise in support of the Czech Republic's public policies. However, this goal is hindered by the fact that science and research have long been institutionally underfunded in the Czech Republic. Yet it is evident that only stable institutions with secure and predictable funding can respond effectively to the socio-economic and political challenges and the various types of ongoing crises that the Czech Republic, Europe and the world currently face. It is thus essential to strengthen the role of science and education in society and to capitalise fully not only on their educational and cultural potential, but also on their economic and social potential.

Prof. Eva Zažímalová
President of the Czech Academy of Sciences



# Mission and Structure

## of the Czech Academy of Sciences

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 take part in education, primarily by educating young researchers in doctoral study programmes, as well as through the pedagogical activities of CAS researchers at universities.

The CAS also develops cooperative ties with applied research and industry. The Academy's numerous joint international projects and exchanges of researchers with partner institutions abroad reinforce the integration of Czech science into the international context.

The CAS Head Office, as an internal organisational unit of the CAS, ensures that CAS bodies have the conditions needed to perform their executive duties. The CAS Head Office is in charge of professional economic, controlling, organisational and administrative tasks carried out by the CAS as set forth by legal regulations and the CAS Statutes. Pursuant to the valid organisational structure, the CAS Head Office is comprised of divisions that report directly to the CAS President (Control division) and divisions managed by the director of the CAS Head Office (administrative, management, economic, research support and international cooperation divisions and the secretariat).

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

**CAS Academy Assembly**
**276 members**
(k 31. 12. 2022)

**CAS President**
**Eva Zažímalová**

**Supervisory Committee of the Academy Assembly**
**8 členů**
(k 12. 12. 2022)
**Jiří Gabriel,** Chairman
**Miroslav Tůma,** Deputy Chairman

**CAS Science Council**
**29 členů**
**Pavel Baran,** Chairman
**Ondřej Santolík,** Deputy Chairman
**Zdenka Mansfeldová,** Deputy Chairman
**Julius Lukeš,** Deputy Chairman
**Petr Dvořák**, Deputy Chairman
**Michal Tomášek**, Deputy Chairman

**CAS Academy Council**
**Eva Zažímalová,** President
**Ilona Müllerová,** Vice President
**Zdeněk Havlas,** Vice President
**Ondřej Beránek,** Vice President
**Jan Řídký,** Vice President
**Martin Bilej,** Vice President
**Pavel Baran,** Member of the Presidium
**Jiří Homola**
**David Honys**
**Tomáš Kostelecký**
**Jana Bludská**
**Pavel Janáček**
**Luboš Náhlík**
**Jiří Plešek**
**Markéta Pravdová**
**Štefan Vajda**
**Jan Vondráček**

**CAS Head Office**

**Advisory Bodies to the CAS Academy Council**
**30 orgánů**

**CAS INSTITUTES**

**CAS Research Infrastructure Institutes**
**Centre of Administration and Operations (CAO)**

## Research Area I. – Mathematics, Physics and Earth Sciences
**18 institutes**
**I.**

### Section 1
**of Mathematics, Physics and Computer Science**

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

### Section 2
**of Applied Physics**

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

### Section 3
**of Earth Sciences**

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

## Research Area II. – Life and Chemical Sciences
**18 institutes**
**II.**

### Section 4
**of Chemical Sciences**

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

### Section 5
**of Biological and Medical Sciences**

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

### Section 6
**of Bio-Ecological Sciences**

Biology Centre
Institute of Botany
Institute of Vertebrate Biology
Global Change Research Institute

## Research Area III. – Humanities and Social Sciences
**17 institutes**
**III.**

### Section 7
**of Social and Economic Sciences**

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

### Section 8
**of Historical Sciences**

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

### Section 9
**of Humanities and Philology**

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

# Czech Academy of Sciences

## in the System of Research, Development and Innovation

The Czech Academy of Sciences is part of a Czech tradition of scientific institutions that dates back almost 300 years which began with the founding of the first enlightenment society, Societas incognitorum, in Olomouc (1746), continued with the Prague-based Private Society of Sciences (1769), which was the basis for the Royal Czech Society of Sciences (1784), and led finally to the founding of the Emperor Franz Josef Czech Academy for Science, Literature and Art (1890–1952), the direct predecessor of the contemporary CAS.

In 2022, in accordance with its long-term development concept, the CAS continued with its rigorous research, educational, popularisation and cultural work. Although the CAS, like all of society, grappled with the impact of the energy crisis in 2022, it maintained its position as the most productive Czech scientific research institution and made a number of valuable contributions to society as a whole. Based on the latest data from the Research, Development and Innovation Council (R&D&I Council), the CAS produces approximately 38% of all significant research results in the Czech Republic although it has only 12% of the country's full-time equivalent research staff. Thus, although the CAS has only a part of the research capacity of the Czech Republic, it is the most efficient producer of excellent scientific results according to Methodology M17+. Specific results are listed in subsequent chapters of this report.

Naturally, considerable efforts were devoted to supporting educational activities and further development of partnerships with universities, particularly in relation to the planned reform of doctoral studies funding under the Ministry of Education, Youth and Sport and its impacts on CAS institutes. The CAS also continued collaborating with the business sector by seeking new contacts, supporting knowledge and technology transfer to application areas and creating an enabling organisational and legal environment. The CAS also built on its previous successful efforts, which have achieved significant progress in cooperation with both chambers of the Parliament of the Czech Republic and the Government of the Czech Republic. The aim is to provide Parliament, the Government and other state and regional administrative authorities with qualified expertise to improve the quality of decision-making processes (e.g. through *AVex* expert opinions). The Strategy AV21 platform has proven effective in addressing concrete scientific issues that are essential to contemporary society and has been exceptionally well-received by the political and business sectors and the general public.

Alongside cutting-edge research and responses to current societal challenges, knowledge and technology transfer to economic and social practice is another integral part of the CAS' mission. A new *CAS Strategy for Knowledge and Technology Transfer* was developed to this end in 2022. It was prepared in cooperation with the CAS Technology Transfer Council and many other stakeholders. The aim of the strategy is to strengthen applied research and facilitate transfer of research results to practice, thereby supporting fields with a high added value of knowledge and highly qualified labour in the Czech economy. The strategy envisages interconnections between transfer activities and the priorities of *Strategy AV21* programmes; further links are expected in relation to the implementation of the new *Concept for the development of CAS activities*.

One of the most important events at the CAS in 2022 was the transfer of the ELI Beamlines Facility to the international Extreme Light Infrastructure European Research Infrastructure Consortium (ELI ERIC). An ERIC (European Research Infrastructure Consortium) is a legal framework established by European legislation to enable Member States to collaborate transnationally within the EU legal environment regardless of legislative differences between Member States. The CAS is ready to create an enabling environment to maximise use of the opportunities that this consortium brings to CAS institutes' research teams in various disciplines. Member States join ERICs and are represented by "representing entities". For the ELI ERIC, the Ministry of Educa-

tion, Youth and Sports is the entity responsible for administration and co-funding for the Czech Republic and the CAS is the representing entity responsible for the project's scientific research aspects.

An equally significant topic in 2022 was the CAS' efforts during the Czech Presidency of the Council of the European Union. The Czech Academy of Sciences actively supported the Presidency by selecting three priority topics: genetically modified organisms, low-emission energy and a resilient society. These three priorities were based on Strategy AV21 programmes in line with the CAS vision to conduct "top research in the public interest". CAS institutes also organised a number of smaller activities contributing to the success of the Czech Presidency. Most of the participants of these conferences, seminars and accompanying events agreed that the importance of scientific findings for European society is growing and Europe's future thus depends primarily on greater, efficient investments into science, research and innovation.

In 2022, the CAS and its representatives actively engaged in the implementation of a number of conceptual R&D&I documents which are crucial to the advancement of research and development. The key documents include the following:

- National Recovery Plan in the context of the Economic Strategy of the Czech Republic
- National Research, Development and Innovation Policy of the Czech Republic 2021+ (R&D&I 2021+ )
- National Priorities of Oriented Research
- Innovation Strategy of the Czech Republic 2019–2030
- National RIS3 Strategy
- National Methodology M17+
- Preparation of a new law on research, development, innovation and knowledge transfer
- Development of the Czech state budget for 2023–2025
- Memorandum on support of research, development and innovation in the Czech Republic

## National Recovery Plan in the context of the Economic Strategy of the Czech Republic

The CAS plays an active role in the implementation of the *National Recovery Plan (NRP)*, which is part of the *Economic Strategy of the Czech Republic under component 5.1 Excellent research and development in priority public interest areas in healthcare*, which is overseen by the Ministry of Education, Youth and Sports. The budget for this component is roughly CZK 5 billion. Accordingly, the establishment of a National Institute of Virology and Bacteriology was supported with CZK 1.3 billion from the Exceles Program of the Ministry of Education, Youth and Sports. The main coordinator of the emerging consortium is the Institute of Organic Chemistry and Biochemistry. Twenty-eight research teams from Charles University, Masaryk University, the University of Chemistry and Technology in Prague, Palacký University in Olomouc, the Institute of Molecular Genetics, the Institute of Microbiology and the Biology Centre joined the consortium. Other supported projects include the *National Institute for Cancer Research, National Institute for Neurological Research, National Institute for Metabolic and Cardiovascular Disease Research* and *the National Institute for Research of the Socio-oeconomic Impacts of Diseases and Systemic Risks*.

## National Research, Development and Innovation Policy of the Czech Republic 2021+ (R&D&I 2021+)

*The National R&D&I 2021+ Policy* is the overarching strategic national R&D&I document, which plays an important role in the development of the state R&D&I budget. It is also a strategic framework for development of all components of the R&D&I system in the Czech Republic. The policy was approved by Government Resolution No. 759 of 20 July 2020 and contains five strategic objectives, which are further elaborated into specific objectives. The CAS has actively engaged in implementation of all relevant parts of the *National R&D&I 2021+ Policy* since the beginning of 2021. Special attention was paid to major social challenges as well as new technological trends. We focused in particular on implementation of measure no. 27, which aims to redefine research priorities to increase the resilience of Czech society to global threats. These include e.g. climate change, environmental sustainability, energy, healthcare, quality of life, food security, the aging population, digitalisation and robotisation. The CAS addresses all of these issues rigorously through *Strategy AV21* programmes, through which it responds to current social challenges in accordance with the CAS vision of conducting "top research in the public interest".

## National Priorities of Oriented Research

A political decision was made with the intention of accelerating the development of new *National Priorities of Oriented Research* (NPOR), despite the fact that the existing NPOR are valid until 2030. The Research, Development and Innovation Council (R&D&I Council) therefore initiated discussions about these priorities which are intended to lead to clear strategic directions in future for the development of the Czech research and innovation environment and identify areas for key public investments. As part of the process of developing the new NPOR, the first roundtable was held on 11 October 2022 and attended by the Minister for Science, Research and Innovation, representatives of the Office of the Government of the Czech Republic, members of the R&D&I Council , representatives of providers including the CAS and representatives of interest groups relevant to the R&D&I sector. The aim of the roundtable was to introduce the conclusions of an analysis of support of existing NPOR to the key R&D&I stakeholders and discuss the development concept for new NPOR as well as major social challenges to which future research should respond. Subsequently, the CAS was invited to nominate a representative to the NPOR working group.

## Innovation Strategy of the Czech Republic 2019–2030

The CAS played a key role in the preparation, overall development and implementation of the *Innovation Strategy of the Czech Republic*, which contains the key goals and framework tools for anchoring science and research as key components of the economic and public policy transformation in the Czech Republic. It is comprised of nine interconnected pillars that contain the existing positions, basic strategic goals and tools leading to implementation of the strategy. The pillars include: Funding and evaluation of research and development, Innovation and research centres, National start-up and spin-off environment, Polytechnic education, Digitalisation, Mobility and construction environment, In-

> The CAS actively supported the Czech Presidency of the Council of the European Union by presenting three priority research topics focused on food security including genetically modified organisms, low-emission energy and a resilient society. The choice of topics was based on selected Strategy AV21 programmes in line with the motto "Top research in the public interest."

tellectual property protection, Smart investment and smart marketing. An important part of the strategy is the cross-cutting topic of reducing the administrative burden in science and research. *The Innovation Strategy of the Czech Republic* is an ambitious document that follows on *the National R&D&I Policy* and *National RIS3 strategy* and focuses on presenting the Czech Republic as a country that aims to become a leading innovator over the next decade. The fulfilment of objectives from the *National R&D&I Policy and Innovation Strategy of the Czech Republic* is also supported by essential documents concerning the financial stabilisation of science and research in the Czech Republic, and the Czech government's commitment to systematically increase institutional support for long-term conceptual development of research organisations by at least 4% per year.

## National RIS3 Strategy

*The National Research and Innovation Strategy for Intelligent Specialisation of the Czech Republic 2021-2027 (National RIS3 Strategy)* is one of the implementation tools of the *National R&D&I Policy* in regard to applied research in the Czech Republic. It is a strategic document that builds on the previous strategy for the 2014-2020 period. It focuses mainly on support of promising sectors and their transformation in relation to activities with a higher added value, through e.g. greater emphasis on support for digitalisation, nanotechnologies, biotechnology, photonics, artificial intelligence, advanced materials, etc. It is also an essential prerequisite for EU cohesion policy R&D&I interventions. CAS representatives took part in preparation of the document through the *RIS3 Steering Committee* and sub-working groups, as well as through *National Innovation Platforms*. After a number of rounds of comments, the *National RIS3 Strategy* was submitted to the R&D&I Council for discussion and subsequently the Government of the Czech Republic submitted it to the European Commission for approval. After two rounds of comments, the European Commission accepted it on 19 May 2022. A total funding allocation of EUR 4.7 billion was approved for RIS3 priorities in the Czech Republic in 2021-2027.

## National Methodology 2017+

2022 was the fifth year of implementation of *Methodology 2017+* on a national level, including evaluation of selected high-quality research results through peer review by remote evaluators for specific fields and all research organisations. *Methodology 2017+* continues to evolve in order to capture true quality as best as possible and monitor international trends. In this context, the R&D&I Council addressed the question of how to make the methodology more reflective of disciplinary differences and differing types of research results. For example, successful knowledge and technology transfer, a functioning spin-off or the sale of a licence could also be evaluated results in the future. Similarly, a specific approach to the evaluation of the humanities is needed. Materials for evaluation of all CAS institutes per *Methodology 2017+* were prepared by a CAS committee established specifically for this purpose. The committee submitted the materials to the Office of the Government of the Czech Republic. Subsequently, in December 2022, a tripartite meeting was held about the *Methodology 2017+* evaluation results, which was attended by CAS representatives, relevant R&D&I Council members and representatives of expert panels. The meeting resulted in indicative ranking of research organisations according to the procedure prescribed by *Methodology 2017+*. The evaluation confirmed the CAS' position as a high-performing component of the national R&D&I system.

## Preparation of a new law on research, development, innovation and knowledge transfer

The preparation of a new law on research, development, innovation and knowledge transfer is of crucial importance to the CAS' position in the R&D&I system. During discussions about the latest major amendment to Act No. 130/2002 Coll., on Support of Research and Development from Public Funds, the Legislative Council of the Government pointed out that the modifications had reached the limit of the scope of changes that can be made by legislative amendments. Therefore, new legislation is currently being prepared as a new act. Its basis was discussed by the R&D&I Council at its 379th meeting on 20 May 2022. The main intentions of the new act are to create a legislative environment enabling knowledge transfer, improve conditions for human resources in science and research, set forth ethical principles, protect state security interests, protect intellectual property, forge closer links between basic and applied research, reduce the bureaucratic burden, increase flexibility and simplify the system of conditions for targeted and institutional support and new forms of supporting innovation using funding tools and securing transparent decision-making processes at

*Miloš Vystrčil, President of the Senate of the Czech Republic, spoke at the LX. Session of the CAS Academy Assembly, which took place on 13 December 2022 at the National House in Vinohrady, Prague.*

the provider level. The proposed legislative changes are currently being discussed in the relevant working group, which includes representatives of the CAS and other science and research stakeholders in the Czech Republic.

Considerable attention was also paid to meetings and discussion on the amendment to Act No. 111/1998 on Higher Education Institutions, with a focus on doctoral study programmes and scholarships.

## Development of the Czech state budget for 2023–2025

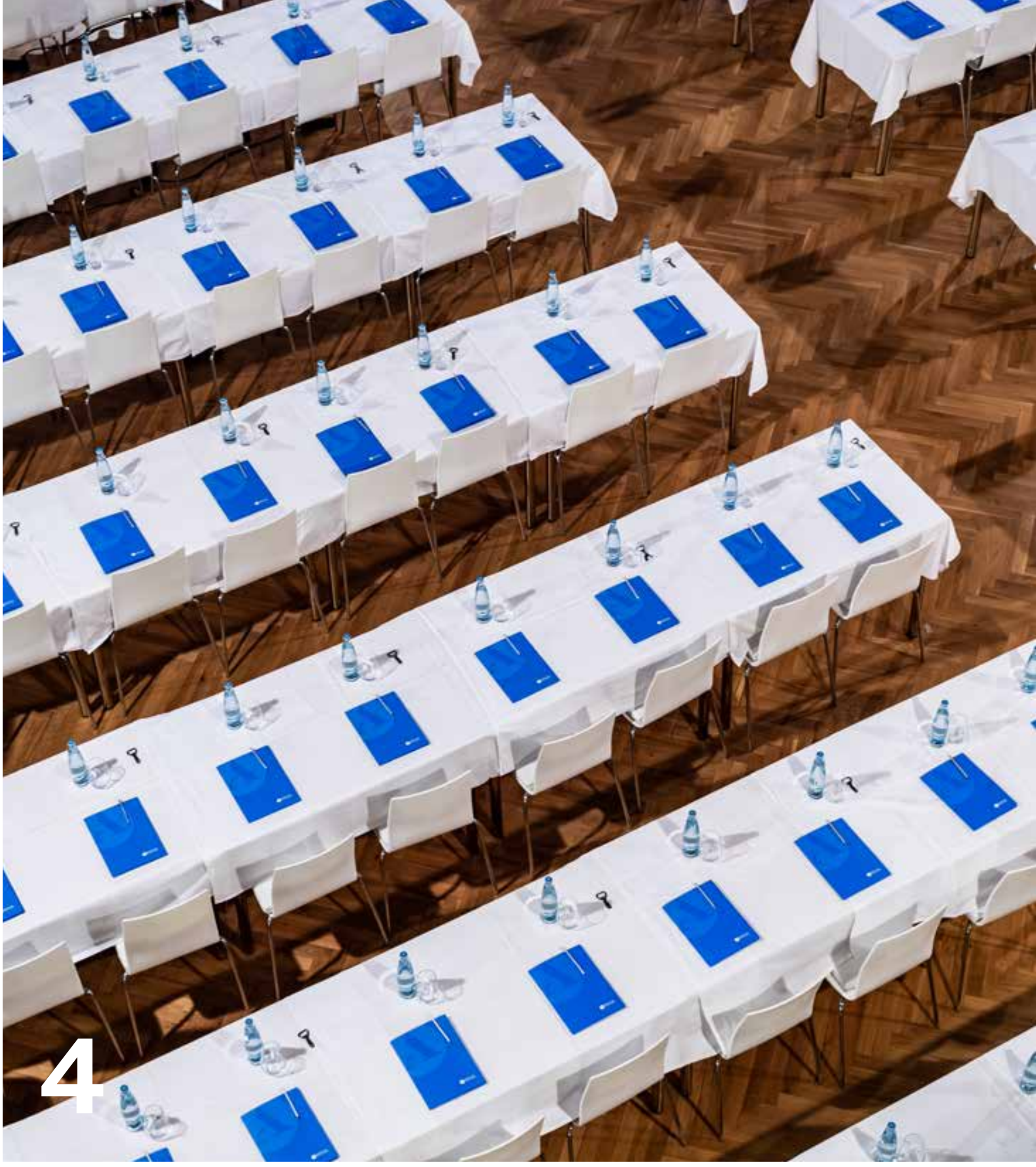
At its 373rd session on 26 November 2021, the R&D&I Council approved draft R&D&I funding from the state budget of the Czech Republic for 2023 with a mid-term outlook to 2024-2025. CZK 7,002 million per year was proposed for the CAS budget chapter for 2023-2025. This amount includes CZK 210 million for funding of ELI Beamlines and CZK 10 million for ERC-CZ programme projects.

Subsequently, the Ministry of Finance of the Czech Republic submitted a preliminary draft schedule of income and expenditures for the chapters of the state budget of the Czech Republic for 2023-2025 (Czech Government Resolution No. 471 of 1 June 2022). In this draft, CZK 6,773 million was listed for the CAS chapter of the state budget for 2023 and in the mid-term outlook an annual allocation of CZK 6,998 million was listed for 2024 and for 2025. The CAS took note of the submitted draft state budget allocations for 2023-2025, but raised a fundamental objection to the draft in regard to the unprecedented growth in inflation and impacts of the energy crisis. In a letter dated 22 July 2022, the CAS requested an increase in funding for the CAS chapter of the state budget to CZK 7,330 million for 2023, CZK 7,598 million for 2024 and CZK 7,837 million for 2025, with reference to the *Memorandum on support of research, development and innovation in the Czech Republic* dated 19 December 2019.

After complicated budgetary negotiations, the Czech government adopted Resolution No. 808 on 26 September 2022, which listed CZK 7,177 million for the CAS chapter of the state budget for 2023 and an annual allocation of CZK 7,301 million in the mid-term outlook for 2024 and for 2025. The CAS budget for 2023 includes CZK 200 million for CAS institutes as partial compensation (less than 40%) for increased energy prices and from 2023 onwards, the CAS budget includes a new allocation of CZK 200 million for co-funding of the project "COMPASS-U: Tokamak for cutting-edge fusion research" at the Institute of Plasma Physics. In the mid-term outlook for 2024-2025, an annual allocation of CZK 300 million is planned as co-funding of this project. However, the transfer of ELI Beamlines to ELI-ERIC was not taken into account in the mid-term outlook, and therefore, in the next phase of preparation of the draft state budget for 2024-2025, funds of CZK 210 million will be allocated to the Ministry of Education, Youth and Sports chapter. After this adjustment, institutional funding for the CAS for 2024-2025 will amount to CZK 7,091 million per year. The Act on the State Budget of the Czech Republic for 2023 was approved by the Chamber of Deputies of the Parliament of the Czech Republic on 1 December 2022 with effect from 1 January 2023.

## Memorandum on support of research, development and innovation in the Czech Republic

The financial stability of the scientific research environment is one of the main prerequisites for the successful development of CAS institutes and other research organisations operating in the R&D&I system. An adequate level of basic institutional funding will enable CAS institutes to concentrate on conceptual scientific and educational work and effective performance of their primary functions. To this end, the CAS participated in elaboration of the *Memorandum on support of research, development and innovation in the Czech Republic*, in which it made a commitment to effective fulfilment of the objectives of the *Innovation Strategy of the Czech Republic*, while the government committed to an increase in institutional funding for long-term conceptual development of research organisations of at least four percent per year. The long-term goal is to increase direct institutional support to key actors in Czech science and research - the Czech Academy of Sciences and universities - up to 70% of their total budgets. For these reasons, this document should be annually considered during the process of developing the state budget for R&D&I, while the CAS will strive to ensure that it is updated – particularly in regard to the high rate of inflation over the past year.



4

# Organisational Measures

The LIX. Session of the CAS Academy Assembly was the Academy Assembly's last session during its eighth term of office of 2018–2022. The agenda of the session included secret ballot voting to elect members of the Academy Assembly for the 2022–2026 term pursuant to Article 11 (1) (e) and (f) of the CAS Statutes. It was the first time that the election was held through an electronic voting application at an in-person meeting of the Academy Assembly. The LX. Session of the Academy Assembly was the constitutive meeting of the Academy Assembly in its ninth term of office of 2022-2026. The Academy Assembly approved the draft Rules of Procedure and Elections of the Academy Assembly, established the working committees of the Academy Assembly and elected members to the Supervisory Committee of the Academy Assembly for the new term of office by secret ballot. The Academy Assembly also approved, among other things, the draft CAS budget for 2023 and the Concept of the development of the activities of the CAS.

In 2022, the term of office ended for most bodies of CAS institutes, i.e. institute directors, chairpersons, vice-chairpersons and other members of the supervisory boards of CAS institutes. The President of the CAS appointed 32 directors of CAS institutes. The Academy Council appointed 21 chairpersons, 39 vice-chairpersons and 144 members of supervisory boards of CAS institutes.

A key topic in 2022 was the preparation of the evaluation of CAS institutes' research and professional activities for 2020–2024. The Academy Council approved the draft objectives and key elements for this evaluation. The Academy Council also expressed its support for the European Commission's initiative "Towards an agreement on reforming research assessment" and gave its approval for the CAS to join the coalition for reforming the research assessment system in line with the CAS' efforts to improve its evaluation system and follow the latest evaluation trends.

The CAS continued to devote significant attention to raising the awareness of CAS institutes by organising regular informational seminars focused on current topics and finding solutions to institutes' specific practical problems.

*LX. Session of the CAS Academy Assembly took place on 13 December 2022 at the National House in Vinohrady, Prague.*

## Renewal of the composition of the Academy Assembly for the 2022–2026 term

The eighth term of the Academy Assembly of 2018-2022 ended in 2022. At its eighth session on 11 January 2022, the Academy Council approved the proposed procedure for constituting the Academy Assembly for its ninth term. In accordance with the valid CAS Statutes and the approved procedure, the categories of the Academy Assembly were constituted as follows: a) the directors of CAS institutes became members of the Academy Assembly by virtue of their office, b) the elected representatives of CAS institutes were elected by each institute in September and October 2022 in accordance with the instructions of the CAS President in her bulk letter No. 3 of 17 June 2022, c) the CAS received the list of ten representatives of universities appointed by the Council of Higher Education Institutions in a letter from the Chair of the Council of Higher Education Institutions dated 11 October 2022, d) nine representatives of state authorities were appointed by the Government of the Czech Republic by Government Resolution No. 868 at its meeting on 19 October 2022, e) ten representatives of the industrial, business and banking sectors were elected by the Academy Assembly on 20 April 2022 at its LIX. Session (see right), f) twenty-five eminent domestic and foreign scientists were also elected by the Academy Assembly at the last session of the 2018-2022 term on 20 April 2022, g) according to Article 11 (2) of the CAS Statutes, the CAS President and other members of the Academy Council who were not elected or appointed members of the Academy Assembly in one of the above-mentioned groups were appointed members of the Academy Assembly. There was a total of 276 Academy Assembly members at the beginning of the ninth term of office. The composition of the Academy Assembly for the ninth term of office of 2022–2026 was published on the Academy Assembly website.

## Sessions of the Academy Assembly in 2022

In 2022, there were two regular sessions of the Academy Assembly, the CAS' highest body.

**The LIX. Session of the Academy Assembly** was the last session in the eighth term of 2018-2022. 199 members of the Academy Assembly (77%) took part in the session, which was held on 20 April 2022 at the National House Vinohrady. The agenda included a secret ballot election of Academy Assembly members for the 2022-2026 term in accordance with Article 11 (1) (e) and (f) of the CAS Statutes. For the first time, this election was held via an electronic voting application at an in-person session of the Assembly. A total of 35 new Academy Assembly members for the 2022-2026 term were elected, including 10 representatives of the industrial, business and banking sectors and 25 eminent domestic and foreign scientists, which is the maximum allowed in these categories pursuant to Article 11 (1) (e) and (f) of the CAS Statutes. The names of the newly elected Academy Assembly members are part of the resolution of the LIX. Session of the Academy Assembly. The Academy Assembly approved all submitted materials without comments, including the 2021 Annual Report of the Czech Academy of Sciences, 2021 CAS financial report and an excerpt from the 2021 CAS closing account. The Academy Assembly also took note of information on the submitted draft state budget for research, development and innovation for 2023 with an outlook to 2024-2025, expressed its support for the draft and asked the Government of the Czech Republic to adopt it.

The LIX. Session's resolution also included a resolution adopted by the Academy Assembly in per rollam voting No. 4, which took place on 4-8 April 2022 as part of preparations for the LIX. Session of the Academy Assembly. In this resolution, the Academy Assembly approved the working group for the LIX. Session of the Academy Assembly and secret ballot voting procedures for the election of Academy Assembly members for the 2022–2026 term pursuant to Article 11 (1) (e) and (f) of the CAS Statutes at the LIX. Session of the Academy Assembly.

**The LX. Session of the Academy Assembly** was the constitutive meeting of the Academy Assembly in its ninth term of office of 2022-2026. It was held on 13 December at the National House Vinohrady and 230 members of the Academy Assembly took part (86%). The Academy Assembly approved the draft Rules of Procedure and Elections of the Academy Assembly for the 2022-2026 term and established the working committees of the Academy Assembly for the entire 2022-2026 term – the mandate, proposal and election committees, each with five members nominated from among the Academy Assembly members. CAS Head Office staff members were appointed to serve as Academy Assembly working committee secretaries. The composition of the working committees established by the Academy Assembly for the 2022-2026 term became part of the resolution of the LX. Session. The Academy Assembly approved all the materials according to the approved agenda of the session, including the CAS financial report for 2022, the draft CAS budget for 2023 and the Concept of development of the activities of the CAS. The agenda also included a secret ballot election of members of the Supervisory Committee of the Academy Assembly for the 2022-2026 term of office, in which all nine committee members were elected. The secret ballot election was once again conducted through an electronic voting application. The names of the newly elected members of the Supervisory Committee of the Academy Assembly became part of the resolution of the LX. Session and were published on the website of the Academy Assembly.

At the LX. Session, the Academy Assembly also appreciated the efforts of the Minister for Science,

Research and Innovation, H. Langšádlová, who is focusing her energy on the field of science and research in the Czech Republic during the current difficult economic situation, and who expressed her support for further negotiations on increasing state budget expenditures for R&D&I, especially in the mid-term outlook for 2024-2025.

Along with the renewal of the Academy Assembly for the new term and meetings of the Academy Assembly, the activities of the Czech Academy of Sciences pursued other important goals during 2022. The CAS continued to devote considerable efforts to raising the awareness of CAS institutes by organising regular information seminars focused on current topics and addressing CAS institutes' specific practical problems.

## Renewal of bodies of CAS institutes

Terms of office ended in 2022 for most CAS institute management bodies, i.e. institute directors, chairpersons, vice-chairpersons and other members of supervisory boards.

The President of the CAS appointed 32 new CAS institute directors in 2022 based on selection processes and recommendations from the boards of the relevant CAS institutes. In this regard, Guideline of the Academy Council of the CAS No. 10/2016 - Rules for Filling Positions of Directors of Institutes of the Czech Academy of Sciences, was amended.

Due to expiring mandates or termination of employment, the Academy Council appointed 21 new chairpersons, 39 vice-chairpersons and 144 members to CAS institute supervisory boards in 2022. To ensure timely renewal of institute bodies to maintain continuity in the institutes' work, the President of the CAS sent out a bulk letter containing principles and procedures for the appointment of CAS institute directors, election of members of CAS institute boards and appointment of CAS institute supervisory board chairpersons, vice-chairpersons and other members. In this context, Instruction of the Academy Council of the CAS No. 1/2020 on Supervisory Boards of Institutes of the Czech Academy of Sciences was also amended. An information leaflet containing a summary of the statutory rights and obligations of board and supervisory board members was sent to the newly appointed members of boards and supervisory boards of CAS institutes. On 4 May 2022, a seminar was held via videoconference, especially for new members, chairpersons, vice-chairpersons and secretaries of supervisory boards of CAS institutes, about the position and responsibilities of members, the programme and agendas of supervisory boards. The Academy Council also discussed the report on the activities of CAS institute supervisory boards for 2021, prepared on the basis of the evaluation of all of the boards' annual reports on their activities.

## CAS cooperation with academic and public sector partners

The CAS Academy Council consistently emphasises the importance of R&D collaboration between various institutions on the national and international levels. In 2022, the CAS initiated collaboration with additional key partners.

In terms of cooperation with universities, the CAS concluded a *Memorandum on cooperation in implementation of scientific and research tasks* with the Police Academy of the Czech Republic in Prague. The focal point of cooperation with universities in the Czech Republic shifted from negotiations on agreements between the CAS and university rectors to faculties and specific CAS institutes, which jointly prepare documents for accreditation of study programmes and work together to educate doctoral students. In terms of international cooperation with universities, in 2022 the CAS placed particular emphasis on expanding collaborative ties with European universities.

In regard to cooperation with the state and public sector, the CAS concluded a *Declaration of cooperation* with Czech Radio.

In the context of development of regional cooperation, an agreement on cooperation was signed with the capital city of Prague. On the basis of cooperation agreements concluded with a total of 18 regional partners, the CAS continued to help regions and micro-regions of the Czech Republic to improve the quality of life through jointly funded research projects and application of these projects aimed at addressing social, economic, ecological, natural and cultural issues.

In 2022, the CAS concluded ten new international cooperation agreements and extended several previously concluded agreements. These included e.g. conclusion of agreements on cooperation with the National Agency for Research and Development, ANID, Chile, the Indian Institute of Technology Madras, the Polish Akademia Umiejetności (PAU), the Bulgarian Academy of Sciences (BAS), EIG CONCERT-Japan, Consejo Superior de Investigaciones Científicas and the Israel Academy of Sciences and Humanities.

In accordance with archaeological heritage preservation, in 2022 the Czech Academy of Sciences concluded ten agreements to conduct archaeological research with organisations holding authorisations pursuant to the state monument preservation law.

## Activities related to CAS internal regulations

Nine internal regulations were approved and issued by the CAS in 2022.

In compliance with grant provision requirements pursuant to Act No. 218/2000 Coll., on Budgetary Rules, the Academy Council evaluated submitted applications and awarded grants correspondingly. In 2022, the CAS released 29 calls for grant applications and issued a total of 1,269 decisions (including 1,032 decisions on grant awards and 237 decisions on modifications and corrections to decisions). The CAS Academy Council continued to strive to simplify the laborious administrative aspects of the grant process.

In 2022, amendments to Academy Council guidelines were adopted to standardise the procedure for submission and review of grant reports, including Academy Council Guideline No. 2/2022 amending the Guideline of the Academy Council of the CAS on Support for Instrumentation, to which provisions for grant reports were added, and Academy Council Guideline No. 3/2022 amending the Guideline of the Academy Council of the CAS on Support for Construction Projects, to which an environmental impact provision was added to the construction works proposal item.

Guideline of the Academy Council of the CAS No. 1/2019 on Support for Holders of the Scientific Degree "Research Professor" at a CAS Institute was also amended, which eliminated the conclusion of a tripartite contract between the holder, the CAS institute and the CAS in light of the unification of the procedure for submitting and discussing grant reports.

The Academy Council continued in its committed efforts to support and recognise excellent scientific results and researchers at CAS institutes. In May 2022, Guideline of the Academy Council of the CAS No. 8/2018 on the Fellowship for Prospective Researchers – Lumina Quaeruntur was amended, following the new concept of this fellowship discussed by the CAS Science Council. Academy Council Guideline No. 5/2022, among other things, restricted the possibility for an institute to submit the same proposal for a single fellowship candidate more than twice, intro-

duced a two-round evaluation in case a larger number of proposals are received, set a requirement for a minimum of 20% co-funding by the institute for eligible costs and newly regulated the length of research practice of the nominated fellow, the amount of his/her working time, the composition of the research team and the cooperation of the Lumina Quaeruntur Fellowship Committee with the Science Support Division of the CAS Head Office.

## Expansion and support of Strategy AV21 research programmes

The Academy Council continued to devote notable energy to the expansion and support of Strategy AV21 research programmes. On the proposal of the Strategy AV21 Council and the recommendation of the Science Council, in January 2022 the Academy Council approved the establishment of four Strategy AV21 Research Programmes for a period of five years. The programmes are Breakthrough Technologies for the Future - Sensing, Digitalisation, Artificial Intelligence and Quantum Technologies; Sustainable Energy; Anatomy of European Society, History, Tradition, Culture, Identity; and Towards Precision Medicine and Gene Therapy - A New Hope in the Treatment of Human Diseases. In May 2022, the Academy Council approved a proposal for additional funding for Strategy AV21 research programmes in 2022. In September 2022, the Academy Council approved the design of the new Strategy AV21 logo and its use for the promotion of Strategy AV21.

## Activities of the CAS Science Council

The Science Council provided conceptual support to the Academy Council in matters of science policy development and implementation, with regular submission of its suggestions and recommendations. The most important of these is the *Concept for the development of the activities of the CAS*, which replaced the outdated version from 2016 and was approved by the Academy Assembly at its LX. Session on 13 December 2022. The concept was developed as a collaborative effort between the Science Council and Academy Council and included areas with long-term strategic potential. Current societal topics including environmental and energy sustainability, cybersecurity and equal opportunities were incorporated into the new version of the concept.

Other important topics that the Science Council addressed include the promotion of excellence at the CAS. In addition to three nominations for "Research Professor" degree recipients, the Science Council discussed four proposals for Strategy AV21 research programmes and recommended to the Academy Council that one of them receive financial support. Other topics included the preparation of an amendment to the Guideline of the Academy Council of the CAS on the Fellowship for Prospective Researchers – Lumina Quaeruntur, the issue of doctoral studies at the CAS, discussion on the preparation of an amendment to the Higher Education Act and the scientific aspects of the transfer of the ELI Beamlines Facility from the Institute of Physics to the ELI ERIC. In connection with the transformation of the ELI Beamlines Facility, the Science Council recommended to the Academy Council that the CAS consistently strive to maintain excellence in science and research, including the provision of infrastructure services carried out at the ELI Beamlines Facility. With the approval of the Academy Council, the Science Council further proposed that Prof. RNDr. Pavel Zemánek, Ph.D., be nominated as the Science Council's representative on the ELI Beamlines advisory body in the ELI ERIC: International Scientific Advisory Committee (ISAC) and then to the newly established International Scientific and Technical Advisory Committee (ISTAC), an advisory body of the ELI ERIC.

In relation to the expiry of the CAS Scientific Integrity Committee's term of office, the Science Council elected new Committee members for the 2022-2026 term, including JUDr. Jan Bárta,CSc., Prof. RNDr. Miroslav Engliš, DrSc., Prof. Ing. Jan Flusser, DrSc., Mgr. Michael Komm, Ph.D., Doc. Mgr. Tereza Stöckelová, Ph.D., Prof. RNDr. Patrik Španěl, Dr. rer. nat., Prof. RNDr. Boris Vyskot, DrSc., Doc. Mirjam Friedová, Ph.D., Doc. Pharm Dr. Jitka Palich Fučíková, Ph.D., Prof. PhDr. Jiří Pešek, CSc., and Doc. PhDr. Ota Konrád, Ph.D. PhDr. Oldřich Tůma, Ph.D. was elected Chair of the Committee.

## Evaluation of research and professional activities of CAS institutes

In June 2022, the Academy Council expressed its support for the European Commission's initiative "Towards an agreement on reforming research assessment" and gave its approval for the CAS to join the coalition for reforming the research assessment system in line with the CAS' efforts to improve its evaluation system and follow the latest evaluation trends.

The main topic of 2022 was the preparation of the evaluation of research and professional activities of CAS institutes for 2020-2024. In this context, in April 2022, the Academy Council discussed the Science Council's recommendations on the CAS evaluation concept and decided to take them into account in the preparation of the next evaluation of CAS institutes. In July 2022, the Academy Council discussed and approved the draft objectives of the evaluation of research and professional activities of CAS institutes for the 2020-2024 period and in October 2022, it approved the recommendations of the CAS Research Evaluation Committee concerning key elements for the evaluation of CAS institutes for the 2020-2024 period.

## Support of Open Science

In 2022, the Academy Council continued to pay heightened attention to the *Open Access* and *European Open Access Cloud* initiative, which processes information and existing activities related to open access to scientific data in both the Czech and European environments. In May 2022, the Academy Council discussed the future of Open Science at the CAS and the draft EOSC-CZ project proposal for the OP JAK operational programme and approved CAS participation in the EOSC-CZ project conditional on its long-term sustainability.

## Supervision of the management of CAS institutes' property

In 2022, the Academy Council, in accordance with Guideline of the Academy Council of the CAS No. 1/2021 on Procedure when Issuing Founder's Prior Consent and for Other Disposal of Assets, granted a number of prior consents in accordance with the Act on Public Research Institutions. These were primarily consents with purchase of scientific instruments and equipment for the purposes of research at CAS institutes, particularly in Research Areas I and II. Due to the difficulties that several CAS institutes encountered in purchasing new economic information systems (hereinafter "EIS") because suppliers failed to fulfil the contractual terms, some consents were issued for the conclusion of new contracts on supply of EIS, including system implementation and operational support and development services. In accordance with Guideline of the Academy Council of the CAS No. 1/2021 on Procedure when Issuing Founder's Prior Consent and for Other Disposal of Assets, a number of requests for consent with the establishment of easements related to the construction of public utilities were also approved as standard procedure.

Regarding knowledge and technology transfer at CAS institutes, two requests for founder's consent with institute participation in a spin-off company were approved (in one case it was the establishment of a new legal entity, in the other case it was entry into an existing entity). The use of research results is also facilitated by the participation of CAS institutes in legal entities such as associations, for which consents were also granted. In addition, three requests from institutes for consent to enter into agreements governing the use of intellectual property were given.

During 2022, further negotiations were held with the Office for Government Representation in Property Matters regarding the non-monetary transfer of administrative building No. 1569 on Washington Street in Prague, which was declared as unneeded state property in 2016, from the property of the Czech Republic for the needs of the Institute of the Czech Language.

## Transfer of the ELI Beamlines Facility

In addition to knowledge and technology transfer, in 2022 the CAS concerned itself with the transfer of the ELI Beamlines Facility located in Dolní Břežany (hereinafter "ELI Beamlines") from the CAS Institute of Physics to the Extreme Light Infrastructure European Research Infrastructure Consortium (hereinafter "ELI ERIC"), established on the basis of Council Regulation (EC) No. 723/2009 of 25 June 2009 on the Community legal framework for a European Research Infrastructure Consortium, with the aim of transforming the facility into part of the consortium by 1 January 2023. The variety of experimental facilities in the ELI ERIC will enable extensive basic and applied scientific research and the achievement of cutting-edge research results in many scientific fields, in particular unique observations of biological structures, particle acceleration for medical purposes, development of a compact laser particle accelerator, study of unknown properties and behaviour of high-energy-density matter and laser-driven nuclear fusion. Considering the importance of the transformation for the development of research infrastructure in both the Czech and European contexts, the Academy Council, in cooperation with the CAS Property Committee and the Science Council, paid considerable attention to the issue of the public interest in the inclusion of ELI Beamlines in the ELI ERIC consortium, the expediency of the transfer of its property in relation to the scientific, economic and administrative aspects and the complex legal context of the transformation. The Academy Assembly took note of the transfer of ELI Beamlines and expressed its approval and thanks through a resolution at its LX. Session.

## Inter-ministerial commenting procedures and amendments to the founding charters of CAS institutes

In regard to inter-ministerial commenting procedures, in 2022 the CAS assessed and took positions on 179 government documents submitted by ministries or other state bodies via the eKLEP Legislative Process Electronic Library. The CAS submitted comments in 34 proceedings (32%), including essential and recommendation comments in 8 proceedings, essential comments in 13 proceedings and recommendation comments in 13 proceedings.

In 2022, two addenda to founding deeds of CAS institutes were issued (Addendum No. 3 - Institute of Archaeology of the CAS, Brno, and Addendum No. 2 - Institute of Macromolecular Chemistry of the CAS).

## Protection of personal data and processing of requests for information pursuant to Act No. 106/1999 Coll.

The CAS continued to pay great attention to thorough protection of personal data in accordance with the General Data Protection Regulation (GDPR) and Act No. 110/2019 Coll., on the Processing of Personal Data.

In 2022, the CAS received a total of ten requests for information under Act No. 106/1999 Coll., on Free Access to Information. The requests were processed in compliance with the law. One decision to reject part of the request was issued. Three requests did not fall within the jurisdiction of the CAS and were deferred under S. 14 (5) (c) of the Act. One request was not a request under Act No. 106/1999 Coll. despite its formal designation as such. The remaining requests were processed by providing information through communication pursuant to S. 4a (2) (a) of the Act, by providing a copy of the requested document pursuant to S. 4a (2) (b) of the Act or by providing a data file containing the requested information pursuant to S. 4a (2) (c) of the Act.

## Patronage of the CAS President

The President of the CAS bestowed patronage on 15 science and research events in 2022. Information about patronage and application forms became available on the CAS website, making it an information interface for applicants requesting patronage for institutes and other applicants.

## Support for CAS knowledge and technology transfer

The Academy Council discussed and approved the new *CAS Strategy for Knowledge and Technology Transfer* prepared by the CAS Technology Transfer Office (*TTO*). The main mission of the knowledge and technology transfer support system is to enable and accelerate the use of scientific research results in practice. The priority objective is to find and arrange funding for technology development and knowledge application, typically in close collaboration with an application partner. The strategy addresses areas such as the social dimension of knowledge transfer at the CAS, how knowledge transfer contributes to the development of the CAS, the objectives of knowledge transfer at the CAS and the strategy of transfer support at the CAS. In 2022, the CAS organised or co-organised several important events to support technology transfer, including the seminar *Supporting Knowledge and Technology Transfer in Germany* (CAS, 25-26 May 2022), *Roundtable on Knowledge and Technology Transfer* (Office of the Government of the Czech Republic and CAS, Liechtenstein Palace, 9 June 2022) and the *13th Plenary Meeting of the European TTO CIRCLE* (CAS, 23.-24 June 2022).

## Increasing the CAS' institutional resilience against the influence of foreign power

The Academy Council also dedicated considerable attention to increasing the institutional resilience of the CAS against the influence of foreign powers. In this context, on 20 October 2022, Academy Council Instruction No. 3/2022 on increasing the institutional resilience of the CAS was issued to set up internal processes at the CAS aimed at increasing the institutional resilience of the CAS against the influence of foreign powers, in particular by raising awareness of threats and the risks to which CAS institutes and employees are exposed (in particular increasing resilience against the unwanted influence of foreign powers, cybersecurity and compliance with international control systems).

# Selected Results

All 54 research institutes of the CAS, which operate as public research institutions, contributed to the scientific results achieved in 2022. CAS institutes are grouped into three research areas: the first area comprises physical sciences, the second area covers life and chemical sciences, and the third area focuses on the humanities and social sciences. CAS scientific research led to many positive results in 2022; nine of the most fascinating outcomes from the three areas are featured on the following pages.

# SELECTED SCIENTIFIC RESULTS FROM RESEARCH AREA I. INSTITUTES

## LASER-ULTRASONIC CHARACTERISATION OF NEWLY DEVELOPED HEUSLER ALLOYS FOR BIOMEDICAL APPLICATIONS

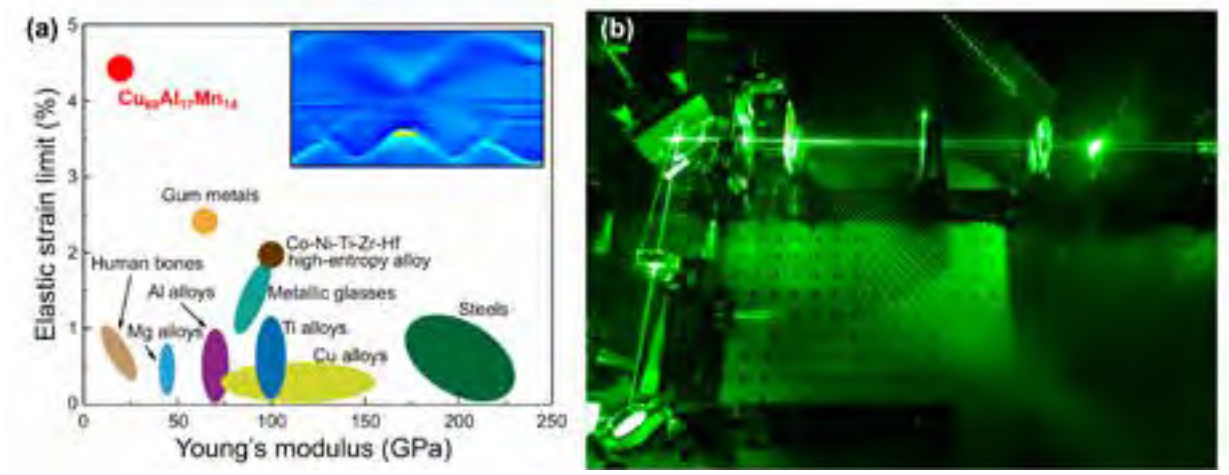
**Institute of Thermomechanics**

New Heusler alloys were developed in collaboration with Tohoku University (Japan). These alloys exhibit a unique combination of a low elasticity modulus, corrosion resistance and the ability to achieve large reversible strains, making them optimal candidates for joint and bone implants. The research utilised two laser-ultrasound methods developed at the Institute of Thermomechanics: resonant ultrasound spectroscopy [Odaira et al.] and transient grating spectroscopy [Xu et al.]

**Bibliographic references:**

*S. Xu, T. Odaira, S. Sato, X. Xu, T. Omori, S. Harjo, T. Kawasaki, H. Seiner, K. Zoubková, Y. Murakami, R. Kainuma, Non-Hookean large elastic deformation in bulk crystalline metals. Nature Communications. 2022, 13(1), 5307. E-ISSN 2041-1723.*

*T. Odaira, S. Xu, K. Hirata, X. Xu, T. Omori, K. Ueki, K. Ueda, T. Narushima, M. Nagasako, S. Harjo, T. Kawasaki, L. Bodnárová, P. Sedlák, H. Seiner, R. Kainuma, Flexible and Tough Superelastic Co-Cr Alloys for Biomedical Applications. Advanced Materials. 2022, 34 (27), art. no. 2202305, IF 32.086.*




**Mechanical properties of CuAlMn alloy using transient grating spectroscopy**

*A unique combination of large reversible strains and a low elasticity modulus in the newly developed Cu-AlMn alloy; (a) the graph shows a map from transient grating spectroscopy measurements, documenting particularly low elastic moduli in certain directions; (b) laser-ultrasonic transient grating spectroscopy experiments used for measurements at the CAS Institute of Thermomechanics.*

## HYDROGEN STORAGE IN MULTICOMPONENT ALLOYS

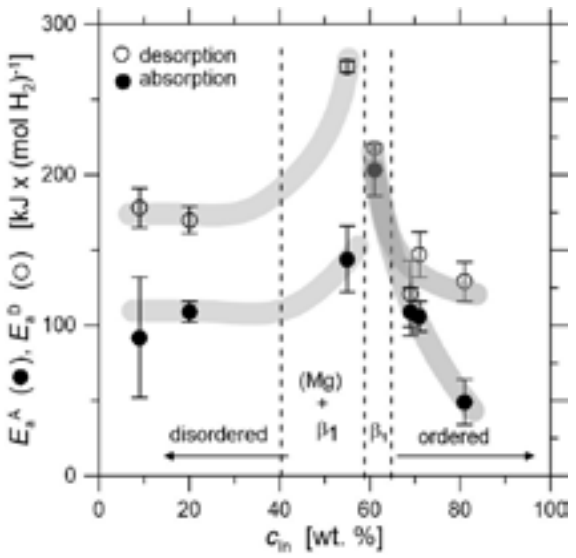
**Institute of Physics of Materials**

In 2022, hydrogen sorption experiments focused on chemisorption in multi-principal-element-alloys (MPEAs) continued. The highlights of results obtained for high-melting metal materials were summarised in two publications [1, 2]. MPEAs from the light-weight-elements family were also investigated, in particular alloys containing Laves phases. In model multi-principal-element high-melting metal alloys, MPEAs were found to be promising primarily as hydrogen sorption catalysts rather than as hydrogen storage media.

**Bibliographic references:**

*J. Čermák, L. Král, P. Roupcová, Hydrogen storage in TiVCrMo and TiZrNbHf multi-principal-element alloys and their catalytic effect upon hydrogen storage in Mg. Renewable Energy 188. 2022, 411-424.*

*J. Čermák, L. Král, P. Roupcová, A new light-element multi-principal-elements alloy AlMg2TiZn and its potential for hydrogen storage. Renewable Energy 198. 2022, 1186-1192.*




**Dependence of activation energy expressing the significant dependence of hydrogen absorption and desorption rates on the chemical composition of Mg-In-C alloys with a variable degree of ordering**

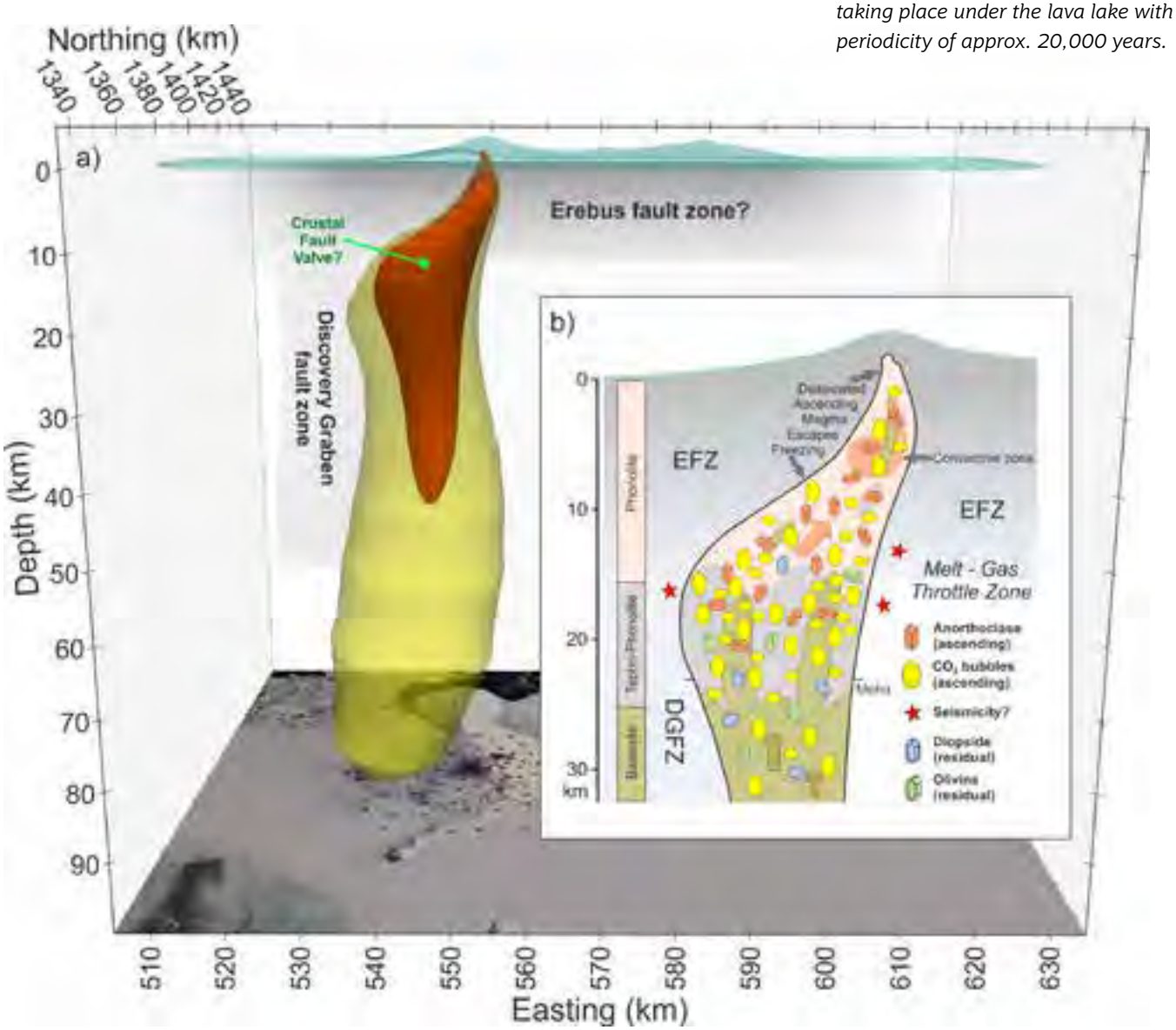
## THE ROLE OF THE EARTH'S CRUST ON MAGMATIC SYSTEMS AT THE MOUNT EREBUS VOLCANO IN ANTARCTICA

**Institute of Geophysics**

Using 3D magnetotelluric surveys that measured conductivity in the Earth's crust, internal processes in Mt. Erebus on Ross Island (Antarctica), an active ultra-alkalic volcano in the continental rift, were explained. In contrast to volcanoes, rift volcanoes over subduction zones, where water is the main volatile component, can significantly affect the composition of the atmosphere by $CO_2$-dominated exhalations and thus impact the climatic balance of the planet, as has happened several times in the Earth's past.


**Bibliographic references:**

*G. J. Hill, P. E. Wannamaker, V. Maris, J. A. Stodt, M. A. Kordy, M. Unsworth, P. A. Bedrosian, E. L. Wallin, D. F. Uhlmann, Y. Ogawa, P. Kyle, Trans-crustal structural control of $CO_2$-rich extensional magmatic systems revealed at Mount Erebus Antarctica. Nature Communications. 2022, 13(1), 2989. E-ISSN 2041-1723.*


**3D visualization of the subsurface structure of the Mt. Erebus volcano**

*Regions of lower electrical resistivity are areas with high melt content.*
*a) The yellow column corresponds to the melt--rich region that extends at least 100 km below Mt. Erebus. The structure shown in red represents the channel of "dry" magma with a high $CO_2$ content that feeds the lava lake in the volcano.*
*b) Schematic representation of the processes taking place under the lava lake with an average periodicity of approx. 20,000 years.*

# SELECTED SCIENTIFIC RESULTS FROM RESEARCH AREA II. INSTITUTES

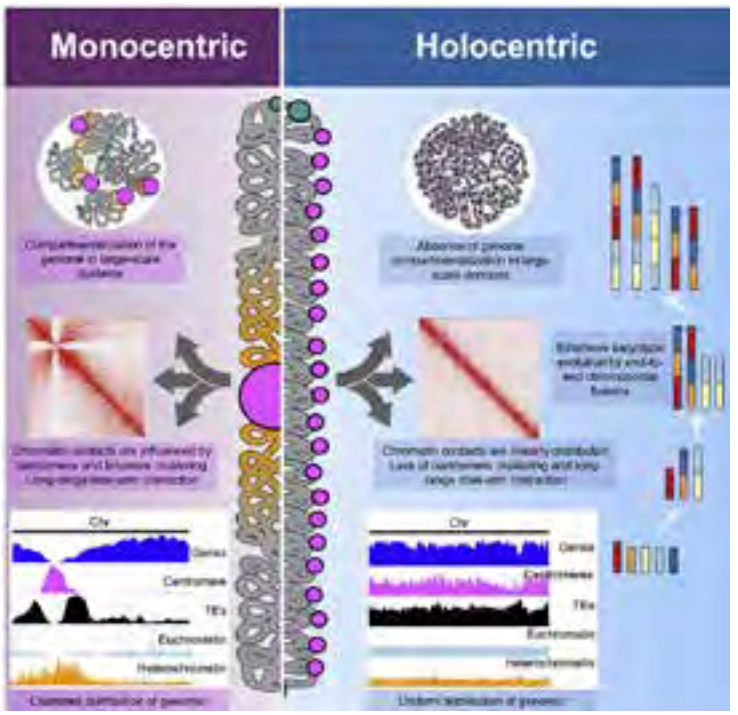
## GENOME ARCHITECTURE AND KARYOTYPE EVOLUTION IN HOLOCENTRIC PLANTS

**Biology Centre**

The complete genomes of three holocentric plant species of the genus Rhynchospora and their closely related monocentric species, the decomposer sieve, were sequenced. Analysis of these genomes revealed that holocentric chromosome organisation entails major changes in genome architecture both at the level of the DNA sequence itself and with respect to epigenetic marks and the ability to generate chromosomal rearrangements.

**Bibliographic references:**

*P. G. Hofstatter, G. Thangavel, T. Lux, P. Neumann, T. Vondrak, P. Novak, M. Zhang, L. Costa, M. Castellani, A. Scott, H. Toegelova, J. Fuchs, Y. Mata-Sucre, Y. Dias, A. L. L. Vanzela, B. Huettel, C. C. S. Almeida, H. Simkova, G. Souza, A. Pedrosa-Harand, J. Macas, K. F. X. Mayer, A. Houben, A. Marques (2022). Repeat-based holocentromeres influence genome architecture and karyotype evolution. Cell 185:3153-3168.e18.*




**Monocentric vs. holocentric chromosomes**

*Schematic illustration of the main differences revealed between monocentric and holocentric chromosomes*

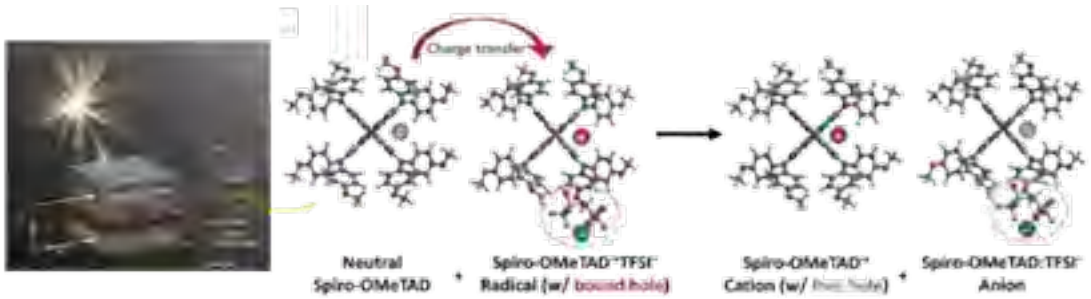
## ION-MODULATED RADICAL DOPING WITH A NEW TYPE OF SPIROCYCLIC ADDITIVE SPIRO-OMETAD FOR MORE EFFICIENT AND STABLE PEROVSKITE SOLAR CELLS

**Institute of Macromolecular Chemistry**

The role of Coulombic interactions in the formation of molecular structure for maximum unpaired electron transfer efficiency in a solar cell layer, in which electron-hole (positive charge) transfer to the anode occurs, was elucidated. This easier electron-hole transfer is facilitated by a new type of additive which is highly efficient and generates a significant number of radicals at relatively low concentrations. Moreover, the additive also limits side reactions, thus increasing the lifetime of the solar cells.

**Bibliographic references:**

*T. Zhang, F. Wang, H.-B. Kim, I.-W. Choi, C. Wang, E. Cho, R. Konefal, Y. Puttisong, K. Terado, L. Kobera, M. Chen, M. Yang, S. Bai, B. Yang, J. Suo, S.-C. Yang, X. Liu, F. Fu, H. Yoshida, W. M. Chen, J. Brus, V. Coropceanu, A. Hagfeldt, J.-L. Brédas, M. Fahlman, D. S. Kim, Z. Hu, F. Gao, Ion-modulated radical doping of spiro--OMeTAD for more efficient and stable perovskite solar cells. Science. 2022, 377(6605), 495–501. ISSN 0036-8075. E-ISSN 1095-9203.*




**Radical doping mechanism with spiro-OMeTAD ion modulation**

*Schematic representation of a perovskite solar cell and illustration of the charge transfer and doping mechanisms with spiro-OMeTAD•+TFSI - radicals in the electron-hole transfer layer*

## PARAMAGNETIC CODING OF MOLECULES

**Institute of Organic Chemistry and Biochemistry**

Contactless RFID chips are commonly found in many products today, but is similar technology possible at the molecular level? The answer is yes. Miloslav Polášek and his team at the Institute of Organic Chemistry and Biochemistry developed molecules which combine ions of metallic elements called lanthanides. The special paramagnetic properties of these elements allow tuning of the molecule's response in a magnetic field. The response can carry digital information and can be read in the radiofrequency spectrum by nuclear magnetic resonance.

**Bibliographic references:**
*J. Kretschmer, T. David, M. Dračínský, O. Socha, D. Jirák, M. Vít, R. Jurok, M. Kuchař, I. Císařová, M. Polášek. Paramagnetic encoding of molecules. Nature Communications. 2022, 13(1), 3179. E-ISSN 2041-1723.*

**Unique molecular CODE**
*The researchers used a set of molecules containing two different lanthanides to encode an image of the word CODE, which they then read using magnetic resonance (artistic rendering). (Image: Tomáš David / Institute of Organic Chemistry and Biochemistry.)*

# SELECTED SCIENTIFIC RESULTS FROM RESEARCH AREA III. INSTITUTES

## SOCIAL STRATIFICATION IN CENTRAL EUROPE: LONG-TERM DEVELOPMENTS AND NEW ISSUES

**Institute of Sociology**

This book shows the development of the main dimensions of the social structure in comparison with the V4 countries and Austria. It raises new questions regarding inequality in married couples, in subjective household well-being, in cultural activities and among retirees. It shows the heterogeneity of the region as well as differences within countries according to stratification variables. While the Czech Republic is closer to Austria in socio-economic development level, Hungary and Poland are closer to it in social differentiation.

**Bibliographic references:**

*J. Večerník, Social Stratification in Central Europe: Long-term Developments and New Issues. Springer Cham. 2022 ISBN 978-3-031-09458-3.*


**Cover of the book** *J. Večerník: Social Stratification in Central Europe: Long-term Developments and New Issues*

## FLYING WITH WAX WINGS: JOSEF MÁNES (1820-1871)

**Institute of Art History**

**Cover of the book** *P. Machalíková (ed.): Flying with Wax Wings. Josef Mánes (1820-1871)*

This book is the outcome of a three-year team project supported by the Czech Science Foundation. The project focused on a new analysis of Josef Mánes' oeuvre in the context of Czech and European 19th-century art. The book offers insights into Mánes' work and personality using current art historical approaches. In addition to the key topics and issues of his work, it also focuses on his afterlife and subsequent reception, which made him an iconic figure of 19th-century Czech art.

**Bibliographic references:**

P. Machalíková (ed.): Flying with Wax Wings. Josef Mánes (1820-1871), Arbor vitae, Řevnice 2022, 310 p. ISBN 978-80-88256-18-2.

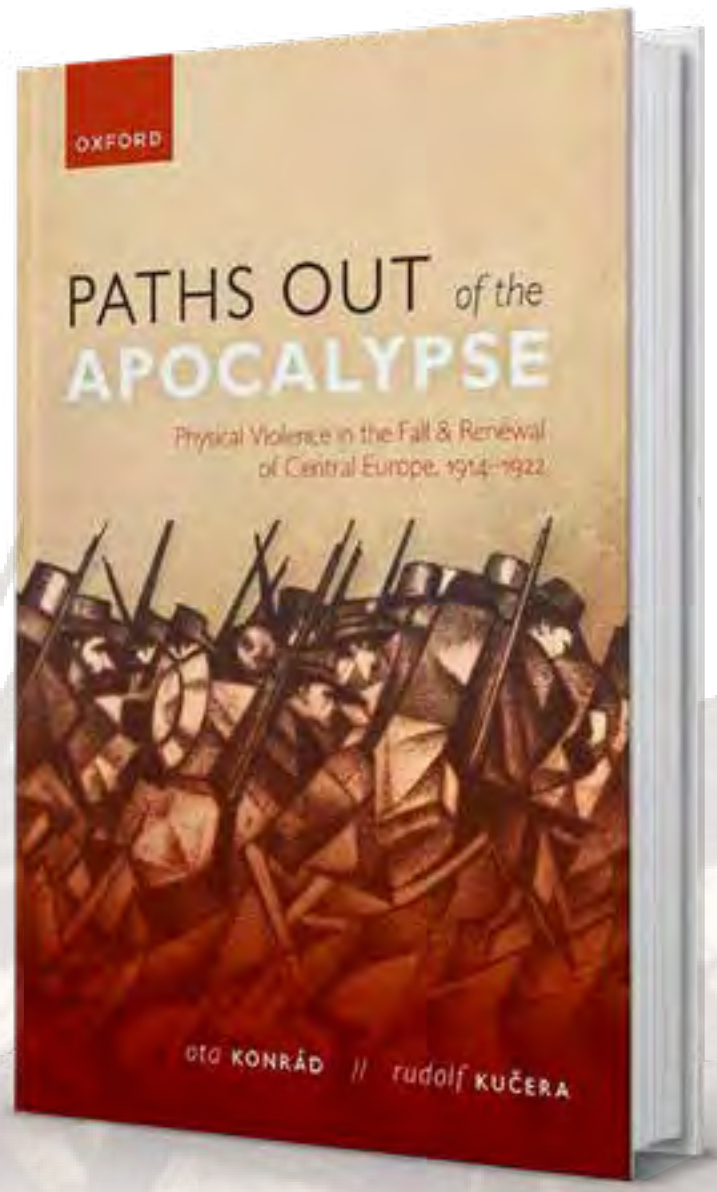
## PATHS OUT OF THE APOCALYPSE: PHYSICAL VIOLENCE IN THE FALL AND RENEWAL OF CENTRAL EUROPE, 1914-1922

**Masaryk Institute and Archives**

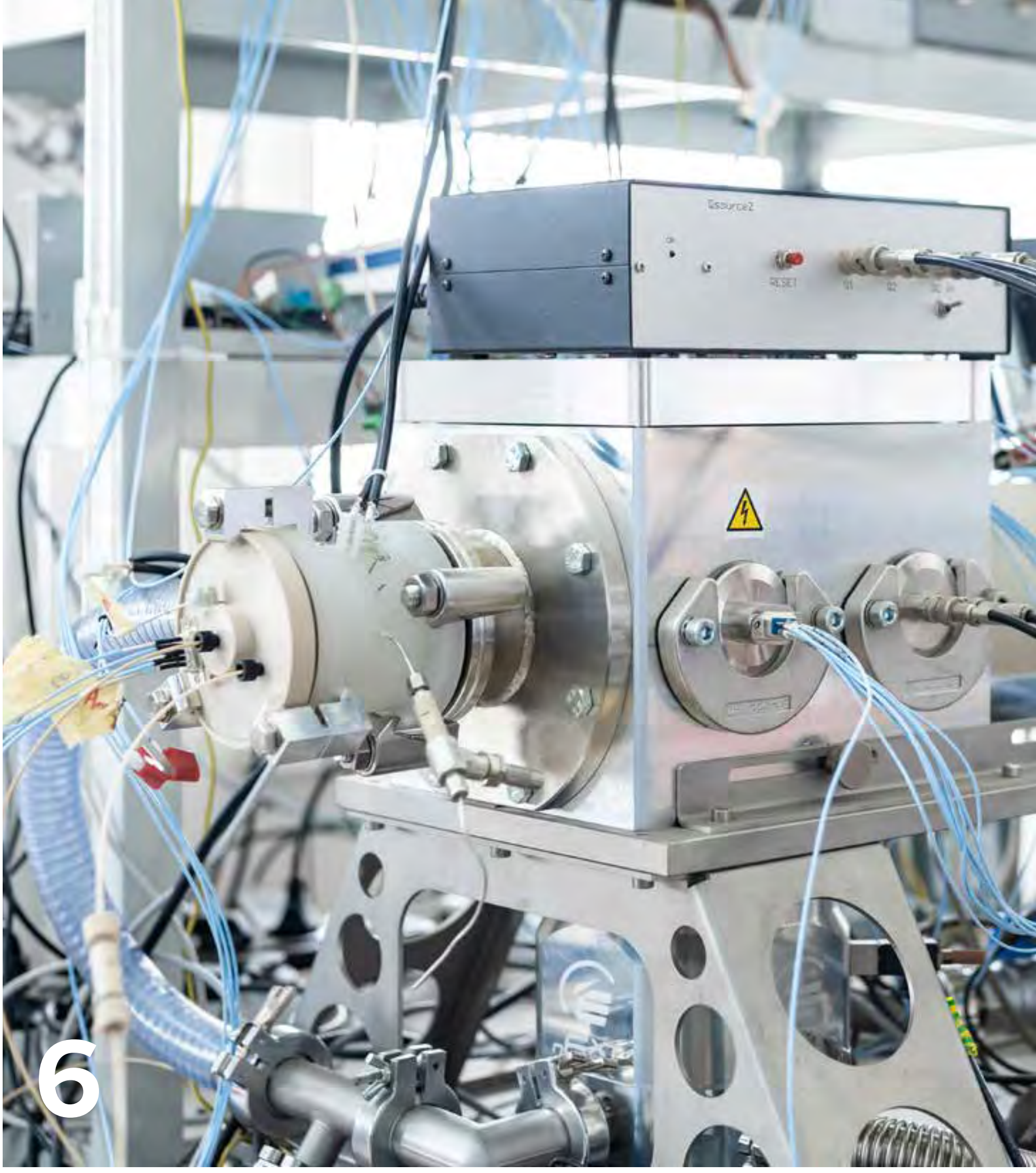
This book uses violence as a prism through which to investigate the profound social, cultural and political changes experienced by Central Europe during and immediately after the Great War. Based on research in national and local archives and abundant secondary literature, the authors show that in the context of total war, physical violence became a predominant means of expressing socio-political demands. The authors apply an interdisciplinary understanding of violence grounded in sociological and psychological theories.

**Bibliographic references:**

*O. Konrád, R. Kučera, Paths out of the Apocalypse: Physical Violence in the Fall and Renewal of Central Europe, 1914-1922. Oxford: Oxford University Press, 2022. ISBN 978-0-19-289678-0.*




**Cover of the book** *O. Konrád and R. Kučera: Paths out of the Apocalypse: Physical Violence in the Fall and Renewal of Central Europe, 1914-1922.*


Source2
RESET

# Strategy AV21

## Top research in the public interest

Strategy AV21, approved by the CAS Academy Assembly in 2014, is the result of the CAS' ongoing efforts to help address issues in contemporary society. It is aptly characterised by the motto "Top research in the public interest", which was registered as a trademark of the CAS in 2021. Strategy AV21 research programmes focus on current, socially critical issues. These issues require broad-based, interdisciplinary research and inter-institutional synergy, both between CAS institutes and with other relevant external partners. Strategy AV21 research programmes benefit from the wide range of research concentrated within the CAS, which gives them the opportunity to create exceptional connections between findings from the natural, technical and social sciences and the humanities. Strategy AV21 goals are closely aligned with the goals of the National Research and Innovation Strategy for Intelligent Specialisation of the Czech Republic (RIS3).

> Strategy AV21 seeks to continuously respond to current societal demand. In 2022, it offered key topics for the Czech EU Presidency, coordinated research in the fire-afflicted area of Bohemian Switzerland and responded to a request from the Chamber of Deputies of the Parliament of the Czech Republic for a seminar on the causes of the energy crisis.

In 2022, Strategy AV21 began its eighth year. One major topic throughout the entire year was the preparation and implementation of activities for the Czech Presidency of the Council of the European Union. The Czech Academy of Sciences developed three main topics in the context of the Presidency - food security and the use of new genome editing methods in crop breeding, low-emission and safe energy and societal resilience - all based on Strategy AV21 research programmes.

The number of research programmes stabilised at fifteen, thus clarifying the array of topics addressed. Four new research programmes started in 2022: "Breakthrough Technologies of the Future - Sensing, Digitalisation, Artificial Intelligence and Quantum Technologies" (No. 26), "Sustainable Energy" (No. 27), "Anatomy of European Society, History, Tradition, Culture, Identity" (No. 28) and "Towards Precision Medicine and Gene Therapy - A New Hope in the Treatment of Human Diseases" (No. 29). Research programme No. 15 "Global Conflicts and Local Interactions: Cultural and Societal Challenges" was completed.

STRATEGY AV21

Top research in the public interest

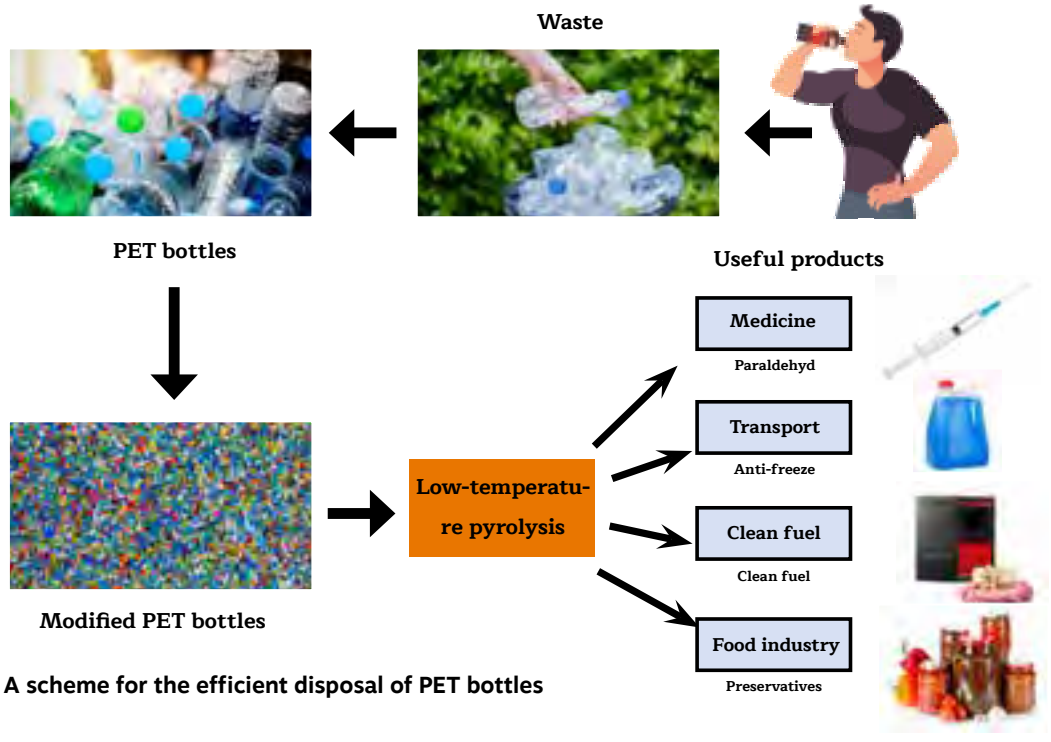
In the middle of the year, the new Strategy AV21 logo was introduced. The modified logo graphically symbolises the fundamental mission of the programme: cooperation across CAS institutes as well as with other entities outside of the CAS from the Czech Republic and abroad.

After a two-year hiatus caused by the covid-19 pandemic, a Strategy AV21 conference was held on 21 October 2022 with the subtitle "Top research in the public interest". The conference was newly conceived as a half-day event. One research programme from each of the research areas, whose research has been completed or is close to completion, was selected. In 2022, the following completed research programmes were presented: No. 6 "Diagnostic Methods and Techniques" and No. 7 "Wellbeing in Health and Disease", along with research programme No. 15 "Global Conflicts and Local Interactions: Cultural and Societal Challenges", which is ending.

In addition to planned activities, Strategy AV21 intermittently responded to current events in the Czech Republic and around the world. At the request of the Strategy AV21 Council, research programme No. 21 "Landscape Preservation and Revitalisation" coordinated research in the fire-afflicted areas of the Bohemian Switzerland National Park. Thirty-three researchers from eight CAS institutes engaged in the research. Strategy AV21 research programmes also responded to the energy crisis, a widely discussed issue in Czech society. Under the auspices of research programme No. 27 "Sustainable Energy", a joint seminar of the Czech Academy of Sciences and the Economic Committee of the Chamber of Deputies of the Parliament of the Czech Republic titled *Causes of the energy crisis and tools to solve it* was held on 2 November 2022.

An example of successful cooperation between the Czech Academy of Sciences and the public sector are the outputs of new research programme No. 26 "Breakthrough Technologies of the Future - Sensing, Digitalisation, Artificial Intelligence and Quantum Technologies". The research team, in collaboration with researchers from Charles University, developed a software tool called "EPICITY - Agent-based model of the spread of respiratory disease epidemics", which makes it possible to simulate and compare scenarios with contact restrictions in different environments, the effectiveness of quarantine measures and contact tracing or testing and vaccination strategies. The results of these experiments served as a basis for the decision-making processes of expert groups at the Ministry of Health and Ministry of Education, Youth and Sports. The software is freely available as an open source program.

Research programme No. 22 "Society in Motion and Public Policies" responded to societal and legislative changes in 2022 with a series of studies examining the impact of taxes and benefits on households and public budgets. The study results contain useful data for professional, political, media and social discourse on the fundamental national economy issues of the contemporary Czech Republic. Two examples are Michal Šoltés et al.'s study *We did the math for you: The impact of annulling the super gross wage, reducing social security contributions and introducing tax holidays*, and Filip Pertold and Petr Pleticha's study *Rising Energy Prices and the Increase in Housing Benefits in January 2022: Did it Help?*. As part of the same research programme,




**A scheme for the efficient disposal of PET bottles**

the Institute of Sociology launched a unique online platform called *NájemPlus (RentPlus)*, which aims to increase the quality and prestige of private rental housing in the Czech Republic.

A research team from the Institute of Rock Structure and Mechanics found a possible solution to the global problem of how to efficiently dispose of waste plastics, especially single-use PET bottles, within research programme No. 27 "Sustainable Energy". Low-temperature pyrolysis of waste PET at atmospheric pressure up to a temperature of 400 °C yielded products useful in the medical, automotive and food industries. The solid carbonaceous residue can be subsequently used in the energy sector.

Scientists from the Environmental Electron Microscopy group of the Institute of Scientific Instruments rebuilt and modified a classical electron microscope within research programme No. 23 "The City as a Laboratory of Change; Construction, Historical Heritage and Place for Safe and Quality Life" to create a unique and one-of-a-kind environmental scanning electron microscope named AQUASEM II. It made it possible to clarify previously ill-defined physicochemical conditions necessary for the formation of salty aerosols during the sublimation of polar ice. Understanding the mechanism by which sea salt enters the atmosphere is of great importance for mathematical modelling and prediction of atmospheric processes. This new knowledge can help in understanding, predicting and combating adverse climate change.

Through research programme No. 20 "Water for Life", the Institute of Hydrodynamics focused on a previously overlooked issue: the hydrological cycle of montane peat bogs, with particular emphasis on determining the quantity of water loss through evaporation. The main objective was to estimate the hydrological behaviour of these rare ecosystems during drought and extreme rainfall events. During the research, two field measuring stations were installed in the Upper Rokytka catchment, where peat bogs make up approximately 60% of the catchment area.

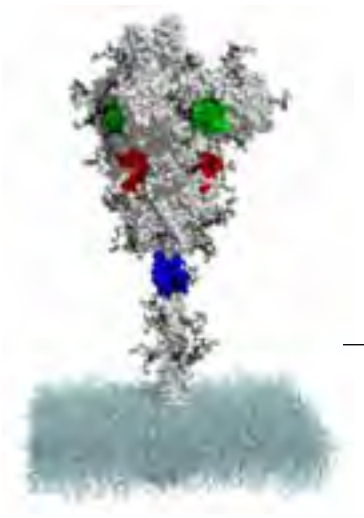
The results of the hydrological model indicate lower total evaporation from the peatland compared to the nearby stands of mixed native spruce and beech forests. This information can be used in practice by managers of protected areas containing peatlands when planning how restoration of such areas will impact the hydrological cycle of the landscape.

A typical example of practical application of the motto of Strategy AV21 "Top research in the public interest" is the involvement of the investigators of research programme No. 25 "Virology and Antiviral Therapy" in international research on coronaviruses, which enabled identification of regions within the viral spike protein that showed a high degree of conservation.

Subsequent analysis of antibodies in covid-19 patients showed that some of them target these highly conserved regions. Such antibodies are able to bind and neutralise all variants of SARS-CoV-2 as well as all other coronaviruses pathogenic to humans. The success of the preclinical antibody testing was achieved mainly owing to a unique mouse model developed specifically for the SARS-CoV-2 infection by scientists from the Czech Centre for Phenogenomics, a national research infrastructure at BIOCEV, in collaboration with scientists from the Biology Centre. Based on the findings, it was demonstrated that antibodies targeting conserved regions are ideal for the treatment of infections caused by both current and emerging SARS-CoV-2 variants.

The research team of research programme No. 29 "Towards Precision Medicine and Gene Therapy - A New Hope for the Treatment of Human Diseases" succeeded in creating unique animal models for the study of some rare diseases (e.g. mouse models for Angelman, Prader-Willi and Nertherton syndromes). The models can be used to monitor the pathophysiology of these diseases and test potential therapies. This approach is essential for the vast majority of rare diseases which do not respond to generic therapies.

The Institute of Contemporary History launched a unique database of printed testimonies of Czech and Slovak Roma and Sinti about the Second World War as part of research programme No. 15 "Global



**SARS-CoV-2 spike protein.**
*Newly discovered highly conserved regions of the protein targeted by the described antibodies are marked in red, green and blue.*

**Newly cultivated yellow chlorella algae.**
*Yellow chlorella has a high ratio of the carotenoid dye lutein.*

Conflicts and Local Interactions: Cultural and Social Challenges". It is the world's first online platform where data from survivor testimonies can be searched and quantitatively processed. The database contains a detailed abstract of each testimony in Czech and English and is searchable by topic, name, place or period. In addition, the database is linked to maps so that the user can easily locate places of internment of Romani people, mass murders, as well as places of hiding and guerrilla warfare.

The outputs of research programme No. 17 "Light in the Service of Society" are an example of successful collaboration with the industrial sector. For instance, for several years scientists at the Institute of Physics have been developing thin-film scintillators (materials that glow in the visible or UV region when hit by ionizing radiation) based on InGaN/GaN quantum wells. At the end of 2022, the development of thin-film scintillators based on nitride semiconductors entered a new phase: the search for an industrial partner for production. After several months of negotiations, collaboration with the company AMS OSRAM was agreed. In this research programme, researchers at the HiLASE Centre investigated the possibilities of changing the functional properties of surfaces using laser-induced micro- and nanostructures. The research focused primarily on enhancing the biocompatibility of stainless steel implants. For this purpose, dynamic beamshaping technology was developed to create a combination of functional micro- and nanostructures on the surface of stainless steel. Subsequent in vitro analysis revealed that micro- and nanostructured surfaces provide a better environment for cell attachment and proliferation compared to untreated surfaces. Surfaces treated by this method also showed a significant reduction in the number of live bacteria on the laser-structured surface. The combination of these results demonstrates the possibility of using the developed technology for mass production of functionalized implants, capillaries or other medical or food devices requiring enhanced biocompatibility or antibacterial properties.

In research programme No. 19 "Foods for the Future", scientists at the Institute of Microbiology - Algatech Centre in Třeboň succeeded in breeding a new algae, yellow chlorella. Chlorella is a freshwater unicellular algae that is used as a dietary supplement and for detoxification of the body. It is rich in antioxidants, vitamins and fibre. One of the substances it contains, lutein, helps reduce the symptoms of age-related retinal degeneration.

Biomass can be used in the production of dietary supplements, functional foods (for the prevention of macular degeneration) as well as animal feed. It can also be used in cosmetics. The high protein content also makes biomass suitable for the production of gluten-free products. The Institute of Microbiology and the Second Medical Faculty of Charles University, Motol University Hospital undertook a joint research project examining the appropriate use of chlorella in the treatment of celiac disease. The results indicate that chlorella constituents have highly beneficial properties which may be applicable in suppression of intestinal inflammation. In order to develop an environmentally friendly alternative to products commonly used to remove heavy metals from soils, in this research programme the Institute of Chemical Process Fundamentals developed and tested a feather hydrolysate produced through an original method that uses hydrolysis with malic acid under elevated pressure and temperature. Unlike the existing cleaner, the resulting product is biodegradable and in tests it demonstrated several-fold higher effects in removing arsenic, manganese, zinc and iron. The effects were identical for other tested elements.

**Installation of the Cherenkov telescope in Ondřejov**

A successful example of international collaboration was presented by the investigators of research programme No. 16 "Space for Mankind" in the development of the new open-source dosimeter SPACEDOS, which was used successfully in the Socrates-R mission and on board the International Space Station in 2019-2021. The instrument can measure spectra of deposited energy in silicon depending on mission requirements. In 2022, work was underway to adapt the SPACEDOS dosimeter design for use in other space missions, such as the ambitious LVICE2 and SOVA missions. NASA is currently testing a modified version designed to study the effectiveness of composite shading materials produced by 3D printing. With the support of this research programme, two Cherenkov telescopes were also put into operation in Ondřejov.

This imaging equipment was installed in the Czech Republic for the first time and is one-of-a-kind in the country. Cherenkov telescopes are capable of detecting high-energy gamma rays that cannot be detected in any other way. These telescopes can, for example, help us understand the nature of cosmic rays and dark energy, or the behaviour of black holes.

The Institute of Philosophy, as part of research programme No. 24 "Resilient Society for the 21st Century. The Potential of Crisis and Effective Transformation" coordinated international comparative research on resilience. The aim of this research, which was also conducted in Ukraine, Israel, Estonia, Slovakia, Lithuania and Georgia, was to compare the level of resilience of individuals, communities and societies. Resilience is a key mechanism for dealing with the "global polycrisis", which includes events such as the covid-19 pandemic, the war in Ukraine and the energy crisis. The research results were presented at the *Facets of Resilience* international conference organised in collaboration with the National Institute of Research on Socioeconomic Impacts of Diseases and Systemic Risks (SYRI).

In the new research programme No. 28 "Anatomy of European Society, History, Tradition, Culture, Identity", an anthropological reconstruction of the appearance of a Langobard woman uncovered in 2011 from grave No. 48 at the Mušov-Roviny burial site in the Břeclav district, was prepared in 2022 in

**Anthropological reconstruction of the appearance of a Langobard woman from grave No. 48 at the Mušov-Roviny burial site in the Břeclav district**

collaboration with the Laboratory of Anthropological Reconstruction. Five virtual models were created.

The work of the research team of the Institute of Biotechnology in research programme No. 18 "Preclinical Testing of Potential Pharmaceuticals" also showed considerable societal value by demonstrating in a mouse model, in collaboration with IKEM, that the elimination of senescent cells will improve glucose tolerance and reduce visceral adipose tissue. This novel therapeutic approach of modulating mitochondrial function is a significant contribution to alleviating the symptoms of one of the greatest global health threats facing contemporary society - type 2 diabetes.

Another important output of Strategy AV21 are expert opinions for legislative bodies, known as *AVexes*. In 2022, the following opinion papers were published: Migration and citizens from "third-world countries" in the Czech Republic, Knowledge and technology transfer and how to support it in the Czech Republic and Equitable transformation. The transition to a low-carbon economy from a legal perspective. Five expert brochures were published by Academia Publishing House in the Strategy AV21 series: *When it rains and dries. Rainwater and grey water management from a legal perspective in the context of drought management*, *Trees in Agriculture. The history and present state of agroforestry in the Czech Republic*, *Daylilies: history, cultivation and breeding*, *Small modular reactors* and *Practical gemmotherapy*.

# List of Strategy AV21 research programmes

## AND PROGRAMME COORDINATORS

VP15
**Global Conflicts and Local Interactions: Cultural and Social Challenges**
*Mgr. Jindřich Krejčí, Ph.D.*
*Institute of Sociology*
*01/01/ 2016 – 31/12/2022*

VP16
**Space for Mankind**
*RNDr. Jiří Svoboda, Ph.D.*
*Astronomical Institute*
*01/01/2017 – 31/12/2023*

VP17
**Light at the Service of Society**
*Ing. Tomáš Mocek, Ph.D.*
*Institute of Physics*
*01/01/2017 – 31/12/2023*

VP18
**Preclinical Testing of Potential Pharmaceuticals**
*MUDr. Jan Kopecký, DrSc.*
*Institute of Physiology*
*01/01/2017 – 31/12/2023*

VP19
**Foods for the Future**
*prof. Ing. Jaroslav Doležel, DrSc.*
*Institute of Experimental Botany*
*01/01/2020 – 31/12/2024*

VP20
**Water for Life**
*doc. RNDr. Martin Pivokonský, Ph.D.*
*Institute of Hydrodynamics*
*01/01/2020 – 31/12/2024*

VP21
**Landscape Preservation and Revitalisation**
*prof. Mgr. Ing. Jan Frouz, CSc.*
*Biology Centre*
*01/01/2020 – 31/12/2024*

VP22
**Society in Motion**
*doc. Ing. Daniel Münich, Ph.D.*
*Economics Institute*
*01/01/2020 – 31/12/2024*

VP23
**The City as a Laboratory of Change and Safe Construction**
*PhDr. Adéla Gjuričová, Ph.D.*
*Institute of Contemporary History*
*01/ 01/ 2020 – 31/ 12/ 2024*

VP24
**Resilient Society for the 21st Century. The Potential of Crisis and Effective Transformation**
*doc. RNDr. Mgr. Alice Koubová, Ph.D. et Ph.D.*
*Institute of Philosophy*
*09/02/2021 – 31/12/2025*

VP25
**Virology and Antiviral Therapy**
*doc. RNDr. Daniel Růžek, Ph.D.*
*Biology Centre*
*09/02/2021 – 31/12/2025*

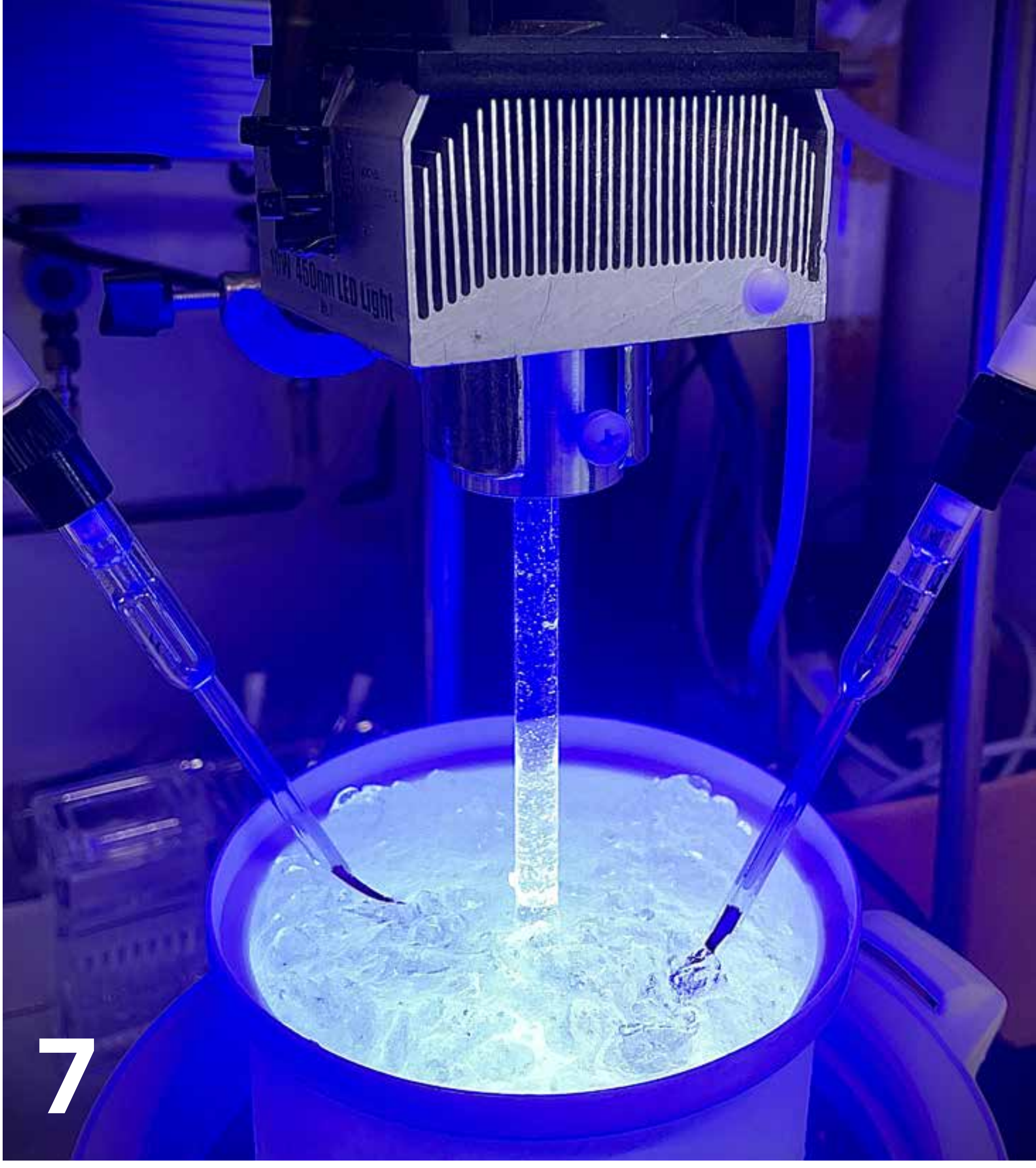
VP26
**Breakthrough Technologies of the Future – Sensing, Digitalisation, Artificial Intelligence and Quantum Technologies**
*prof. Ing. Josef Lazar, Dr.*
*Institute of Scientific Instruments and Institute of Physics*
*01/01/2022 – 31/12/2026*

VP27
**Sustainable Energy**
*doc. Miroslav Chomát, CSc.*
*Institute of Thermomechanics and Institute of Plasma Physics*
*01/01/2022 – 31/12/2026*

VP28
**Anatomy of European Society, History, Tradition, Culture, Identity**
*Mgr. Jana Maříková Kubková, Ph.D.*
*Institute of Archaeology, Prague*
*01/01/2022 – 31/12/2026*

VP29
**Towards Precision Medicine and Gene Therapy - A New Hope in the Treatment of Human Diseases**
*doc. Dr. Radislav Sedláček, Ph.D.*
*Institute of Molecular Genetics*
*01/01/2022 – 31/12/2026*

**Research Infrastructure Support for Strategy AV21**
*Ing. Tomáš Wencel, MBA*
*Centre of Administration and Operations of the CAS*
*01/01/2022 – 31/12/2022*


10W 450nm LED Light

# Projects from Operational Programmes

## of EU structural funds

In 2022, CAS institutes continued to work on projects under operational programmes co-financed by the European Structural and Investment Funds within the 2014-2020 programming period with the expected completion of project implementation in 2023. CAS institutes were also involved in the new 2021-2027 programming period, where grant programmes are once again divided into national operational programmes, cross-border cooperation programmes and supranational and interregional cooperation programmes. In the new programming period, CAS institutes submitted project applications in response to calls announced by the Jan Amos Komenský Operational Programme (OP JAK) managed by the Ministry of Education, Youth and Sports and the Technologies and Applications for Competitiveness Operational Programme (OP TAK) managed by the Ministry of Industry and Trade. Projects from both programming periods will run simultaneously until 2023, at which point the eligibility of expenditures from the previous programming period will end.

In 2022, CAS institutes were involved in 132 projects falling under EU Structural Funds operational programmes.

> Operational programmes are a very effective tool for supporting high-quality research at CAS institutes and using this research to make the Czech Republic more competitive.

In 2022, CAS institutes continued to work on projects under operational programmes co-financed by the European Structural and Investment Funds within the 2014-2020 programming period with the expected completion of project implementation in 2023. CAS institutes submitted project applications in response to the calls announced by the OP JAK and OP TAK within the new 2021-2027 programming period. Most of the submitted projects are in the evaluation phase and have not yet been supported. Implementation of projects supported by these calls will begin in 2023 at the earliest. It can be assumed that CAS institutes will continue to submit applications for financial support next year, mainly in response to the calls announced by the OP JAK, OP TAK and Integrated Regional Operational Programme (IROP). It is expected that further grant calls will be announced during 2023.

In 2022, CAS institutes were involved in 132 projects falling under EU Structural Funds operational programmes. CAS institutes served as coordinators or beneficiaries of 106 projects, of which one was launched in 2022, 42 continued throughout the year and 63 projects were completed during the year. Table 1 provides an overview of CAS institutes' participation in the projects categorised by operational programme. More detailed information about the project launched in 2022, which has an approved funding allocation of CZK 7,485,000 from the 2014-2020 programming period, is listed in Table 2.

**Table 1:** Participation of CAS institutes in operational programme projects in 2022

| OPERATIONAL PROGRAMME | Projects launched | Projects ongoing | Projects completed | TOTAL |
|---|---|---|---|---|
| Integrated Regional Operational Programme | 0 | 1 | 0 | 1 |
| OP Research, Development and Education | 0 | 38 | 55 | 93 |
| OP Employment | 0 | 0 | 6 | 6 |
| OP Environment | 0 | 3 | 0 | 3 |
| Cross-border Cooperation Programme Interreg V-A Austria – Czech Republic | 0 | 0 | 2 | 2 |
| Cross-border Cooperation Programme Interreg V-A Slovakia – Czech Republic | 1 | 0 | 0 | 1 |
| **TOTAL** | **1** | **42** | **63** | **106** |

**Table 2:** Operational programme projects launched in 2022

| Beneficiary | PROJECT | Total approved project support in thousands of CZK |
|---|---|---|
| **OP Interreg V-A Slovakia - Czech Republic** | | |
| **ARÚB** | In the footsteps of the Great Moravian Slavs | **7,485** |

# Practical Application of Research

2022 brought positive developments in knowledge and technology transfer in many aspects. A new CAS Strategy for Knowledge and Technology Transfer was developed. Its preparation and related discussions in the bodies of the Czech Academy of Sciences confirmed that knowledge transfer has unequivocal support and is a high priority for the overall development of the CAS. The issue of knowledge transfer has become a regular part of meetings of institute directors, who understand its importance and are interested in expanding related activities at the institutes.

The knowledge and technology transfer support system at the CAS, where the Technology Transfer Office is a key component, is being further developed and improved. The CAS Technology Transfer Office acts as a catalyst and transfer guarantor and implements many activities and initiatives that benefit the institutes. Whether it is a proactive approach to supporting specific projects, moderating dialogue related to optimising and developing the legislative environment to remove barriers to knowledge transfer or supporting the development of collaborative ties with industrial and other application partners.

## CAS Strategy for Knowledge and Technology Transfer

An important milestone in the development of knowledge and technology transfer (KTT) at the Czech Academy of Sciences in 2022 was the development and approval of the new CAS Strategy for Knowledge and Technology Transfer. The Academy Council approved this document in November 2022. Vice-Chair of the Academy Council Ilona Müllerová, was responsible for the development of the strategy, which was managed in close cooperation with the CAS Technology Transfer Office (CAS TTO).

The CAS Strategy for Knowledge and Technology Transfer confirms the key role of knowledge transfer in the development of the entire Czech Academy of Sciences. It also defines the priorities, focus areas and objectives of knowledge and technology transfer in the CAS environment. The document describes the main pillars of transfer implementation and support at the CAS.

Knowledge and technology transfer at the CAS means the application of scientific research results that bring about social changes in the economy and society, especially in relation to the introduction of new technologies and services, efficient use of natural resources, creation of new jobs, support for legislation and the development of relevant public policies and other direct and indirect development of the social and cultural environment.

The starting point is that CAS institutes are sought-after knowledge providers for domestic and foreign industry, public administration, the non-profit sector and the public. The share of licensed intellectual property will increase thanks to support of exceptional knowledge transfer projects. Active support for the establishment of spin-off companies helps open new possibilities for private funding of transfers and strengthen the competitiveness of the Czech Republic. Long-term development and cultivation of the knowledge transfer environment will raise the social relevance of research.

The CAS has created and is developing a comprehensive system of knowledge and technology transfer support over the long-term. The main mission of this system is to enable and accelerate the use of scientific research results in practice. The priority objective is to find and arrange funding for technology development and knowledge application, typically in close cooperation with an application partner.

> Through the new CAS Strategy for Knowledge and Technology Transfer, the priorities, focus areas and objectives of knowledge and technology transfer in the CAS environment were set for upcoming years.

The system is based on having a professional office under unified coordination and management, which carries out clearly defined activities to support transfer efforts at the institutes and in research teams. The priority focus areas of the CAS Strategy for Knowledge and Technology Transfer include early identification and evaluation of intellectual property and application potential and development of related knowledge and technologies for practical application.

Knowledge and technology transfer support extends to all CAS research areas. The implementation of the strategy includes specific activities aimed at applying research results in the social sciences and humanities.

KTT advisory bodies have been established to support knowledge and technology transfer activities and coordination within the CAS. These include the CAS Technology Transfer Council and the CAS Intellectual Property Rights Council. Both councils and their members actively engage in addressing current issues related to development of KTT within the CAS' scope of activity.

## Practical aspects of transfer

During 2022, a wide range of KTT activities were implemented at CAS institutes. The long-term focus of virtually all CAS institutes is the implementation of joint research and development projects with private or public entities. These collaborations produce results that are clearly applicable in practice. In many cases, the staff of the CAS TTO provided assistance and support. They have noticed increasing interest in the development and application of research results through business ventures. This is seen in the growing number of new spin-offs established by CAS institutes with the inventors and with private investors. Therefore, in 2022, the CAS TTO staff focused on simplifying the process of establishing and approving these new companies and creating systematic support for CAS institutes.

CAS representatives actively support the development and cultivation of the knowledge and technology transfer environment in the Czech Republic, as well as in the broader context of the European Union. In this context, in June 2022, the Czech Academy of Sciences issued an expert opinion on knowledge and technology transfer in the Czech Republic through an AVex expert opinion. CAS representatives are involved in European transfer associations, such as the TTO Circle at the European Commission and the International Association of Knowledge Transfer Professionals (ASTP), and they also participate in the activities of Transfera.cz.

## Developing competences and deepening expertise

Comprehensive educational activities for institutes continue. In addition to traditional educational programmes, a number of educational or awareness-raising events on current issues were organised in 2022. In May 2022, a joint conference was held in collaboration with the most prominent research organisations from Germany. In cooperation with the Max Planck Society, the Fraunhofer Society, the Leibnitz Association and the Helmholtz Society, participants shared experiences about transfer support systems in Germany.

In today's world it has become clear that knowledge transfer demands a high level of expertise and professionalism, connects knowledge not only from research areas but also from the fields of law and economics, and calls for strong interpersonal skills and the ability to translate between the specific languages of scientists, financial investors, civil servants and self-government, lawyers and manufacturing companies.

### Outlook for the upcoming period

The CAS Strategy for Knowledge and Technology Transfer includes a clearly articulated plan of strategic initiatives for the 2023-2025 period. These initiatives focus on various topics that are part of the strategy.

An important priority in the implementation of the strategy is capturing and utilising research results from CAS institutes. Concrete activities will be implemented leading to the targeted identification of promising results. This will be directly followed by support to advance the readiness of results for practical application, with one of the main tools being the creation of a CAS Programme for development of applications and commercialisation.

Another strategic initiative will be targeted support for the establishment of new spin-off companies applying technology in practice. At the same time, the practical application of knowledge will be developed and promoted in a targeted manner.

Last but not least, the systematic development of a professional transfer team at the CAS is an important strategic initiative. Here, the focus should be on developing the necessary competencies and on strengthening capacities and improving the quality of related activities through the development of a knowledge base and standardisation of some tasks.

# Selected examples of research results for practical application

### Astronomical Institute

Carried out an upgrade of E125 telescope automation in Chile in cooperation with ProjectSoft HK a.s.

### Institute of Physics

The Institute invented an absorbing material based on samarium-doped garnet for suppression of the amplified spontaneous emissions of the active medium of a solid-state laser, its use to form a monolithic element and the method of its production. The invention also includes a monolithic element comprising layers of the absorbing material configured on opposite walls of the active medium Nd:YAG, which is formed in the shape of block, for suppression of amplified spontaneous emission of the active medium of a solid-state laser. Patent 309300 was granted on 10 August 2022.

### Institute of Physics

The institute created a conceptual design of laser focusing optics, VIS and X-ray diagnostics for the Rigaku Corporation. The components and a detailed 3D design of the experimental setup were supplied. The design concerns the development of a laser-induced X-ray source based on the interaction of a 1 kHz picosecond Yb:YAG laser system with a micron-sized cryogenic liquid krypton beam.

### Institute of Geophysics

This is an applied research project carried out at the JEZ-1 and JEZ-2 observatory stations on the slope of the ČSA surface mine for the company Severní energetická, a.s., Most. The stations monitor the long-term tilt of the tectonically disturbed rock mass on the slope of the Ore Mountains. The application of the results in the monitoring of the tilt of the ČSA mine risk slope is part of the landslide monitoring system.

### Institute of Geology

For the Administration of the Bohemian Switzerland National Park, the institute prepared an assessment of concentrations of ecologically and ecotoxically significant elements in precipitation water, atmospheric deposition and substance flows in open and forested areas of the national park. The results were applied to set up nature conservation management and metabolic transport monitoring in different, contrasting ecosystems in the national park and to assess the impact of the large-scale fire in 2022 on the park's ecosystems.

### Institute of Photonics and Electronics

The company ABB s.r.o. purchased the rights to use utility models for use in the production of power semiconductor components. The technology makes it possible to prepare P- and N-type semiconductors with homogeneous doping and high dopant concentrations.

### Institute of Atmospheric Physics

Preliminary wind assessments were developed for several energy companies operating in the Czech Republic to assess the suitability of given sites for the construction of wind power plants. The studies are based on three mathematical models developed at the Institute of Atmospheric Physics to determine the average wind speed. The studies contain the results of calculations of models with a profile up to 200 m, an assessment of their credibility and the resulting estimate of wind conditions and annual electricity production, including a result uncertainty estimation. These assessments serve as guidelines for the client to help determine whether or not to start measuring wind in a given location and developing a wind power plant construction project.

### Institute of Physics of Materials

The institute developed an analysis for the purposes of replacing a high-pressure section of the K3 boiler steam pipeline at Elektrárny Opatovice, a.s. The institute identified why the material that had caused the failure had become embrittled. Namely, it was the exclusion of primary and secondary cementite at the grain boundaries and within the grains due to improper heat treatment of the steam pipeline.

### Institute of Plasma Physics

An instrument was developed for contactless and non-destructive measurement of the distribution of inhomogeneities in crystals where only the inspection faces are polished. The instrument can automatically obtain a 3D map of the distribution of bubbles in crystals with diameters up to 60 mm. The accuracy of the determination of the transverse coordinate of the bubble position is about ten micrometres, and one millimetre for the determination of the

longitudinal position. The instrument is used to check the quality of crystals grown by the project partner, CRYTUR, spol. s r.o.

### Institute of Geonics

The safety of a planned underground radioactive waste repository was assessed for the Czech Radioactive Waste Repository Authority (SURAO). On the basis of this result, the SURAO proposed an in situ experiment for the PVP Bukov site to bring a deeper understanding of the influence of the EDZ phenomenon on the safety of the underground repository. The result is supported by a non-certified methodology and the "ENDORSE" software.

### Institute of Geonics

In partnership with PTV, s.r.o., a modification of an abrasive cutting head was designed to increase the cutting performance of the head and achieve associated energy and operating cost savings in machining/cutting with high-speed abrasive waterjet technology. The solution saves energy and money and helps protect the environment during operation of new or modified tools (heads). The co-author of the result, PTV, s.r.o., included the new abrasive cutting head for industrial applications in its production programme.

### Institute of Computer Science

The institute developed special maps for Evropská Street in Prague, which use information from transport, energy, environmental and socio-economic data. A set of specialised models was developed for each scenario. The result can be displayed using either a classic graphical interface or virtual reality. The result can be used in the preparation of new development projects related to European Street, to prioritise transport measures, or to justify the deployment of intelligent transport systems or low-emission public transport vehicles.

### Nuclear Physics Institute

The institute developed a certified method to determine the age of historic mortar. Radiocarbon dating of organic residues may not always correctly tell the age of the historic mortar being analysed. An alternative is to date the carbon contained in the structure of the lime mortar, which, if properly processed, provides representative data on the period in which the structure originated.

### Institute of Hydrodynamics

The institute developed a procedure to remove perfluorinated organic compounds (PFCs) in water treatment, in particular by adsorption under semi-operating conditions. The procedure will be used as a basis for the operation of a water treatment plant in Kutná Hora operated by Vodohospodářská společnost Vrchlice - Maleč, a. s. It will be used by water treatment plant operators; it serves as a basic material for optimisation of coagulation/flocculation and adsorption processes in water treatment.

### Institute of Scientific Instruments

The institute developed a new hyperspectral camera for biotechnological applications and elemental analysis for PSI, spol. s.r.o. The high-resolution hyperspectral camera with a wavelength range of 350-1100 nm is composed of an Offner-type spectroscope and a high-resolution CMOS camera. It works in push-broom mode.

### Institute of Rock Structure and Mechanics

For ČEZ, a.s., the institute calculated the seismic hazard probability curves for both nuclear power plants in the Czech Republic (Dukovany NPP and Temelín NPP), uniform response spectra and seismic hazard deaggregation. The results served as the main background material for an International Atomic Energy Agency (IAEA) mission in May 2022.

### Institute of Theoretical and Applied Mechanics

For ČEPS, a.s., the institute carried out tests of pipe materials of samples from the VTL gas pipeline. The test results are being applied as part of preparations for the use of hydrogen in the Czech gas distribution network on the basis of hydrogen blending into natural gas - P2G "Power to Gas".

### Institute of Thermomechanics

The institute signed a licence agreement with the Czech start-up PSP Technologies s.r.o. on use of a new surface hardening technology that applies residual compressive stresses into metal workpieces through the impact of small projectiles. Workpieces machined in this way show increased resistance, especially against propagation of fatigue cracks.

### Institute of Biophysics

The institute developed a molecular kit for early detection of critical microbial contaminants in algal cultures. This functional sample is used by Algamo, s.r.o.

### Biology Centre

In collaboration with the Institute of Physics and the Faculty of Science of the University of South Bohemia, the Biology Centre developed a functional sample of an ultra-resistant biochip for rapid detection of the SARS-CoV-2 virus. A terpolymer layer postmodified with a specific antibody was developed. In conjunction with the quartz crystal microbalance (QCM) method, the functional biochip offers a rapid and sensitive viral particle detection method with minimal sample preparation requirements.

### Institute of Biotechnology

The institute concluded a licence agreement with DYNTEC spol. s.r.o. for the use of a medicinal product to protect honey bee colonies against honey bee plague that is based on recombinant endolysin. Recombinant phage endolysins are being developed to prepare an antibacterial product as an alternative to antibiotics and will be used for targeted destruction of pan-resistant bacterial pathogen biofilms.

### Institute of Physiology

In collaboration with PrimeCell Bioscience, a.s., an enhanced bioprinting technology was developed. It is a modular system for 3D bioprinting of carriers based on biocompatible hydrogels and polymers for tissue engineering.

### Institute of Microbiology

This collaboration in organic synthesis with Santiago chemikálie s.r.o. focuses on the design, preparation and bioactivity testing of new, more efficient derivatives of lincosamide antibiotics.

### Institute of Microbiology

For the company Bioveta, a.s., the institute confirmed the possibility of using the bacteriophage Staphylococcus intermedius in veterinary medicine. This will enable related development of a new product that could to some extent replace or reduce the use of antibiotics, whose widespread and universal use leads to the emergence of resistance and contaminates the environment, which in turn endangers humans.

## Institute of Inorganic Chemistry

For Centrum výzkumu Řež, s.r.o., the institute verified the reproducibility of the synthesis of refractory materials with increased resistance to acid action for the LOCA experiment. The result can be applied as a suitable material for nuclear storage facilities.

## Institute of Chemical Process Fundamentals

A functional fuel sample was produced for REMA Systém, a.s. which contains sewage sludge with additives from electrical waste materials and agricultural waste. The related technology allows a mixture of sewage sludge and waste plastics to be converted into pellets by simple mechanical operations and burned in a controlled manner in a fluidised bed (buoyancy). This technology can therefore partially replace fossil fuels (natural gas) that are expensive and scarce today.

## Institute of Chemical Process Fundamentals

For the company POZEMNÍ KOMUNIKACE BOHEMIA, a.s., a functional sample of Modified Additive 3 was developed for the treatment of heavily contaminated pavement layers in new asphalt mixtures. The additive is applicable to all types of abrasive coatings. It saves money on waste disposal and significantly reduces the cost of the resulting asphalt mix.

## J. Heyrovský Institute of Physical Chemistry

For the company ÚJP Praha, a.s., the institute prepared an evaluation of nanomorphological and nanomechanical changes of the surface of Zr-alloy tubes due to the corrosive environment corresponding to the environment in the VVER reactor. The results of the study will be used to assess the corrosion effects on pipes used for nuclear fuel storage. The study is part of the documentation leading to the modification of the alloy composition and production process.

## Institute of Macromolecular Chemistry

The institute introduced and tested a new microscopic technique – micro CT - for the company Thermo Fisher Scientific s.r.o. This technique is associated with determining the 3D structure of the biodegradable polymeric mixture TPS/PCL, which can be used for local drug release from the TPS phase.

## Institute of Molecular Genetics

The project entails *in vivo* verification of the effect of new antibodies against covid-19 in collaboration with AXON COVIDAX, a. s.

## Institute of Organic Chemistry and Biochemistry

The institute was granted 16 new patents on substances or particles that can be used in the pharmaceutical industry, medicine or agrochemical production. The patents were granted for various regions including the USA, Europe, Japan, Australia and the Czech Republic. Some of them have already been licensed to commercial partners.

## Global Change Research Institute

The institute produced a map showing the impacts of rapid climate change on the landscape in relation to the typification of production areas. The map makes it possible to evaluate the need for regional requalification for existing production areas and the possibility of introducing new production areas with the potential for landscape adaptation to climate change impacts (drought, heat waves, etc.). The map can be used for argumentation in assessments of the common agricultural policy, grant system or strategic planning in primary agricultural production.

## Institute of Archaeology, Brno

Through extensive rescue archaeological research on the route of the future northern bypass around Opava, settlement structures from the Neolithic Age (LnK, HLS, KNP, Chlopice-Veselé) and the Hallstatt Age (KLPP) were examined in three cadastres (Vávrovice, Palhanec, Kateřinky). A large number of objects were also found: ceramics, bronze jewellery, gold jewellery, ground stone industry, etc., which contribute significantly to knowledge about the prehistoric settlement of the region.

## Institute of Ethnology

The institute created a specialised public database of pictorial sources of folk architecture (http://viskalia.fsv.cvut.cz/viskalia/). The public section of the database is intended for use in basic research conducted by staff of partner institutions, and also for state and local government authorities, conservation and spatial planning authorities, heritage institutions, schools and the professional and lay public.

## Institute of Philosophy

The institute collaborated in the preparation and moderation of workshops on ethics in public administration at two EUPAN meetings in Prague (26 September 2022 and 24 November 2022). The events were held as part of the Czech Presidency of the Council of the EU.

## Masaryk Institute and Archives of the Czech Republic

For the town of Zruč nad Sázavou, the institute prepared and launched a public web portal called “Baťa’s Zruč”.

## Oriental Institute

Institute staff provided expert consultations to the Immigration and Refugee Board of Canada (IRB), the most important administrative tribunal in Canada that issues decisions on immigration and refugee issues.

## Institute of Psychology

The institute prepared a gender audit for Charles University and subsequently a draft Gender Equality Plan.

## Institute of Sociology

For the non-profit organization proFem - Centre for Victims of Domestic and Sexual Violence, o.p.s., the institute conducted research on “Removing obstacles in the system of assistance to partner violence victims”. A report from qualitative research among survivors of gender-based violence summarises the obstacles they face within the assistance system.

## Institute of Art History

The institute prepared an opinion of the restoration on the calendar dial of the Old Town Astronomical Clock for the Prague City Hall.

## Czech Language Institute

Through a collaborative effort with Masaryk University and Charles University, the institute helped create a web-based spelling, grammar and typographical proofreader for the Czech language. The web portal Opravidlo (opravidlo.cz) is a comprehensive automatic online proofreader of texts written in Czech and is available to the general public. It checks typos, spelling, grammatical and typographical errors. In addition, error messages in Opravidlo contain links to the explanatory section of the Internet Language Guide.

# Employees and Salaries

The total number of CAS employees (listed as the average number of employees calculated in Full Time Equivalent – FTE) increased year--on-year from 10,107 in 2021 to 10,147 in 2022. A total of 5,067 employees are paid through extra-budgetary allocations (which equalled 49.94% in 2022 compared to 48.88% in 2021). The number of research institute employees with university degrees who have passed arduous attestations pursuant to the Career Development Rules for CAS Employees with a University Degree and have been classified in the relevant qualification levels grew year-on-year from 6,189 to 6,230.

The Czech Academy of Sciences and its institutes expended a total of CZK 5,951,761,000 on salaries and wages and CZK 196,163,000 for other payments for work. The total average monthly salary at the CAS was CZK 48,881 in 2022 with year-on-year growth of 3.79% from 2021.

**Chart 1:** Number of employees and average monthly salary at the CAS

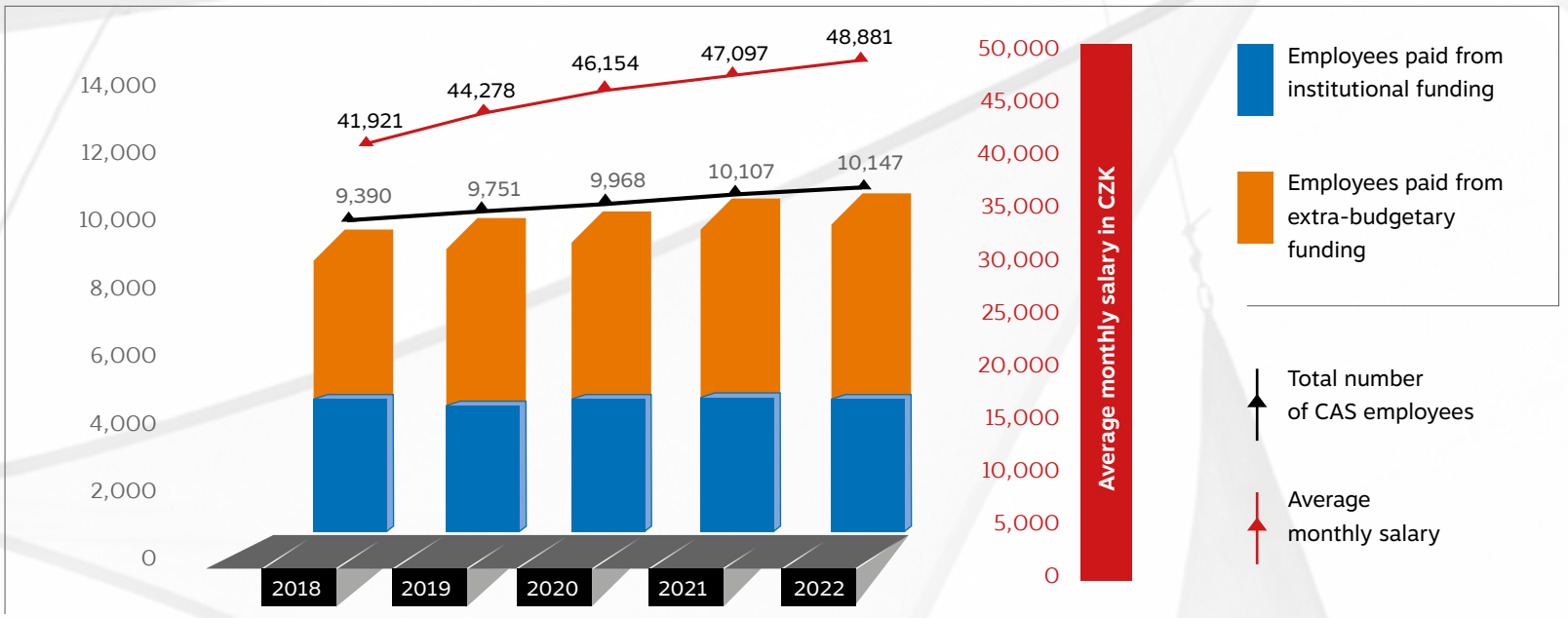



Table 3 provides a more detailed look at the number of CAS employees categorised into employees of the CAS Head Office and employees of all CAS research institutes.

**Table 3:** Number of CAS employees

| Year | 2018 | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|
| CAS public research institutions | 9,314 | 9,672 | 9,893 | 10,037 | 10,080 |
| CAS Head Office | 75 | 79 | 75 | 70 | 67 |
| **CAS TOTAL** | **9,390** | **9,751** | **9,968** | **10,107** | **10,147** |

At the CAS Head Office, CZK 43,589,243 was expended for salaries and CZK 9,678,341 for other payments for work performed by 66.62 employees (recalculated as average FTE). Deferred liabilities totalling CZK 32,890 for salaries and CZK 73,847 for other payments for work performed were carried over. The average monthly salary of CAS Head Office employees in 2022 was CZK 54,525.

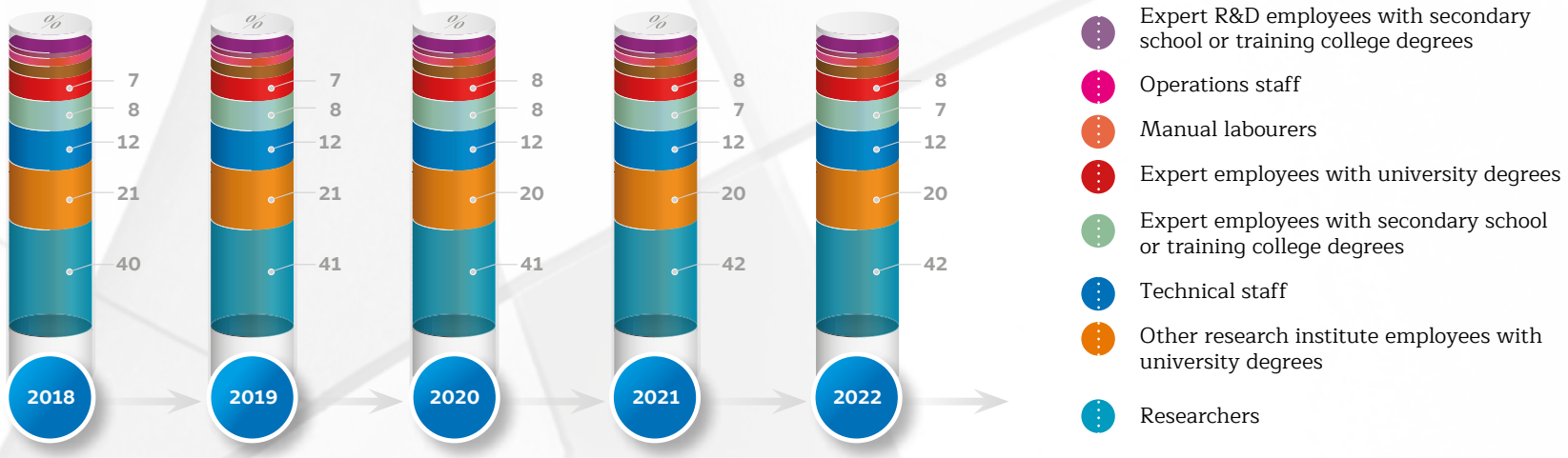
In 2022, CZK 5,908,172,000 was expended on salaries and CZK 186,484,000 for other payments for work performed by 10,080 employees across all CAS institutes (public research institutions). The average monthly salary equalled CZK 48,844 with year-on-year growth of 3.85% from 2021.

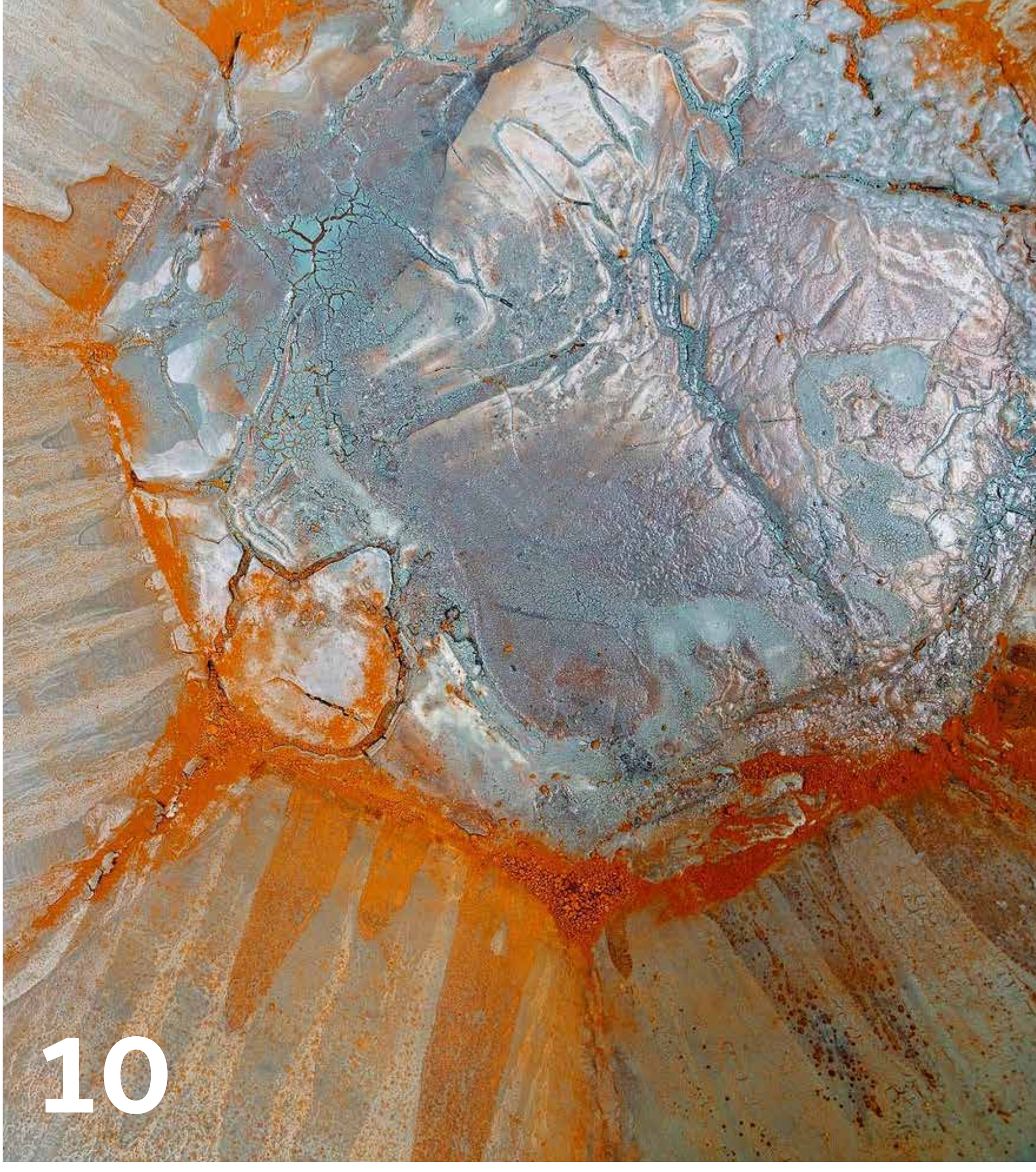
The table below provides a more detailed look at average monthly salaries at public research institutions (including all funding sources – institutional and extra-budgetary) for each employee category.

**Table 4:** Number of employees and average monthly salary per category for 2022

| Category | Average recalculated number of employees | Average monthly salary in CZK |
|---|---|---|
| Researchers | 4,226 | 60,690 |
| Other research institute employees with university degrees | 2,004 | 38,398 |
| Expert employees with university degrees | 817 | 47,213 |
| Expert employees with secondary school/training college degrees | 707 | 36,595 |
| Expert R&D employees with secondary school/training college degrees | 231 | 36,568 |
| Technical and administrative staff | 1,226 | 49,646 |
| Manual labourers | 501 | 29,317 |
| Operations staff | 368 | 28,446 |
| **Total** | **10,080** | **48,844** |

**Chart 2:** CAS research institute employee categories (in %)



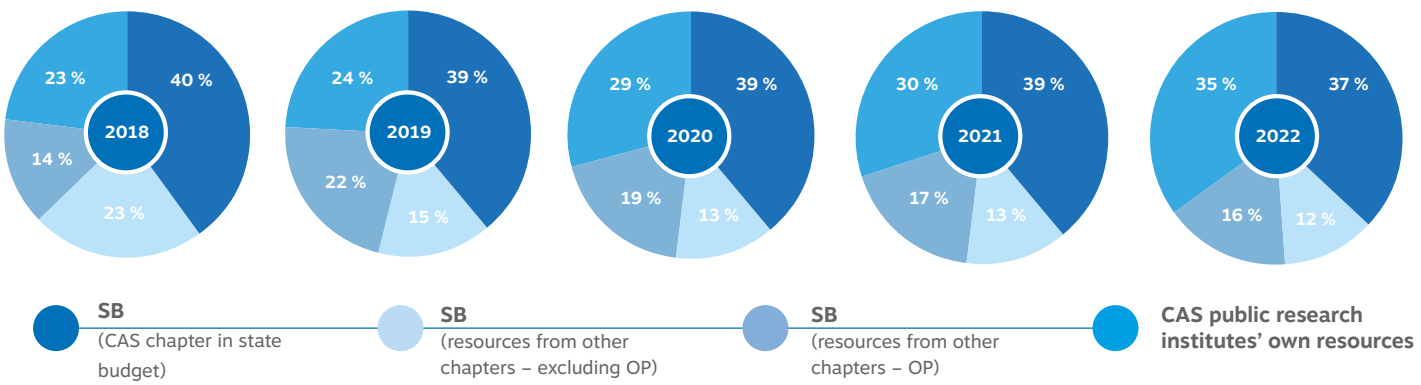


# Financial Resources

## and their use

In 2022, the Czech Academy of Sciences managed a total of CZK 19,262.66 million, of which CZK 7,099.90 million came from the CAS chapter in the state budget (SB). This state budget CAS chapter funding equalled 37% of the CAS' total financial resources in 2022.

## **Chart 3:** CAS Financial resources (in %)




**Financial resources** (for the entire CAS) originating from the CAS budget chapter, grants from other budget chapters and the CAS' own resources are summarised in the following table.

## **Table 5:** Structure of financial resources (actual) in mil. CZK

| Type of expenditure | Non-investment resources | Investment resources | Total |
|---|---|---|---|
| **Resources from the CAS budget chapter** | **5,897.70** | **1,202.20** | **7,099.90** |
| **Grants from other budget chapters** | **4,765.06** | **375.45** | **5,140.51** |
| GA CR grants | 1,840.72 | 15.45 | |
| TA CR projects | 408.96 | 0.00 | |
| Projects of other ministries, including operational programmes | 2,515.38 | 360.00 | |
| **Public research institutes' own resources** | **7,022.25** | | **7,022.25** |
| **Commissions related to main activity** | **720.98** | | |
| Publication sales | 33.17 | | |
| Rent (residential, non-residential premises and machinery) | 49.64 | | |
| Licenses | 3,335.44 | | |
| Conference fees | 21.95 | | |
| Interest and foreign exchange gains | 882.00 | | |
| Sale of assets, securities and shares | 905.53 | | |
| Foreign grants and gifts | 163.51 | | |
| Resources from own funds | 327.38 | | |
| Sale of goods and services | 582.65 | | |
| **Total resources** | **17,685.01** | **1,577.65** | **19,262.66** |
| **Zdroje celkem** | **17 685,01** | **1 577,65** | **19 262,66** |

> Out of their total revenues of CZK 17,584.85 million, CAS institutes used CZK 15,453.48 million to cover their own costs.

Given that CAS Institutes are managed as public research institutions in the system of non-governmental organisations and they are permitted to close their accounts by 30 June of the following year and that the institutes' financial statements must be verified by an auditor, the following expenditures statement should be taken as preliminary.

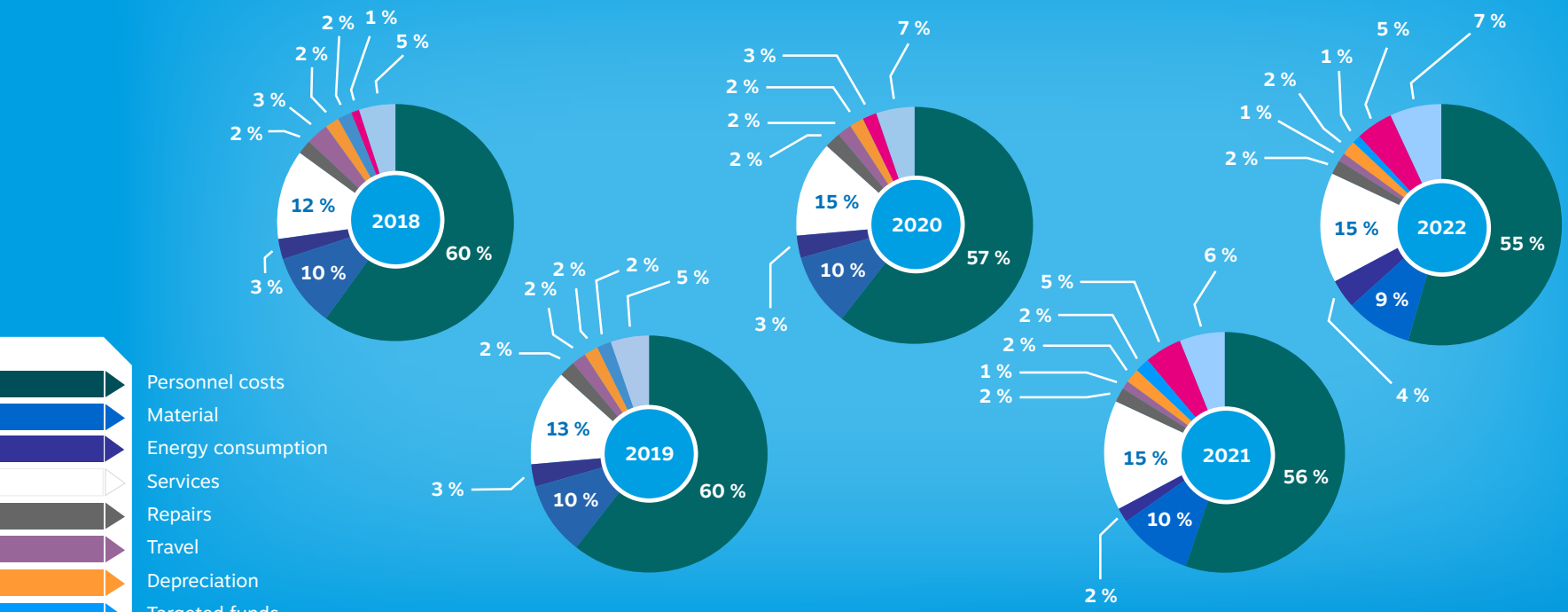
**In comparison to 2021**, the total expenditures of CAS institutes (public research institutions) increased by CZK 1,530.54 million. A detailed breakdown of the expenditures of CAS institutes is provided in the following table.

**Table 6:** Structure of non-investment expenditures of CAS institutes (in mil. CZK)

| TYPE OF EXPENDITURE | 2021 | 2022 | Coefficient |
|---|---|---|---|
| **Personnel costs (wages, mandatory insurance paid by the employer, sickness insurance benefit reimbursements)** | 7,833.32 | 8,477.31 | 1.08 |
| **Materials (e.g. books, journals, small tangible assets, consumable supplies, protective gear)** | 1,329.05 | 1,336.65 | 1.01 |
| Energy, water, fuel | 329.62 | 592.90 | 1.80 |
| **Services (postal services, small tangible assets, rent, conference fees, other services)** | 2,055.77 | 2,353.20 | 1.14 |
| Repairs and maintenance | 241.71 | 243.61 | 1.01 |
| Travel expenses | 101.84 | 207.74 | 2.04 |
| Creation of targeted funds in total | 242.55 | 217.53 | 0.90 |
| Transfer to social funds and other social expenses | 288.61 | 319.18 | 1.11 |
| Taxes and fees | 337.46 | 484.07 | 1.43 |
| Depreciation of fixed assets | 237.97 | 238.62 | 1.00 |
| Exchange rate losses | 93.06 | 129.14 | 1.39 |
| Securities and shares (sale of) | 672.11 | 770.52 | 1.15 |
| Other expenses (accident insurance, fines, damages) | 249.33 | 177.23 | 0.71 |
| Inventory change - own performance | -18.18 | -21.78 | 1.20 |
| Activation of material, goods, services and property | -71.28 | -72.44 | 1.02 |
| **CAS institutes expended a total of** | **13,922.94** | **15,453.48** | **1.11** |

A significant cost item consists of depreciation of assets acquired with grant funding amounting to CZK 1977.40 million, which is not included in this table.

## **Chart 4:** Use of non-investment resources (in %)




A comparison of non-investment resources expended by CAS institutes during the monitored period from 2018 to 2022 shows that the share of personnel costs in the total amount of expenditures is gradually decreasing.

The main sources of investment funding are institutional and targeted grants from the state budget and foreign grants. They serve primarily for the acquisition or improvement of buildings and equipment, or for maintenance and repair of buildings and equipment.

## **Table 7:** Investment resources of CAS institutes (in mil. CZK)

| Funding source | 2021 | 2022 | Coefficient |
|---|---|---|---|
| Resources from the CAS chapter of the state budget | 1,394.1 | 1,192.2 | 0.86 |
| Resources from other ministries, including operational programmes | 938.7 | 375.5 | 0.40 |
| Depreciation | 244.1 | 262.1 | 1.07 |
| Transfer of additional profits | 31.7 | 16.4 | 0.52 |
| Foreign grants and gifts | 39.0 | 11.6 | 0.30 |
| Revenue from sale of fixed assets | 74.6 | 45.0 | 0.60 |
| Aggregation of funds to acquire fixed assets | 13.1 | 18.8 | 1.44 |
| **Total** | **2,735.3** | **1,921.6** | **0.70** |

## **Table 8:** Use of investment resources by CAS institutes (in mil. CZK)

| Type of expenditure | 2021 | 2022 | Coefficient |
|---|---|---|---|
| Funding of construction | 851.9 | 813.3 | 0.95 |
| Acquisition of instruments and equipment | 1,532.1 | 1,171.2 | 0.76 |
| Maintenance and repairs | 119.1 | 38.5 | 0.32 |
| Other | 283.7 | 240.2 | 0.85 |
| **Total** | **2,786.9** | **2,263.2** | **0.81** |

Resource generation equalled CZK 1,921.6 million in 2022 and CAS institutes used a total of CZK 2,263.2 million. The asset reproduction fund decreased by CZK 341.6 million.

# Controlling

The CAS Controlling Section (hereinafter also the "CS" or the "Controlling Section") is responsible for controlling at CAS with respect to the CAS' role as the founder of CAS institutes and provider of grants from public funding. The Controlling Section is directly subordinate to the President of the CAS and its work consists of:

- public administration and financial control of grants provided from the CAS chapter of the budget, which is ensured by the Division of Public Administration Control of the CAS Head Office (hereinafter also the "Division of Public Administration Control"),
- internal audit of the CAS (hereinafter also the "IA" or "internal audit"), which is carried out directly by the Director of the CS.

## Division of Public Administration Control

The Division of Public Administration Control prepares and carries out its controlling tasks in a manner fulfilling the requirements set forth for the given public administration area, which arise in particular from the Act on Financial Control and other regulations governing the performance of public administration control and financial control.

Controls are carried out on the basis of the approved annual plan and specific controls are carried out in accordance with the thematic focus areas that have been set for the given control. Primary attention is always paid to the fulfilment of the duty within the defined scope and structure, which is to ensure the verification of the proper management of state budget funds disbursed by the CAS as the administrator of the science and research budget chapter. Appropriate attention is paid to compliance with budgetary rules and to management of assets acquired with public funds.

Accordingly, in 2022, the controlled entities were, as usual, subjected to verification of compliance with the statutory conditions for the use of budgetary funds and conditions set by the provider for the use of grants and maintenance of proper accounting records. When controlling compliance with budgetary rules and other legal regulations governing the management of public entities, the control teams focused on whether the procedures set out in the applicable legislation and internal rules for the preparation, implementation and funding of investments, compliance with the legal provisions for tenders, including compliance with the terms of the register of contracts, were followed. They also assessed adherence to rules governing due diligence in asset management.

In the case of asset management, the control teams focused on the proper exercise of property rights in relation to intangible assets and responsible management of tangible assets. In 2022, the Division of Public Administration Control primarily verified whether asset records were properly maintained and whether the principles of economy, efficiency and effectiveness were followed in the use of funds and assets of the controlled entities.

In the case of supplier-customer relations, attention was focused on the fulfilment of the conditions of economic and non-economic activities according to the EU Guideline, as well as on examining whether the conditions of the Act

on Public Research Institutions had been violated by carrying out financial or asset transactions without adequate prior written consent from the competent bodies (i.e. if the management of the relevant entities was affected by the consequences of absolutely invalid legal acts).

Labour relations were also examined as a standard focus area, in particular the fulfilment of the conditions set out in the Labour Code, including the handling of employee liability for loss events at the workplace, and whether all related transactions were properly recorded in the accounts.

Increased attention was also paid to the functionality of the internal control system established at the controlled CAS institutes, the effectiveness of which was assessed both in terms of the setting of the system and the result of controlling in all controlled areas.

Cases of non-compliance with applicable legal regulations detected by a control were subsequently analysed in more detail so that the problems identified by the control could be generalised and processed appropriately for the benefit of all the institutes established by the CAS to prevent the recurrence of the detected irregularities in the future.

Despite the ongoing adverse situation caused by the covid-19 epidemic, the Division of Public Administration Control fulfilled the controlling plan approved for 2022. Public administration and financial controls were carried out at eight CAS institutes, in the following public research institutions:

- Institute of Czech Literature,
- Institute of Thermomechanics,
- Institute for Hydrodynamics,
- Institute of Botany,
- Institute of Rock Structure and Mechanics,
- Institute of Organic Chemistry and Biochemistry,
- Institute of Animal Physiology and Genetics,
- Institute of Sociology.

Control results were discussed with the management of the given institute from the list above. The directors of the controlled entities subsequently adopted appropriate measures to remedy the identified deficiencies. The Division of Public Administration Control will continue to monitor the implementation of these measures. All of the control reports and conclusions were also submitted to the President of the CAS and other members of the Academy Council Presidium for discussion at Academy Council sessions. The given control report was also forwarded to the chair of the supervisory board of the controlled institute.

In 2022, the Division of Public Administration Control also examined in greater detail the use and accounting of grants provided in 2021 for research, education and similar activities through the CAS budget chapter to five scientific societies associated within the Council of Scientific Societies of the Czech Republic:

- Czech Immunological Society
- Czech Economic Society, z. s.,
- Czech Society for Biochemistry and Molecular Biology, z. s.,
- Czech Society for Cybernetics and Informatics of the Czech Republic, z. s.,
- Society for Cybernetics and Informatics. z. s.

In 2022, the Division of Public Administration Control controlled the allocation, use and accounting of grants provided from the state budget through Chapter 361 by the Academy of Sciences to CAS institutes and scientific societies associated in the Council of Scientific Societies of the Czech Republic in the total amount of CZK

778,279,780. Of these, the public administration control carried out at CAS institutes examined funds totalling CZK 777,607,780 and the control of scientific societies controlled grants totalling CZK 672,000.

The Division of Public Administration Control also conducts audit verification of the accounting of funds provided for EU Framework Programme projects. In 2022, one audit of an ending project and one partial audit of an ongoing EU Framework Programme project were carried out for a total amount of EUR 2,158,654.63 (CZK 55,031,767.43).

Another standard area of the Division of Public Administration Control's work is processing complaints and suggestions sent to CAS bodies and the CAS Head Office. In addition to cases sent directly to the Division of Public Administration Control for resolution, the Division of Public Administration Control maintains records of other complaints, continuously monitors processing of complaints and in some cases subsequently takes part in resolution. In 2022, the Division of Public Administration Control dealt with or recorded 13 complaints and suggestions for investigation. Six of these cases were ineligible and seven were eligible.

In addition to public administration and financial control, audit verification of accounting of funds for EU Framework Programme projects, and record-keeping and resolution of complaints, the Division of Public Administration Control is responsible for appointing one of its staff to serve as secretary of the Supervisory Committee of the Academy Assembly to handle the administrative and organisational aspects of the Committee's meetings.

## INTERNAL AUDITING

Internal audits are carried out on the basis of the approved annual plan, which identifies the focus areas of the audit in a given period. The work of the CAS Internal Auditor fulfils the requirements of the Act on Financial Control and other regulations governing internal audit performance. This ensures the content-related and substantive implementation of the internal auditor's obligation to detect cases of non-compliance and point out existing risks associated with the handling and disbursal of public funds so that the head of the organisation can take measures to eliminate or minimise them.

In 2022, an internal audit was carried out at the organisational unit of the state and the administrator of the state budget CAS chapter that focused on the parameters and effectiveness of the internal control system, particularly within the CAS Head Office. In relation to the result of the internal audit, the internal auditor recommended, among other things, that ex-ante management control be improved, especially in relation to the provision of grants. The conclusions of the internal audit, including the internal auditor's recommendations, were discussed with the CAS President and the Director of the CAS Head Office.

# Support of Excellence

The scientific policy of the Czech Academy of Sciences includes support of excellent research at its institutes. The CAS implements this support in a number of ways. One well-known avenue is the Academic Premium (Praemium Academiae) intended for scientists working on excellent research in any scientific field. Another means of support is the Otto Wichterle Award for selected promising young researchers.

The Czech Academy of Sciences supports prominent foreign scientists who are invited to collaborate with the CAS through the Lumina Quaeruntur Research Fellowship and the Jan Evangelista Purkyně Fellowship. The CAS also provides targeted support to early career researchers through three other programmes: the Programme to Support Prospective Human Resources – Postdoctoral Fellows, Programme for Research and Mobility Support of Starting Researchers and the Josef Dobrovský Fellowship. Each year, the prestigious Czech Academy of Sciences Awards recognise successful scientists for their outstanding scientific achievements.

# PRAEMIUM ACADEMIAE – ACADEMIC PREMIUM

**The Academic Premium is the most prestigious support for scientific excellence at the Czech Academy of Sciences. It is awarded to outstanding scientists who excel in their fields and provides them with financial and moral support for further scientific work on a globally comparable scale. The Academic Premium award money of up to CZK 5 million per year helps recipients cover their research costs for a period of six years and, in the longer term, to develop their research both by building their own scientific teams and by acquiring needed new instruments or laboratory materials. The Academic Premium is comparable with European Research Council (ERC) grants in terms of its significance and prestige as well as the amount of funding awarded.**

## THE 2022 ACADEMIC PREMIUM AWARD-WINNERS INCLUDE:

### Doc. RNDr. Martin Pivokonský, Ph.D.

*Institute of Hydrodynamics*

Martin Pivokonský is a hydrochemist and water treatment technologist, and the director of the Institute for Hydrodynamics. He studies the physicochemical properties of water, the composition and quality of natural and treated water, the occurrence of natural organic substances and micropollutants and methods to remove these substances.

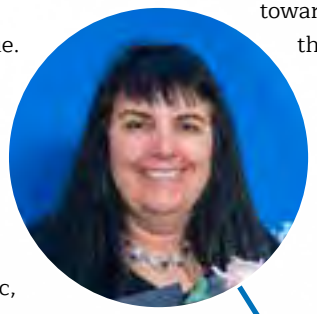
He focuses on processes associated with water treatment and purification such as coagulation, flocculation, sedimentation, filtration, adsorption and membrane filtration. He is the inventor of several patents and technologies for water treatment.

Martin Pivokonský's Academic Premium research will focus on a detailed analysis of contaminants in water sources, further clarification of their properties, mutual interactions and interactions with chemicals used in water purification and treatment. He will also seek new ways to remove them effectively.

He plans on subsequently using the research results to put new technologies into practice in water treatment and purification plants. The project will therefore include both semi-operational and operational testing.

### Doc. MUDr. Lucie Bačáková, CSc.

*Institute of Physiology*



Lucie Bačáková is a leading Czech expert in biomaterials, regenerative medicine, tissue engineering and tissue substitutes. She heads the Laboratory of Biomaterials and Tissue Engineering at the Institute of Physiology.

The topics she addresses are unique. She focuses cumulatively on the repair and regeneration of tissues of the cardiovascular system and of bones, joints, and skin, i.e. the human body systems that suffer most from civilization diseases and damage due to work, traffic, and sports injuries in the contemporary world. By developing this area to an unprecedented extent, she established a new scientific school in the Czech Republic which is highly respected in international circles.

Tissue engineering is one of the hottest trends in modern biomedicine. In recent decades, progress towards effective therapy has been made through experiments with the use of stem cells and advanced development of nanomaterials and materials compatible with human tissue, suitable particularly for implant surface layers.

Lucie Bačáková intends to use the Academic Premium to develop all of these areas.

**Prof. Mgr. Viktor Černý, Dr.**
*Institute of Archaeology, Prague*

Viktor Černý specialises in evolutionary anthropology. He focuses on research of prehistoric events and processes, such as climate change and cultural innovations, and examines them for the causes of contemporary genetic diversity. In collaboration with a number of foreign institutes, he is involved in projects on human evolution in sub-Saharan Africa and its spread to Eurasia.

He has been working at the Institute of Archaeology in Prague since 1994. His research interests include the search for genetic traces of the migration of anatomically modern humans across the Arabian Peninsula, the impact of migration on the population structure of the African Sahel and, more recently, research into genetic imprints based on different subsistence practices. Within these projects, he supervises Master's and Doctoral anthropology students at the Faculty of Science of Charles University in Prague.

The Academic Premium will enable Viktor Černý to address biocultural interactions, and to summarise and significantly expand his research to date. The African Sahel, where he studies the population history and contacts of nomadic pastoralists and settled farmers, will form the core of the project.

The project also foresees engagement with an existing research project in Oman, which is yielding discoveries that are opening up new insights in the elucidation of the migration of anatomically modern humans from Africa across the Bab el-Mandab Strait in the Red Sea to Arabia during the Middle Palaeolithic.

> The purpose of programmes supporting excellence at the Czech Academy of Sciences is to support top research of CAS institutes both morally and financially.

# LUMINA QUAERUNTUR FELLOWSHIP

**The Lumina Quaeruntur Fellowship provides financial aid to promising researchers, enabling them to compose their own research teams and fund their work for up to five years. The fellowship has two key conditions: the fellow must submit a project proposal to the European Research Council (ERC) or a similar international grant agency during the fellowship, and the length of the fellow's scientific practice since receiving a doctorate must be no more than 10 years. Both Czech and foreign researchers are eligible for the fellowship.**

## IN 2022, SIX SCIENTISTS FROM DIVERSE DISCIPLINES AT CAS INSTITUTES BECAME LUMINA QUAERUNTUR FELLOWS:

**Ing. Tomáš Neuman, Ph.D.**
*Institute of Physics*

Tomáš Neuman and his new team will strive to fundamentally advance current research on the interaction of light with molecules and 2D materials using new theoretical and simulation-based computational approaches.

**Teije Middelkoop, Ph.D.**
*Institute of Molecular Genetics*

The goal of Teije Middelkoop's research is to understand how evolutionary pressures affect physical forces such as tension or torque that underlie left-right asymmetric embryonic morphogenesis. As a result, mechanical laws facilitate but also limit the potential diversity of morphological phenotypes and dictate evolutionary change.

**Veronika Pehe, M.A., Ph.D.**
*Institute of Contemporary History*

Veronika Pehe focuses on the decades at the turn of the 20th and 21st centuries, the period of the fall of communist regimes in Central and Eastern Europe. The research group will provide a social and cultural perspective on the changes in the economy, society and realities of everyday work in comparison to parallel changes in Poland, Germany and Hungary, including a strong emphasis on the historical examination of events in Slovakia, which is somewhat neglected in Czech historical scholarship.

**Helmut Schmidt, Ph.D.**
*Institute of Computer Science*

In his research project, Helmut Schmidt will explore the dynamics of neural networks in detail and represent them mathematically. He will also take a state-of-the-art approach to developing brain models that use MRI data to refine data analysis and interpretation.

**Fedora Parkmann, Ph.D.**
*Institute of Art History*

Fedora Parkmann's research reaches back to the early 20th century, when photomechanical reproductions of art became widespread. This gave people access to works of art whose originals they would otherwise have had little chance of viewing. The research team seeks to examine the impacts of this media revolution on the distribution and popularisation of art.

**Mgr. Štěpán Timr, Ph.D.**
*J. Heyrovský Institute of Physical Chemistry*

Štěpán Timr plans on using the Lumina Quaeruntur Fellowship to develop a new multi-level computational scheme to comprehensively describe enzyme clusters that form in cells. He hopes to understand the mechanisms of glycolysis regulation and that the knowledge will open up new possibilities for the treatment of diseases such as cancer.

## J. E. PURKYNĚ FELLOWSHIP

The aim of this fellowship is to bring outstanding scientists from other countries to CAS institutes, including scientists of Czech origin who have been working abroad long-term as well as leading 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 leaders of innovative teams at their respective institutes. In 2022, six J. E. Purkyně fellows were supported with total funding of CZK 5,950,000. New proposals have not been accepted since 2018. Funding for previously approved projects will end in February 2023.

## OTTO WICHTERLE AWARD

**This award is intended for selected, extraordinarily talented, promising CAS scientists up to 35 years of age. The award bears the name of Professor Otto Wichterle, an outstanding world-class Czech chemist, who became President of the Czechoslovak Academy of Sciences after November 1989. The aim of the Otto Wichterle Award is to encourage young CAS scientists whose excellent results contribute to the development of their scientific disciplines. In 2022, CAS President Eva Zažímalová bestowed the Otto Wichterle Award on the following 25 young scientists:**

### I. MATHEMATICS, PHYSICS AND EARTH SCIENCES

**Ing. Drahomír Dvorský, Ph.D.**
Institute of Physics
**Ing. Monika Kučeráková, Ph.D.**
Institute of Physics
**Mgr. Helena Reichlová, Ph.D.**
Institute of Physics
**RNDr. Jan Papež, Ph.D.**
Institute of Mathematics
**Ing. Silvia Carpitella, Ph.D.**
Institute of Information Theory and Automation
**RNDr. Lenka Čermáková, Ph.D.**
Institute of Hydrodynamics
**Mgr. Lukáš Laibl, Ph.D.**
Institute of Geology
**Mgr. Ondřej Lhotka, Ph.D.**
Institute of Atmospheric Physics

### II. LIFE SCIENCES AND CHEMICAL SCIENCES

**RNDr. Karel Škoch, Ph.D.**
Institute of Inorganic Chemistry
**Joanna Elžbieta Olszówka, Ph.D.**
J. Heyrovský Institute of Physical Chemistry
**RNDr. Jan Blahut, Ph.D.**
Institute of Organic Chemistry and Biochemistry
**RNDr. Kristýna Boušová, Ph.D.**
Institute of Organic Chemistry and Biochemistry
**Mgr. Petr Fajkus, Ph.D.**
Institute of Biophysics
**Mgr. Dalibor Košek, Ph.D.**
Institute of Physiology
**RNDr. Martin Ezechiáš, Ph.D.**
Institute of Microbiology
**RNDr. Alena Sucháčková, Ph.D.**
Biology Centre
**RNDr. Ing. Lukáš Vejřík, Ph.D.**
Biology Centre
**RNDr. Zuzana Chumová, Ph.D.**
Institute of Botany
**RNDr. Peter Mikula, Ph.D.**
Institute of Vertebrate Biology

### III. HUMANITIES AND SOCIAL SCIENCES

**Dr. Kateřina Chládková, M.A.**
Institute of Psychology
**PhDr. Eva Krulichová, Ph.D.**
Institute of Sociology
**PhDr. Jakub Štofaník, Ph.D.**
Masaryk Institute and Archives
**Dr. Anja Bunzel, Ph.D.**
Institute of Art History
**Mgr. Jiří Hlaváček, Ph.D.**
Institute of Contemporary History
**Mgr. Jakub Mikulecký, Ph.D.**
Institute of Slavonic Studies

## PROGRAMME TO SUPPORT PROSPECTIVE HUMAN RESOURCES – POSTDOCTORAL FELLOWS AT CAS INSTITUTES

This programme is intended for starting postdoctoral fellows (within two years of the defence of their Ph.D. dissertation or equivalent, or four years in the case of long-term study abroad or parental leave).
Under the 2022 programme calls, 27 candidates were supported in the 18th call and 35 candidates in the 19th call (with funding commencing on 1 January 2022, or 1 July 2022).

## JOSEF DOBROVSKÝ FELLOWSHIP PROGRAMME

This programme helps young foreign researchers who need to study the historical, cultural, artistic, linguistic, geographical or natural context in the Czech Republic for their scientific research. In 2022, total funding of CZK 862,000 was provided for 21 study visits at seven CAS institutes. The following researchers received support:

**Dr. Irena Vladimirsky** (Institute of History)
**Maja Lukanc, Ph.D.** (Institute of History)
**prof. Tomasz Pudłocki** (Masarykův ústav a Archiv)
**Dr. phil. Jana Piňosová, M.A.** (Masaryk Institute and Archives)
**Adam Świątek, Ph.D.** (Masaryk Institute and Archives)
**Corinna Gannon, M.A.** (Institute of Art History)
**Dr. Patrick Becker-Naydenov** (Institute of Art History)
**Dr. Albena Shkodrova-Desmet** (Institute of Contemporary History)
**Dr. Pavla Šimková** (Institute of Contemporary History)
**Jonathan Lahey Dronsfield, Ph.D.** (Institute of Philosophy)
**Mgr. Bothayna Abubakr** (Institute of Czech Literature)
**Anna Ananieva, Ph.D.** (Institute of Czech Literature)
**Magdalena Burger, M.A., MSc.** (Institute of Czech Literature)
**Piotr Gierowski, Ph.D.** (Institute of Czech Literature)
**Prof. Joanna Goszczyńska, Ph.D.** (Institute of Czech Literature)
**Mgr. Lucija Mandić** (Institute of Czech Literature)
**Mgr. Martina Mecco** (Institute of Czech Literature)
**Anna G. Piotrowska, Ph.D.** (Institute of Czech Literature)
**Prof. Jindřich Toman, Ph.D.** (Institute of Czech Literature)
**Mgr. Katarzyna Jasińska, Ph.D.** (Czech Language Institute)
**Mgr. Miha Sušnik** (Czech Language Institute)

## PROGRAMME FOR RESEARCH AND MOBILITY SUPPORT OF STARTING RESEARCHERS

This programme, initiated in 2016, was created to support the development of collaboration between CAS institutes and prominent international scientific research institutions and enable starting researchers to independently take part in active international collaboration. From 2021 onwards, no new research proposals have been accepted and the programme is being phased out. In 2022, 14 projects were supported with a total amount of CZK 4,030,000.

## ERC-CZ/AV PROGRAMME

This programme supports projects of researchers who have received an A in the second round of the European Research Council expert panel evaluation (i.e., not supported due to a lack of funding) or a B. In 2022, the CAS continued to support one project with funding of CZK 6,800,000.
The project investigator is

**Mgr. Iva Mozgová, Ph.D.**
Biology Centre

# CZECH ACADEMY OF SCIENCES AWARDS

**Each year, the Czech Academy of Sciences bestows awards on outstanding researchers for exceptional research results focused on societal priorities which have strengthened the competitiveness of Czech science internationally, and which were first published or implemented within the last five years. In 2022 the Academy of Sciences Award for outstanding results of great scientific significance was bestowed by CAS President Eva Zažímalová upon the following researchers:**

**TEAM OF AUTHORS NOMINATED BY THE INSTITUTE OF PHOTONICS AND ELECTRONICS CONSISTING OF:**

Mgr. Marek Piliarik, Ph.D., Hadrien Marc Louis Robert, Ph.D., Ing. Kristýna Holanová, Łukasz Bujak, Ph.D., Mgr. Milan Vala, Ph.D., Verena Puttrich, Ph.D., and RNDr. Zdeněk Lánský, Ph.D.,

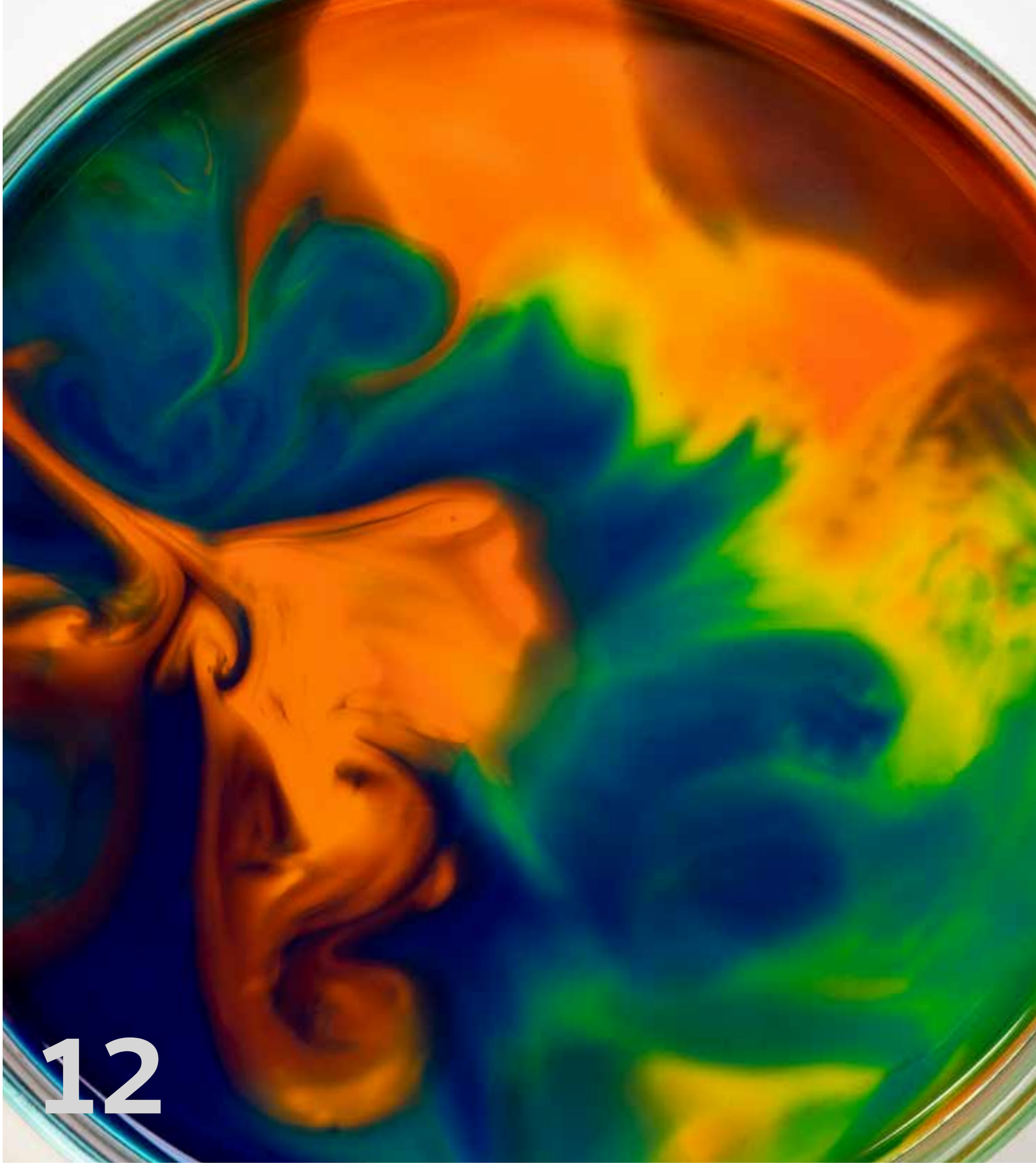
for the scientific outcome *Photothermal spatial light modulator for ultrasensitive 3D nanoscopy*

**Ivan Jarić, MSc., Ph.D.,**
nominated by the Biology Centre,

for the scientific outcome *Societal extinction of species*.

**Dr. Giedre Šabasevičiūtė,**
nominated by the Oriental Institute,

for the scientific outcome Sayyid Qutb: *An Intellectual Biography*



# International Cooperation

Two major tasks stemming from both expected and unexpected international developments in the European region shaped international cooperation at the CAS in 2022. The first was the implementation of a new programme to support researchers at risk, which was the CAS' immediate response to support Ukrainian refugees after the outbreak of war in their country. The second, which the CAS had eagerly anticipated, were planned activities revolving around the Czech Presidency of the Council of the EU. Beyond these activities, the CAS continued to support established bilateral and multilateral programmes and forge new collaborations to support researcher mobility in new destinations. Another key area of the international cooperation agenda were activities to support the CAS' increased participation in the EU Framework Programme. Last but not least, the CAS' traditional involvement in activities related to membership in relevant international NGOs continued.

During the Czech Presidency of the Council of the EU, the Academy of Sciences focused on three areas that respond to current EU-wide topics, which relate to both the war in Ukraine and ongoing climate changes: new genome-editing technologies, energy and resilient societies.

The slowdown of the covid-19 pandemic and the easing of travel restrictions in many countries contributed to a resurgence of international scientific collaboration in 2022. It was possible to carry out a number of international activities that had been postponed during the previous two years due to anti-pandemic measures. In April, the leadership of the CAS and the Slovak Academy of Sciences held their traditional annual meeting in Prague. The topics discussed included the CAS' support of Ukrainian researchers, the security of research in international scientific collaboration and initiatives to support the awarding of ERC grants. In May, a postponed meeting of representatives of the academies of science of the V4 countries and Slovenia was hosted by the Hungarian Academy of Sciences in Budapest. It included a seminar on ERC grant funding opportunities and current strategies to support applicants for these types of projects. In May, the CAS hosted a Czech-Israeli workshop on *Law between State and History* in Prague. This continued the tradition of organising joint biennial workshops in collaboration with the *Israel Academy of Sciences and Humanities* (IASH). In June, during the traditional *Academic Prague* event, CAS representatives met with representatives of foreign embassies in Prague, ministries and major Czech universities. A total of 73 guests attended the event at Villa Lanna, including representatives of embassies from 33 countries. It was the 30th jubilee meeting and to commemorate the anniversary, a LeviGyr flywheel with a levitating coin, on loan from the Institute of Thermomechanics, animated the event.

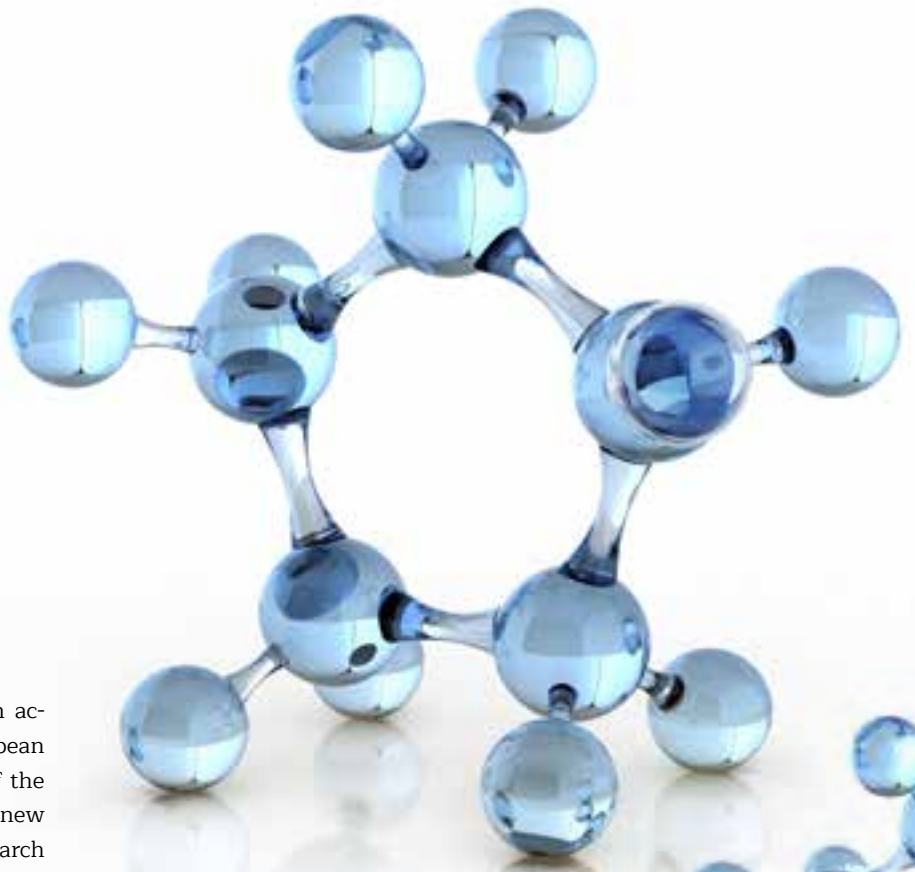
The CAS received a number of foreign visitors in 2022. Over the course of the year the CAS was visited by representatives of several foreign embassies in Prague. Courtesy visits took place with the ambassadors of the Federative Republic of Brazil, the Republic of Chile, the Republic of India, Israel and Japan. The Ambassador of the Republic of Chile accompanied Carolina Gaínza, Chilean Deputy Minister of Science, to a meeting with the CAS President. In March and April, CAS leadership received representatives of two organizations from the USA, namely the *Office of Naval Research Global* and *the University of Nebraska Medical Center*. The delegation from the University of Nebraska Medical Center subsequently visited selected CAS institutes (Institute of Biotechnology, Institute of Molecular Genetics and Institute of Microbiology). Representatives of the *National Applied Research Laboratories* (NARLabs) and the *Taipei Economic and Cultural Office* (TECO), as well as Marie Lefler, a scientific diplomat in Taiwan, also visited the CAS. In September, the CAS leadership discussed the possibilities of deepening bilateral ties with the Saxon State Minister for Science Sebastian Gemkow. Some meetings were also shifted to online environments.

To deepen scientific collaboration and establish new contacts, CAS representatives made several trips abroad, for example to Albania, Belgium, France, Germany, Sweden and the USA. Representatives of the CAS leadership were also invited to participate in delegations of the Senate of the Parliament of Czech Republic to Georgia, the USA and Taiwan.

In 2022, in light of CAS institutes' increasing international involvement, the CAS intensified its efforts to ensure security in research. To this end, it introduced a institutional resilience system setting up internal processes to counteract the influence of foreign powers, especially by raising awareness of the threats and risks to which employees and CAS institutes are exposed. In this area, the CAS continued to cooperate with other research institutions as well as with relevant ministries and administrative authorities.

With regard to CAS membership in international non-governmental organisations, the CAS terminated its membership in the *International Science Council* (ISC) as of 31 December 2022. Financial reasons and the CAS priority to focus on the European region were behind the decision. The CAS continued to engage as a member with the *European Academies Science Advisory Council (EASAC)*, *All European Academies (ALLEA)* and the *InterAcademy Partnership (IAP)*. One of the most important events of 2022 was the EASAC Council meeting, which was, after 14 years, once again hosted by the CAS. The meeting was held in Liblice in June 2022.

In 2022, CAS representatives actively engaged in discussion panels, working groups and conferences in person or online and took part in elaboration of scientific articles. In late June - early July 2022, young scientists met with Nobel Laureates at the annual gathering in Lindau. As the guarantor for the Czech Republic, the CAS nominated a total of six candidates, four of whom the Lindau Committee selected to take part in the meeting. In cooperation with the *International Human Rights Network of Academies and Scholarly Societies (IHRNASS)*, of which the CAS is a member, the CAS joined an appeal to the political representatives of China, Iran and Egypt to release detained scientists. The CAS also condemned the military aggression of the Russian Federation against Ukraine and, through a statement, responded to current events in the Islamic Republic of Iran, where repeated gross human rights violations are claiming human lives.



## ERA Cooperation

The CAS systematically strives to engage in activities implemented in support of the European Research Area (ERA) and takes advantage of the opportunities offered by Horizon Europe, a new EU framework programme supporting research and innovation. In addition to direct involvement in research initiatives at EU level, CAS representatives also participate in the development of European science policies.

In 2022, CAS institutes worked on 151 ongoing projects funded by the Horizon 2020 framework programme, with total funding of EUR 12.78 million. In parallel, researchers applied for the first grants under the new Horizon Europe programme. There were 29 of these new projects, for which the CAS received EUR 1.44 million from the European Commission in 2022.

One of the greatest achievements in a scientist's career is winning a prestigious European Research Council (ERC) grant, which are awarded to excellent, original and ground-breaking projects. A total of nine researchers from CAS institutes were successful in the huge international competition for ERC grants. Five researchers received Starting Grants (Hana Cahová and Tomáš Slanina from the Institute of Organic Chemistry and Biochemistry, Kateřina Rohlenová from the Institute of Biotechnology, Tim Verhagen from the Institute of Physics and Johana Wyss from the Institute of Ethnology), one Synergy grant was awarded to Zdeněk Lánský's team from the Institute of Biotechnology and one Consolidator grant was awarded to Alena Zíková from the Biology Centre. For the first time ever, two Proof of Concept grants were awarded to the CAS. The recipients are Tomáš Čižmár from the Institute of Scientific Instruments and Milan Vrábel from the Institute of Organic Chemistry and Biochemistry.

Systematic support for ERC grant applicants at the national level continued in 2022 through various training and consultation activities conducted by an expert group established on the basis of a Joint Declaration of Charles University and the CAS in cooperation with the CAS Technology Centre. The CAS also continued to financially support ERC project applicants through its own incentive grants, which were awarded to ten applicants in 2022 with total funding of CZK 1 million.

The CAS also continued to support project section staff in 2022. The fourth meeting of project managers working at CAS research institutes was held in May 2022 with the aim of improving support and services for researchers. The overarching topic of the meeting was measures to support the expansion of participation and promotion of excellence in EU Framework Programmes. In addition, the CAS also focused on strengthening participation in European Research Area activities and regularly informed its institutes about the wide range of research opportunities offered by the EU Horizon Europe Framework Programme and other European initiatives.

The CAS also paid unceasing attention to activities held under the auspices of the Czech Presidency of the Council of the EU (CZ PRES). It focused on three science and research areas that respond to current Europe-wide issues in relation to the war in Ukraine and ongoing climate change. The first concerned new genome-editing techniques and the need to ensure EU food security in the context of climate change. The second area was low-carbon and safe energy and the third was a resilient society. An international *Conference on genome editing for food safety and crop improvement*, organised by the CAS and EU-SAGE, a European network of plant biologists supporting new genome techniques, took place in Prague in October 2022. The aim of the conference was to highlight the need for changes in European legislation to put new breeding techniques on equal footing with other breeding practices and resultant sustainable food production. Several events


were held on energy issues. In August, an international scientific conference titled *Challenges on the Renewable Energy Storage* brought together leading European experts in catalysis, electrocatalysis and technological implementation of these methods. In November, the Ministry of Industry and Trade, in cooperation with the European Commission, organised the *16th Strategic Energy Technology Plan (SET Plan) Conference*, which was followed by the expert conference *Decarbonisation of Energy Intensive Industries*, which aimed primarily to inspire participants and present the possibilities of using $CO_2$ and other greenhouse gases as feedstock for chemical and other industrial applications. In November, in cooperation with the *National Institute for Research on the Socioeconomic Impact of Diseases and Systemic Risks (SYRI)*, the CAS organised a three-day conference called *Facets of Resilience*. The conference focused on societal preconditions, tools and strategies for strengthening the capacity of organisations, the state and civil society to respond to current and anticipated crises, including geopolitical, environmental and health crises. In November, a conference organised by the Institute of Philosophy, which was entitled *Hate speech and Czech society: Current risks and prevention options*, was held in the Senate of the Czech Republic. In a series of workshops, scientists from Research area III addressed the topic of resilience in relation to regions, physical health and environmental policies. Specific CAS institutes were in charge of a number of international or national activities associated with the CZ PRES. They organised almost thirty events of various formats (scientific conferences, theatre performances, roundtables, etc.) over a six-month period.

## Bilateral and Multilateral Collaboration

The Czech Academy of Sciences continued to participate in international bilateral and multilateral projects through joint research programmes in collaboration with European and non-European partners. It continued to update contractual documents, extended existing collaborative ties and entered into several new bilateral agreements on scientific collaboration. These included agreements with the *Chilean Agencia Nacional de Investigación y Desarrollo* (ANID), the Indian *Institute of Technology Madras* (IITM) and the Taiwanese *National Health Research Institute* (NHRI). CAS' successful collaboration with the prestigious American university *Massachusetts Institute of Technology* (MIT) entered its second year. The project was open to researchers from research institutions across the entire Czech Republic.

In 2022, some bilateral collaboration programmes supporting researcher mobility were affected by the epidemic. These were mainly projects with Asian partners, as it was not possible to travel to some Asian countries. Overall, the CAS supported bilateral projects with total funding of CZK 18.26 million in 2022. Similarly to the previous two years, the CAS granted extensions to international collaboration projects with partner organisations in Poland, China, India, Japan and Taiwan, which were originally scheduled to end in 2022. Nine joint mobility projects and 12 Mobility Plus projects were extended. In a new tender for projects supporting researcher mobility, 35 projects from 12 countries were supported out of a total of 93 submitted proposals.

In response to the war in Ukraine triggered by the invasion of Russian troops in February 2022, in March the CAS launched a new international programme to support researchers in distress called the *Researchers at Risk Fellowship*. It aims to support researchers forced to flee their home country because of war, political or religious persecution, or who are unable to continue their scientific work in their home country for one of the above reasons. The pilot phase of the programme focused specifically on researchers from Ukraine. In 2022, 48 researchers were supported with CZK 17 million through this programme.

Following the invasion of Ukraine by Russian troops with the support of Belarus, the CAS terminated its active mobility project collaboration with the *National Academy of Sciences of Belarus* (NASB).

In terms of CAS' multilateral collaboration, the ERA-NET VICTOR-E co-fund project imple-

mented by the Institute of Contemporary History within the HERA partnership was completed as of October 2022. This project, co-funded by the European Commission, was extended by slightly less than six months in its final year due to the impacts of the covid-19 pandemic and supported with funding of CZK 1.27 million. In 2022, the CAS also supported two other three-year projects co-funded by the European Commission, which were awarded funding in the CHANSE tender launched through the HERA and NORFACE partnership. At the end of October 2022, the Institute of Sociology began work on the SMARTUP project, and the Institute of Philosophy started the TIMED project in November 2022. The CAS provided a grant of CZK 587,000 for both projects in their first months of implementation. In addition to the ERA-NET co-fund projects, four SEA-Europe JFS projects ran successfully in 2022 (from the J. Heyrovsky Institute of Physical Chemistry and the Institute of Inorganic Chemistry, the Biology Centre and two projects from the Institute of Microbiology). A total of CZK 4.04 million was expended for the projects in 2022. The CAS continued its collaboration with Japan and selected European countries by participating in another EIG CONCERT-Japan call for projects, namely the ninth call titled *Design of Materials with Atomic Precision*.

## CEFRES platform cooperation

Under French-Czech CERES Platform cooperation between the CAS, the French National Centre for Scientific Research (CNRS), Charles University and the French Embassy in the Czech Republic, the research team comprised of Johana Wyss (Institute of Ethnology) and Michèle Baussant (Institut des sciences sociales du politique, CNRS) concluded its TANDEM programme project titled *Europe: a resentful confederation of vanquished peoples? Raw and lapsed memories of post-imperial (European) minorities"*. Project investigator Johana Wyss obtained an ERC grant of almost CZK 37 million in November 2022.

In February 2022, the TANDEM programme launched its third two-year project, this time on the topic of *Home beyond species: More-than-human dwelling in the age of crises*. The researchers are Petr Gibas (Institute of Sociology) and Chloé Mondéme (École Normale Supérieure de Lyon). The project is scheduled to end in January 2024.

# Regional Cooperation

The Czech Academy of Sciences helps Czech regions and microregions improve their quality of life through jointly funded research projects and their application. In 2022, work was conducted under agreements on 19 joint projects, funded according to agreements concluded between CAS institutes and their regional partners.

> Collaboration between CAS institutes and regional partners such as regions and microregions of the Czech Republic focuses on addressing social, economic, ecological, natural and cultural issues through basic research and application projects.

In 2022, institutes from the sections of Applied Physics, Earth Sciences, Chemical Sciences, Biological and Medical Sciences, Biological-Ecological Sciences, Socio-economic Sciences, Historical Sciences, Humanities and Philological Sciences of the CAS were engaged in regional cooperation projects. The projects addressed topics such as: 3D scanning of mine underground areas (capturing the real condition of the mines with the aim of possible future use for regional purposes), mapping of the occurrence of critically endangered animals (providing the scientific basis for development of a protection plan for these species), studying and optimising nutrient solutions (improving crop resilience and quality), astronomical observations (obtaining comprehensive information on the properties of the ionosphere), analysis of archaeological sites (approximating the chronological and spatial evolution of sites) and public transport access to secondary schools.

These collaborative projects are rooted in agreements concluded successively with the Association of Municipalities of Orlicko (2003), South Moravian Region (2008), City of Brno (2008), Prague 1 Municipal District (2009), Pardubice Region (2013), Hradec Králové Region (2013), Vysočina Region (2014), Zlín Region (2015), Ústí nad Labem Region (2015), Central Bohemian Region (2016), Karlovy Vary Region (2016), Olomouc Region (2017), South Bohemian Region (2018), Pilsen Region (2019), Šumava National Park Administration (2019), Liberec Region (2020), Moravian-Silesian Region (2020) and the Capital City of Prague (2022). In 2022, work was conducted under agreements on 19 joint projects, funded according to agreements concluded between CAS institutes and their regional partners.

These joint projects include a regular annual meeting, which is held alternately in Prague and Brno and attended by representatives of the CAS and regions of the Czech Republic. At these meetings, researchers and representatives of regional and local governments exchange information and inspiration and discuss their work. The Regional Cooperation Committee selected six of the 19 joint projects to take part in a presentation and evaluation of the results of projects funded by the 2021 regional cooperation grant, which took place in Prague on 27 June 2022, as follows:

1. **Phosphorus cycling in alternative wastewater treatment systems**, Institute of Experimental Botany, Pardubice Region and the Upper Secondary School of Electrical Engineering Pardubice,
2. **Technological research of the ruins of Štamberk Castle in the broader context of the region**, Institute of Theoretical and Applied Mechanics, Telč Microregion,
3. **Radio spectrum observation of ionospheric disturbances**, J. Heyrovsky Institute of Physical Chemistry, Karlovy Vary Observatory and Radio Club, o.p.s,
4. **Study of the use of compost to increase soil organic matter and improve soil sorption properties as a measure to combat drought in the Central Bohemian Region**, Institute of Experimental Botany, BIOPRO PLUS, s.r.o.,
5. **Hradisko u Kroměříže – A fortress from the Bronze Age**, Institute of Archaeology, Prague, Kroměříž Region Museum,
6. **Protection - preservation - knowledge. The contribution of citizen science in archaeology to learn about the past of the South Moravian Region**, Institute of Archaeology, Brno, South Moravian Region, Department of Culture and Monument Protection.

**Section of Earth Sciences**

- Geophysical skills at the Skalná Primary School (Skalná).
- 3D spatial survey of the underground of the Svornost mine and its surroundings to identify the real layout of the mining areas, including follow-up analyses (Jáchymov).
- Drainage and 3D laser scanning of the St. Antonín Paduánský mine in Horní Město to identify its real layout and volume including identification of mine water courses for possible future use for the municipality of Horní Město, phase III – completion of expansion of measurement station and findings and time series (Horní Město).

**Section of Chemical Sciences**

- Radio spectrum observation of ionospheric disturbances (Karlovy Vary).
- Development of the land component of space missions (Valašské Meziříčí).

**Section of Biological and Medical Sciences**

- Phosphorus cycle in alternative waste water treatment systems (Pardubice).
- Study of use of compost to raise the organic content in soil and improve crop resilience and quality as a measure to combat extreme climatic conditions in the Central Bohemian Region (Dobříš).
- Optimization of nutrient solution for growing leafy vegetables and herbs in a hydroponic production system and product safety monitoring (Hradec Králové).

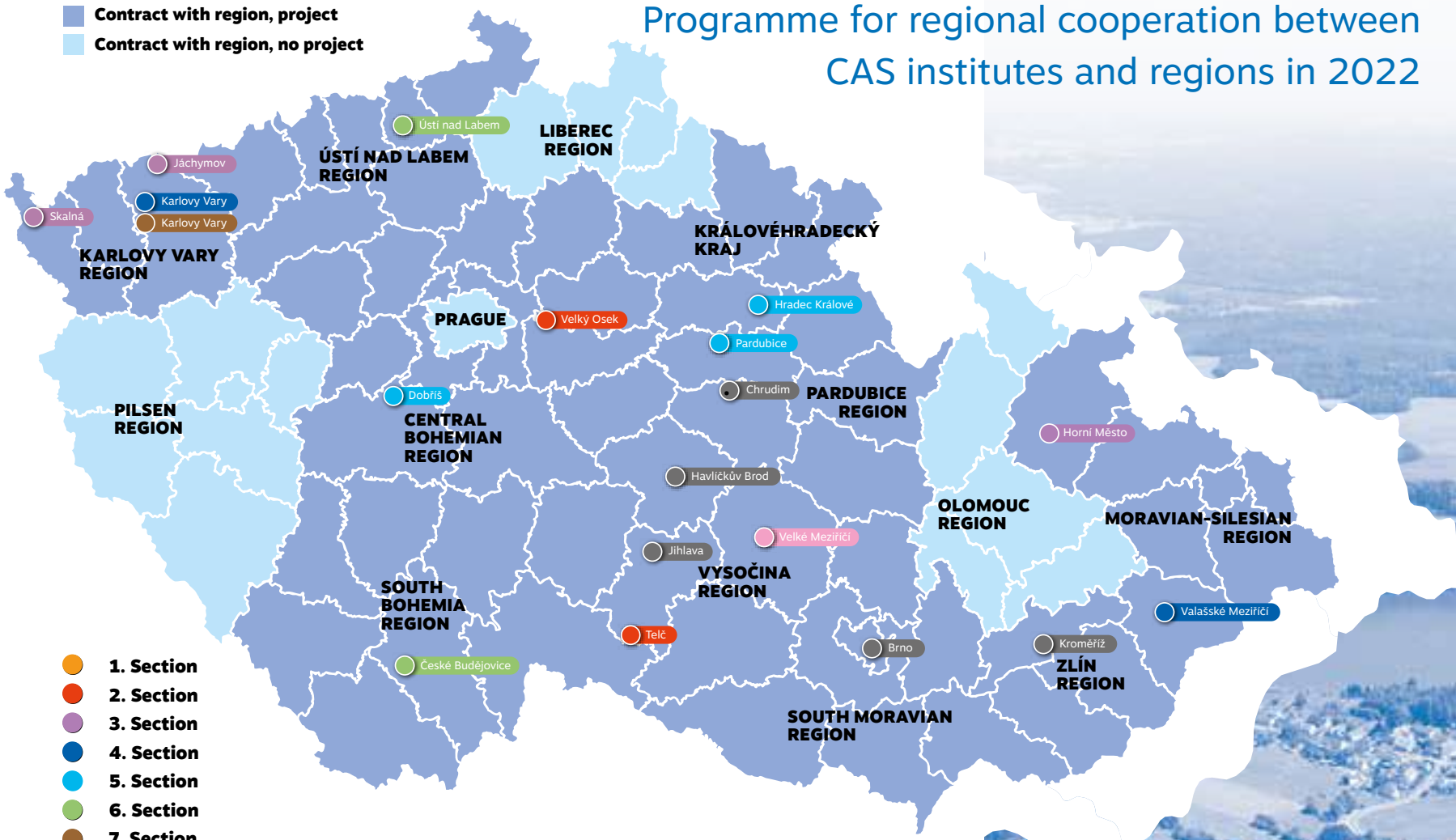
**Section of Applied Physics**

- Technological research of the Štamberk castle ruins in the wider context of the region (Telč).
- Determination of the water balance in the Elbe Lowland in the municipality of Velký Osek cadastral area (Velký Osek).

**Section of Humanities and Philological Sciences**

- Current philosophy (Velké Meziříčí).

# Map of the distribution of projects of the Programme for regional cooperation between CAS institutes and regions in 2022




### Section of Historical Sciences

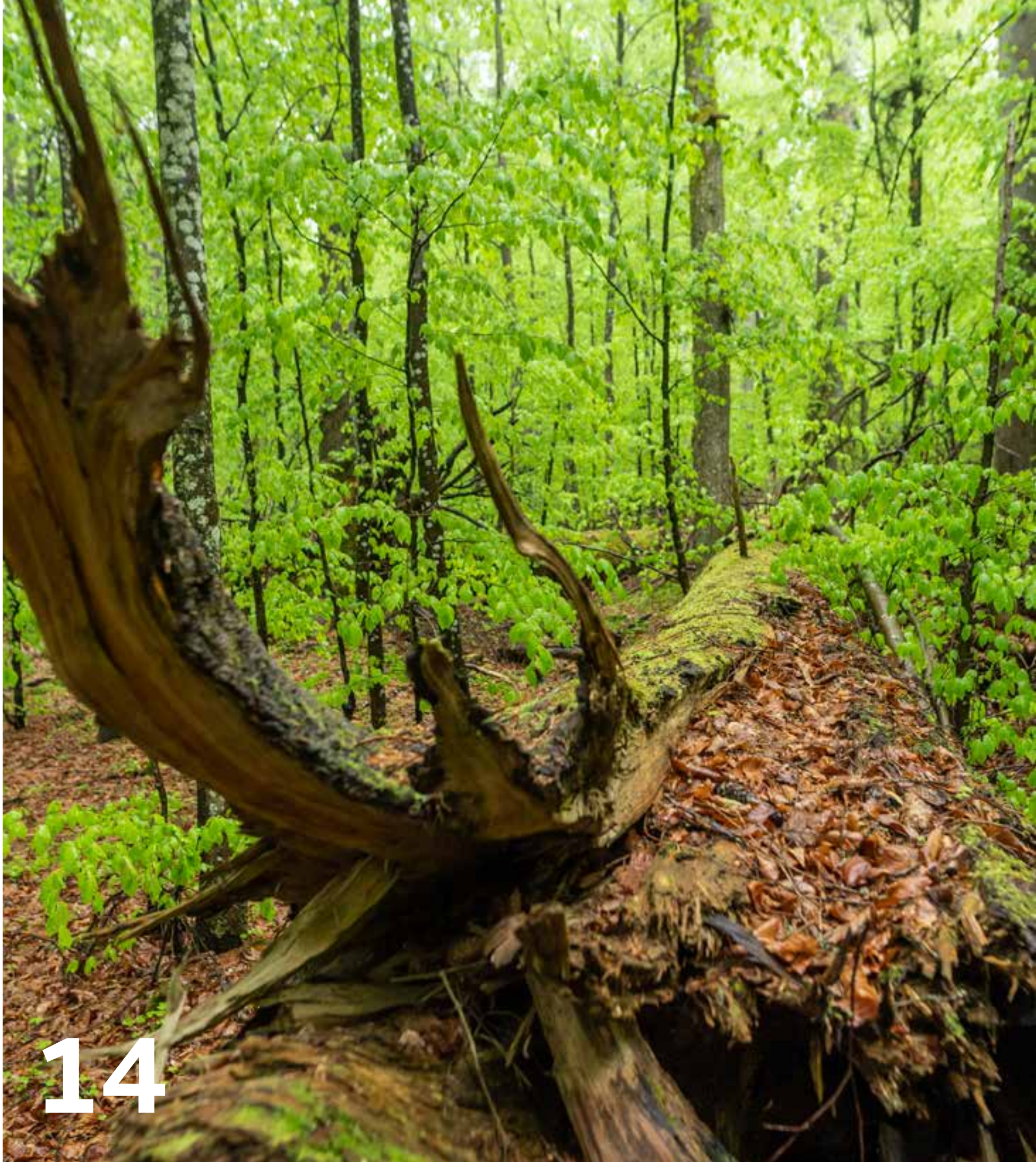
- Havlíček, Havel! Conference on the occasion of the 200th anniversary of Karel Havlíček Borovský's birth (Havlíčkův Brod).
- Celts and Germans in the Dalešice Dam region (Jihlava).
- Lapidarium of the Regional Museum in Chrudim (architectural articles stored at Košumberk Castle and in the Regional Museum) (Chrudim).
- Hradisko near Kroměříž – a Bronze Age fortress (Kroměříž).
- Citizen science in archaeology – sustainability and professional application of results (Brno).

### Section of Biological-Ecological Sciences

- Mapping the occurrence of the critically endangered crucian carp in the South Bohemian Region and preparation of a regional crucian carp conservation action plan (České Budějovice).
- Critically endangered endemic of the Czech steppes: Scientific basis for the protection of the jewel beetle (Cylindromorphus bohemicus) (Ústí nad Labem).

### Section of Socio-Economic Sciences

- Transport access to secondary schools in the Karlovy Vary region (Karlovy Vary).



# Environment and Sustainable Operations

in Scientific Research and Research Infrastructure

In 2022, the Czech Academy of Sciences continued to focus on socially crucial topics related to sustainability and environmental protection. The permanent advisory bodies to the CAS Academy Council in this area are the Environmental Committee and the Energy Research Committee. These committees are composed of leading experts in the relevant fields. Research conducted through Strategy AV21 research programmes at CAS institutes delves into current issues such as: “Landscape Preservation and Revitalisation”, “Foods for the Future”, “Water for Life”, “Sustainable Energy” and “Resilient Society for the 21st Century. The Potential of Crisis and Effective Transformation”.

## Biology Centre

**Fires in Bohemian Switzerland**

The Strategy AV21 Programme "Landscape Preservation and Revitalisation" coordinated CAS research into the causes and impacts of the large-scale fire in the Bohemian Switzerland National Park.

Several dozen research groups and individuals from various CAS institutes took part, including teams from the Institute of Botany and the Biology Centre, which had been studying this issue long before the fire. These groups extensively examined the interactions of fire dynamics of natural pine stands in the national park with vegetation, biodiversity, and soil functioning. These studies clearly show that fires have always been part of local natural ecosystems. The problem, however, is that long-term efforts to suppress fires have led to the accumulation of large amounts of fuel over large areas, which in turn increases the chances of large and intense fires that are particularly difficult to extinguish. These teams' research results also show quite clearly that prescribed burning is a simple and effective way to prevent similar catastrophic fires in the future. Additionally, there are indications that the application of this method can have positive impacts on both biodiversity and the functioning of local ecosystems.

*Crucian carp*

**Save the carp!**

The project "Save the carp!" aims to prevent further population decline of the crucian carp, which used to be one of the most common fish in pools and village fish ponds but is now on the verge of extinction. Although the crucian carp is a master at surviving in inhospitable conditions, it has lost its original natural habitat and is being displaced by the invasive Prussian carp. Scientists from the Biology Centre collaborated with experts from the Czech University of Agriculture and Zoo Prague to alter this adverse situation.

The project was launched at Prague Zoo in spring 2021, when over 160 crucian carp were released into the former mill-race on the zoo's premises. Hydrobiologists from the Biology Centre oversaw cultivation of the carp. An online questionnaire was launched in August 2021 (https://zachrankarase.cz/) for the general public that aimed to map the occurrence of crucian carp (and invasive Prussian carp) in the Czech Republic and identify suitable locations where this native Czech fish could be returned to its habitat. By 2022, over 900 respondents had engaged in the project, reporting more than 1,100 carp sightings. During 2022, collaborative ties were forged with a number of entities through the project and crucian carp were planted in dozens of municipal and private ponds in many places in the Czech Republic. The project participants included the Prague Zoo, the Pilsen Zoo, Palacký University Olomouc, the Vysočina Region, the South Bohemian Region and dozens of individual volunteers. The aim for 2023 is to involve additional entities, including Czech State Forest regional offices, Zoo Jihlava and the Czech Union for Nature Conservation, Kněžice Chapter (ČSOP Kněžice).

*Typical pool habitat of crucian carp*

**Restoring ecosystems after coal mining**

The Strategy AV21 research programme "Landscape Preservation and Revitalisation" has long addressed the restoration of severely disturbed ecosystems damaged by coal mining. This issue is becoming increasingly pressing in relation to the anticipated end of mining, which will suddenly leave behind a larger number of affected areas in need of restoration.

The results obtained from the programme's work show that while mineral extraction causes serious damage to virtually all ecosystem components, soil, water, vegetation, biodiversity, etc., it also opens up a range of sometimes surprising opportunities. In any case, they are not fully appreciated in current reclamation practices.

Due to the relative scarcity of certain nutrients, especially nitrogen, landfills constitute islands of diversity that host an array of species which are rare elsewhere or completely absent from the surrounding, often eutrophicated landscape. Emerging soils from landfills have up to eight times more potential to accumulate carbon and thus contribute to climate change mitigation than, for example, soils in agricultural landscapes. Mine lakes, which are formed by flooding of residual pits of coal mines, are unique reservoirs of clean water unencumbered by excess nutrients, which renders them extremely suitable for recreation

*Experimental landfill catchment area*

and for the cultivation of some attractive lake fish species. Harnessing these opportunities can significantly aid in the equitable transformation of coal regions, but it depends on a thorough understanding of the principles by which restored coalfield ecosystems function. The Strategy AV21 research programme "Landscape Preservation and Revitalisation" plays an important role in this effort.

## Global Change Research Institute

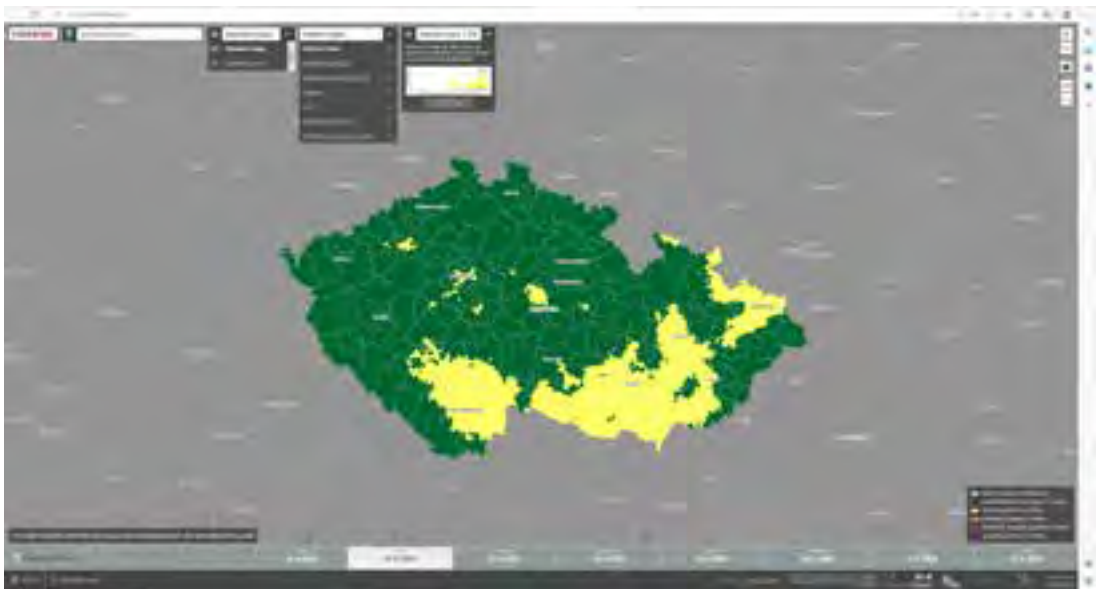
**FireRisk Portal**

The portal www.firerisk.cz provides several basic maps that summarise the spatial distribution of current and expected fire weather for the next few days, at the cadastre resolution. However, all calculations are performed at a basic resolution of 500 × 500 m and thus each cadastre includes ten to several dozen values. The results of each grid are aggregated to the cadastre level for clarity. The portal contains three basic maps and a number of additional map layers. All of the maps are based on the numerical forecast model of the European Centre for Medium-Range Forecasting (ECMWF), which shows the best forecast reliability and robustness for the Czech Republic (and most of Europe) out of the five models used by the FireRisk portal and whose values are available on the additional maps.

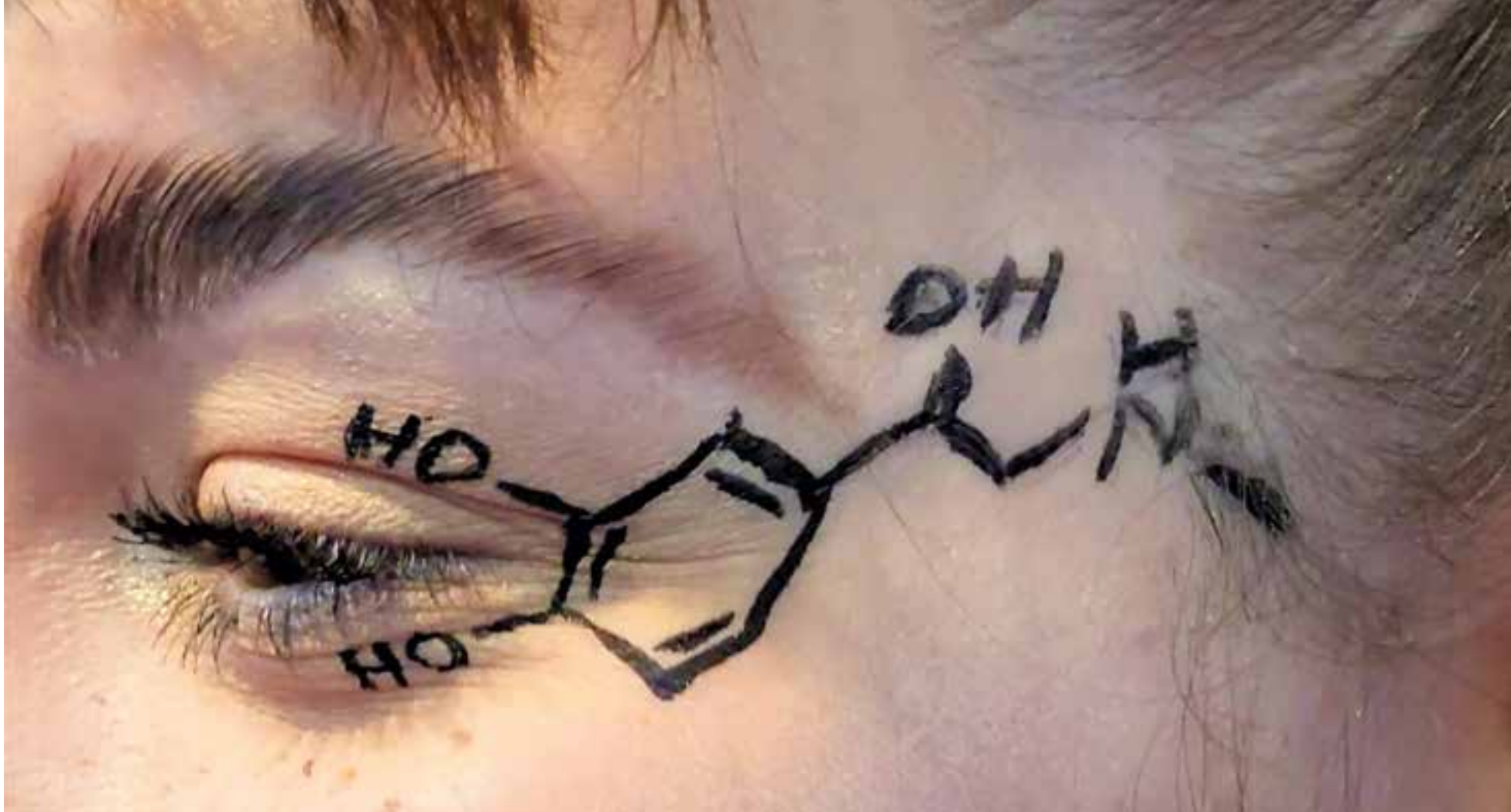
The main operators of the FireRisk portal are three institutions - the Global Change Research Institute (CzechGlobe), the Czech Hydrometeorological Institute and IFER - Institute for Forest Ecosystem Research s.r.o. - which collaboratively carry out the core research and operate the entire website.

Within the Strategy AV21 research programme "Water for Life", scientists have been working on optimising and setting up water treatment technologies that simplify and unify technological water pollutant removal procedures (coagulation and flocculation processes). Through the "Landscape Preservation and Revitalisation" programme, researchers focused on the history and current state of agroforestry in the Czech Republic and its potential environmental benefits. They also helped develop the key strategies for the conservation of the European bison issued by the International Union for Conservation of Nature (IUCN).

> Wildfires in the landscape: Are they natural, or the result of human negligence? Why are the consequences of fires excessively devastating? How can we prevent fires and monitor the risk of fire? CAS institutes are collaborating with other institutions to tackle these issues.



*FireRisk Portal*


HO
HO
OH

# Educational Activities

Educating young scientists and improving the quality of the national education system at all levels are crucial elements of CAS' mission in society and an integral part of research at the Czech Academy of Sciences. CAS' educational efforts are grounded in cooperation with universities, with particular attention on educating students in doctoral programmes. CAS employees are also directly and extensively involved in teaching and supervising university students, while also taking part in a variety of educational and training programmes for secondary school students and teachers.

## COOPERATION WITH UNIVERSITIES

> The Academy of Sciences is constantly deepening collaborative ties with universities, secondary and primary schools. The education of students in doctoral programmes is a particular area of emphasis.

The amendment to Act No. 111/1998 Coll., on Higher Education Institutions requires that doctoral programmes implemented by institutes in cooperation with universities be accredited by the National Accreditation Bureau. A mandatory part of the accreditation application is an agreement between the Czech Academy of Sciences and the relevant university on cooperation on implementation of the given doctoral programme. The Academy Council has drawn up a model agreement and works individually with the management of each relevant university on the specific wording of each given agreement, including points such as representation of CAS institutes in subject area boards of specific study programmes. Agreements have already been signed with sixteen universities and negotiations with others are continuing in an atmosphere of mutual trust and due procedure.

In 2022, a Memorandum of Cooperation was concluded between the CAS and the Police Academy of the Czech Republic in Prague. A collaborative Czech-German effort with the Leibniz Institute for the History and Culture of Eastern Europe (GWZO) is developing, which also envisions future joint education of post-graduate students. The CAS also continues to actively look for other opportunities to expand collaboration with universities throughout the Central European region.

Relations between the CAS and universities are monitored and coordinated by the CAS Council for Higher Education and Researchers Training Cooperation, which is an advisory body to the CAS management. The Council convened at two meetings during 2022. At the meeting on 6 April 2022, the main issues of discussion were the upcoming reform of doctoral study funding according to the *Strategic Plan for Higher Education* (SZ 2021+) and a planned questionnaire on doctoral studies at CAS institutes. The second Council meeting was held online on 30 November 2022. The proposed questionnaire was sent to CAS institutes during October 2022. The data will be evaluated and further processed next year, when they will serve as a basis for exploring additional opportunities to support doctoral studies at CAS institutes.

CAS institutes and employees participate extensively in student education at both public and private universities. In 2022, CAS employees provided more than 4,500 semestral series of lectures, practicals or seminars with a total scope of almost 72,000 hours. CAS institutes thus contribute significantly to student education and supervision of students' qualification work. In 2022, employees of CAS institutes trained 2,259 doctoral students and also participated in the supervision of bachelor and master programme students. A total of 199 doctoral students trained at CAS institutes successfully completed their studies in 2022.

The CAS has supported the general education of doctoral students for many years through its successful and sought-after week-long *Course on the basics of scientific work*, which is intended for doctoral students in various disciplines and aims to cultivate the skills students need to succeed in the fiercely competitive international environment. Courses are held in Prague and in Brno. In 2022, 81 students took part in four combined courses in Prague, and 237 students participated in five in-person courses in Brno. Students from other institutions also actively seek out the courses. The lecturers are renowned and experienced experts, mainly CAS employees, and lecture content is chosen to be useful for doctoral students across all disciplines. The main subjects include scientific methodology, ethical principles in scientific work and bioethics, evaluation of scientific work, scientific communication and its written genres, suitable presentation of research results, editorial aspects of publishing in journals, scientific writing techniques, rhetoric and the culture of the spoken word, lecturing skills, current information resources for science, research and education, research funding, targeted funding, project development, intellectual property rights and commercialisation, technology and knowledge transfer, professional writing skills in English, and more. The import and significance of these courses is evidenced by student feedback, which is collected and evaluated on an ongoing basis by the CAS.

*Students of the Course on the basics of scientific work, held on 21-25 March 2022 at the CAS building at Národní 3 in Prague.*

**Table 9:** Overview of the most significant forms of cooperation with universities

| | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|---|---|
| **Doctoral students trained at CAS institutes** | 2,091 | 2,019 | 2,175 | 1,995 | 2,046 | 2,161 | 2,312 | 2,259 |
| **Newly admitted doctoral students** | 376 | 348 | 323 | 376 | 384 | 427 | 395 | 344 |
| **Number of completed doctoral dissertations** | 264 | 263 | 260 | 264 | 242 | 181 | 228 | 199 |
| **No. of semestral series of lectures, seminars and practicals** | 4,246 | 5,547 | 4,949 | 5,247 | 6,909 | 6,479 | 6,101 | 4,556 |
| **Number of hours lectured** | 76,348 | 75,978 | 6,423 | 71,335 | 73,086 | 69,518 | 68,176 | 71,903 |

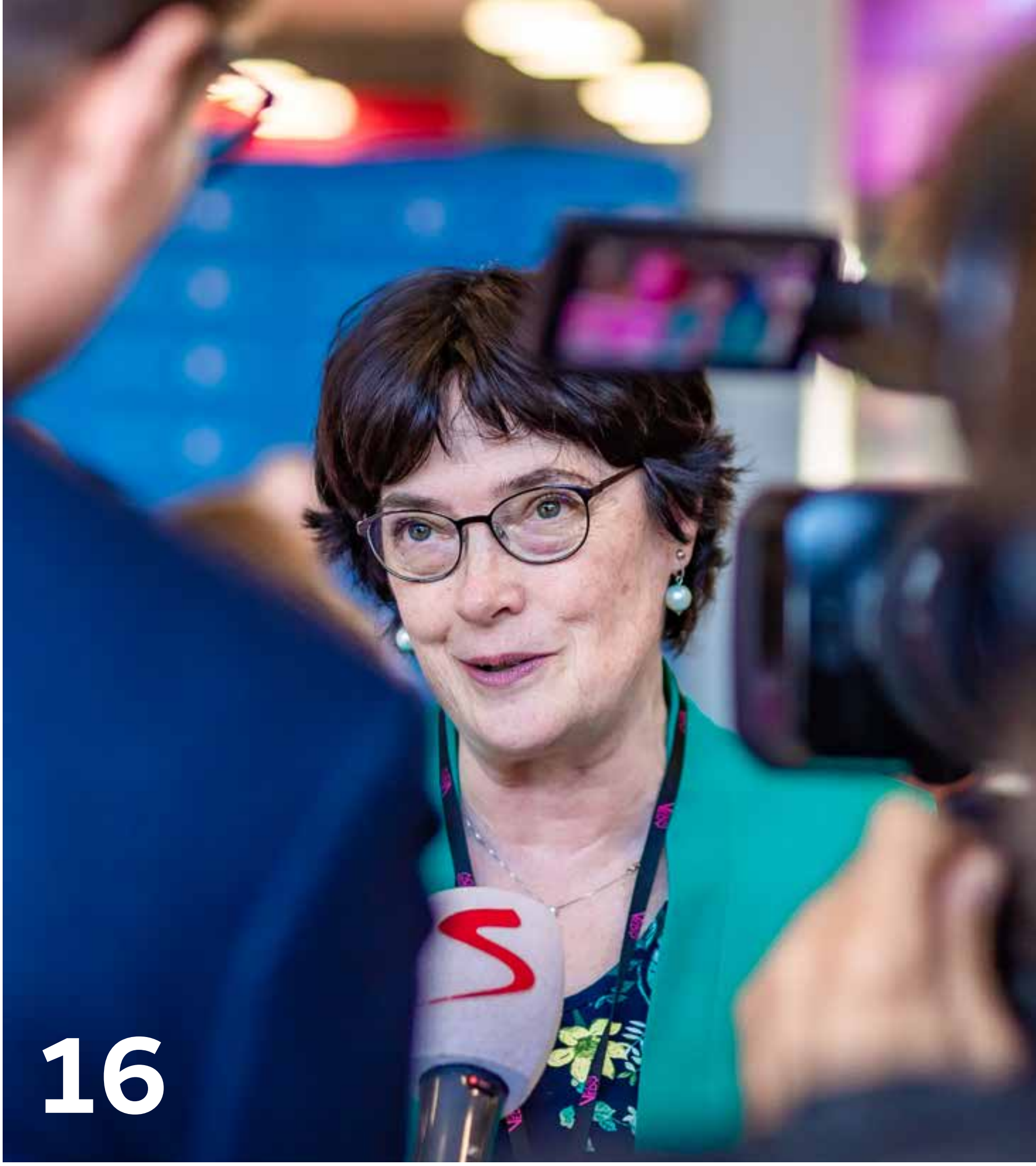
## OPEN SCIENCE PROJECT

The CAS offers students of secondary, higher vocational and higher education institutions the opportunity to participate in scientific work through one-year internships at CAS institutes under the guidance of experienced teachers. Open Science student internships have been running since 2005 and are fully funded by the Czech Academy of Sciences. The internships are twelve months long with a minimum of eight hours per month. Travel costs are also covered for students who commute. In 2022, 216 secondary school students tried out scientific practice at 34 CAS institutes. For 2023, another 116 topics have been announced at 37 CAS institutes which cover a wide range of scientific fields and disciplines in all three research areas.

## ENGAGEMENT AT SECONDARY AND PRIMARY SCHOOLS

CAS' engagement in secondary and primary school education centres around teaching and a broad array of lectures. Through the Open Science project the CAS also offers summer science camps for secondary and primary school natural science teachers and the School of the Czech language and literature for teachers.


*Summer science camp at the Třešť Castle CAS Conference Centre*



# Media Communications

## and Promotion

The Czech Academy of Sciences has always dedicated great effort to communicating with the public, particularly through the media. The essential pillar of CAS media communications is the continuous, regular and systematic popularisation of science and research results. Scientists and science promoters strive to spark public interest in scientific work. CAS employees endeavour to bring science closer to non-scientists as best as possible, capture their interest in research findings across disciplines and present their institutes and themselves at work on specific research projects.

Scientists' expert statements on current events or issues have the potential to set the public agenda and highlight socially important topics. In addition, the significant scientific results produced by the CAS have the potential to leave an indelible imprint on the Czech media landscape and beyond.

# THE CZECH ACADEMY OF SCIENCES AS A MEDIA PARTNER

> The Czech Academy of Sciences has always dedicated great effort to communicating with the public, particularly through the media. In 2022, there were 34,566 media outputs about the CAS in monitored media.

An essential part of CAS media communications involves working with public service media: Czech Television (CT), Czech Radio (CR) and the Czech Press Agency. This time-tested and well-developed collaboration is proving to be essential, both in normal times uninterrupted by unexpected events as well as in times of uncertainty or cataclysmal changes, such as the waning covid-19 pandemic or Russian troops' shocking invasion of Ukraine in 2022.

Throughout 2022, CAS scientists were regularly invited to take part in Czech Television and Czech Radio broadcasting and asked for interviews to clarify various current topics. Their statements served as a guarantee of verified knowledge in various scientific disciplines for both journalists and the public.

In 2022, there were 34,566 media outputs mentioning the CAS and variations of its name, 64% of which were on the internet, 26% in printed media, 2.52% in Czech Press Agency news desks which other media use as a source, 4% in television news and 3.38% on radio. The remaining 0.79% mentions were in podcasts. According to Newton Media, the keyword Academy of Sciences appeared in the monitored media an average of 2,880 times per month. The vast majority of media reporting about the CAS had a positive overtone.

The work of the CAS, across all of its scientific disciplines, figured prominently in the media in 2022. Consequently only a few brief examples of the pronounced impact of CAS media communications can be shared below.

## CAS research topics

A significant event for the CAS was the LIX. Session of the Academy Assembly on 20 April at the National House Vinohrady, Prague. In the presence of Prime Minister Petr Fiala and Minister for Science, Research and Innovation Helena Langšádlová, the CAS presented, among other things, its three priorities for the Czech EU Council Presidency, including a roughly five-minute video presented both at the Assembly and on CAS social media. The media were very interested in this topic, and the session was widely reported, especially by Czech Television, Czech Radio and the Czech Press Agency. CAS President Eva Zažímalová spoke in the video, along with Academy Council member Jiří Plešek, botanist Jaroslav Doležel from the **Institute of Experimental Botany** and philosopher Alice Koubová from the **Institute of Philosophy**. Throughout the year, the media repeatedly covered the scientific priorities for the Czech EU Council Presidency. The CAS effectively promoted topics that it considers essential and beneficial to society in the public discourse.


A literally explosive topic noticed by journalists and covered in almost all media was a press release by the **Institute of Chemical Process Fundamentals** and the **Institute of Hydrodynamics** about the unbearable toxicity of New Year fireworks and their impact on the environment and human health.

Media interest was also drawn to a press release by the **Institute of Experimental Botany** about a highly effective plant stimulator developed by scientists, which promises higher yields even in times of unfavourable climatic conditions such as drought, with less need to fertilise crops. A press conference on the topic was also held at the CAS building, in which President Eva Zažímalová participated.

The commemoration of the 100th anniversary of the invention of polarography also generated

extensive media coverage. Scientists from the **J. Heyrovsky Institute of Physical Chemistry** explained the principle of polarography, for which Prof. Heyrovsky won the Nobel Prize in 1959, as well as its benefit for devices still used today in healthcare, environmental protection or energy conversion and storage. Researchers also used the media to present how the legacy of J. Heyrovsky, the only Czech Nobel Laureate in a technical field, is being further developed.

Astronomical phenomena always elicit great media and public interest. The **Institute of Astronomy's** Pavel Suchan, who is experienced in science popularisation, commented on the partial lunar eclipse in mid-May and the super full moon, the swarm of Perseids and fireballs over the Czech Republic and other events in the near and distant universe. Experts from this institute also explained the widely publicised success of the NASA mission, which was the first planetary protection intervention and which involved CAS scientists.

Animal-related topics also tend to be popular in the media. In 2022, there was extensive media coverage, for example, of a report by the **Institute of Vertebrate Biology** on the possibility of using leeches to obtain blood samples from animals in rescue stations and zoos, and of an experiment by scientists from the same institute that showed that swallows' tidiness helps them avoid the arduous process of raising other birds' young, for they throw unfamiliar eggs out of their own nests.

Media attention also honed in on a press release about an experiment reconstructing the process of preparing several ancient Greco-Egyptian perfumes, conducted by Sean Coughlin of the **Institute of Philosophy** in his *Alchemy of Scents project*.

A press release on the impact of heat on the mortality rate in Prague over the last forty years also received media coverage. The study was developed by experts from the **Institute of Atmospheric Physics** and the Faculty of Environmental Sciences of the Czech University of Life Sciences Prague.

News of archaeological discoveries also tend to receive a notable response, as was the case with a press release by the **Institute of Archaeology, Prague** and the Moravian Museum about the anthropological reconstruction of the appearance of a woman buried 4,000 years ago in Mikulovice near Pardubice and a news report about the uncovering of a prehistoric roundhouse in Prague-Vinoř. News from the **Institute of Archaeology, Brno**, about the discovery of an almost intact skeleton of a Langobard warrior at the site of the extinct village of Mušov also drew media attention.

Journalists also worked extensively with a report by the **Institute of Organic Chemistry and Biochemistry** about a new method at the interface of chemistry and modern technology, which uses molecules as data carriers and can be used to label cells, drugs or banknotes.

Scientists at the **Institute of Macromolecular Chemistry** received media attention for their work on a mechanism that uses perovskites to increase the lifespan and efficiency of solar cells.

A new application showing how Jews were restricted in Prague during the war was presented by researchers from the **Masaryk Institute and Archives**.

The reopening of the castle hotel and conference centre in Třešť in May, which is managed and operated by the **Centre of Administration and Operations**, also generated considerable media coverage.

Six videos from the expedition of two scientists from the **Global Change Research Institute - CzechGlobe**, Zuzana Harmáčková and Lenka Suchá, to Zambia in Central Africa, sought to present the field work of scientists in "vlogs", a new format of short reportage videos that are about three minutes long and are filmed direct-

ly on the spot. Almost 7,000 social media users have viewed their vlogs.

## CAS in current news

In 2022, the strong voice of CAS scientists resounded in the public discourse in relation to the Russian invasion of Ukraine. They condemned the war on the first day of Russia's aggression in Ukraine, and later introduced measures such as the *Researchers at Risk Fellowship* for applicants from Ukraine. The media quoted both CAS President Eva Zažímalová and Academy Council member David Honys, and journalists also immediately published reports about the first of these researchers at work at CAS institutes and published interviews with them.

Sociologist Tomáš Kostelecký, an Academy Council member, commented on Czech society's reaction to the Russian invasion. Yana Leontiyeva from the **Institute of Sociology** repeatedly commented on the situation in Ukraine and the possible wave of migration, Petr Hlaváček from the **Institute of Philosophy** spoke on Russian imperialism, and ethics scholar David Černý from the **Institute of State and Law** explained just war theory. Vladimir Wagner from the **Institute of Nuclear Physics** repeatedly commented on the situation at the Ukrainian Zaporozhye power plant after it was occupied by Russian soldiers.

CAS researchers regularly explain, analyse and comment on current events or the context of major historical anniversaries, etc. Miroslav Trnka and Pavel Zahradníček from the **Global Change Research Institute – CzechGlobe** gave extensive and numerous interviews and commentaries in various media about the impacts of global change.

Lucie Trlifajová and Kamila Fialová from the **Institute of Sociology** and Jan Švejnar from **CERGE-EI** estimated the impact of energy price increases on Czech households in the context of the gradually unfolding energy crisis and inflation. Researchers from the IDEA think tank at the **Economics Institute**, Daniel Münich, Filip Pertold and others regularly contributed analyses of the current economic situation and topics such as state budget expenditures, salaries of state officials, employees and teachers, the pension system, housing costs, etc.

The ethical and legal aspects of the "marriage for all" proposal were discussed by Petr Agha of the **Institute of State and Law**.

Hana Müllerová from the **Institute of State and Law** described the climate lawsuit against the Czech Republic and environmental law.

The influence of the Internet and social networks were presented numerous times in the media by Marie Heřmanová of the **Institute of Sociology**.

Researchers at the **Institute of History** and the **Institute of Contemporary History** analysed e.g. the anniversary of the attack on Reinhard Heydrich and the subsequent tragedy in Lidice (Vojtěch Kyncl, Institute of History), the 80th anniversary of the extermination of the inhabitants of Ležáky (Jan Němeček, Institute of History), the anniversary of the trial of Rudolf Slánský and the death and funeral of Mikhail Gorbachev (Oldřich Tůma, Institute of Contemporary History), and the reign of Queen Elizabeth II in the United Kingdom (Jan Županič, Institute of History).

Researchers of the **Institute of Slavonic Studies** were featured prominently in the media in


relation to research on the first primers, travel guides, pagan summer solstice celebrations and legends associated with St. Nicholas.

## Videos as a new communication format

In 2022, the CAS provided information about its own topics through short videos featuring a scientist commenting on a current issue or a newly published press release. The videos, which are approximately ten to fifteen minutes long, are produced by the Division of External Relations Press Section, which posts them on social media (in their shortened 2-3 minute versions) and sends them to journalists as material for reporting. Media editorial offices then either use the videos directly in their broadcasts or news reports or prepare their own text or video with the help of the respondent. Fifty of these videos were produced in 2022. About one-third of them accompanied and supported CAS press releases, one-third introduced CAS topics (popular videos included e.g. the attitudes of young people towards housing, research on corruption, the approach of courts to the conditional release of prisoners or the history of the popularity of Czech Christmas fairy tales) and one-third responded to events in society such as the war in Ukraine, the covid-19 epidemic, etc.

## Strategy AV21 and AVex expert opinions

*AVex* expert opinions, developed in response to requests from the Parliament of the Czech Republic, were issued for the third year in a row. They provide lawmakers, selected ambassadors and members of the European Parliament with independent and apolitical expert information about concrete, current societal problems and potential solutions. *AVex* opinions significantly strengthen the image of the CAS as an impartial expert institution and synergistically contribute to the practical fulfilment of Strategy AV21's main motto: "Top research in the public interest". Relevant CAS institutes act as guarantors for development of expert opinion content. In 2022, three opinions were developed: *Migration and citizens from "third-world countries" in the Czech Republic* (published in May, the Institute of Ethnology was the guarantor), *Knowledge and technology transfer and how to support it in the Czech Republic* (published in June, the Technology Transfer Office – CAS TTO and the Centre of Administration and Operations were the guarantors) and E*quitable transformation*. *Transition to a low-carbon economy from a legal perspective* (published in December, the Institute of State and Law was the guarantor).

# SCIENCE POPULARISATION

## through the CAS Centre of Administration and Operations

The Czech Academy of Sciences considers the popularisation of research results and the dissemination of scientific knowledge to the general public to be an integral part of its mission.

The CAS service office - the Centre of Administration and Operations - has always played an important role in systematic popularisation of CAS research results. It manages a diverse spectrum of popularisation activities through the CAS Division of External Relations.

In 2022, the CAS continued with its prestigious lecture series called **CAS: Top research in the public interest**, in which leading Czech scientists share their views on current issues and societal topics. The tenth gala lecture was given on 4 April by Ondřej Lebeda from the Institute of Nuclear Physics and was titled *The Wonderful World of Radionuclides - From Physics to Medicine*. On 3 October 2022, Sylvie Graf from the Institute of Psychology gave a gala lecture on *Reducing Prejudice as a Path to a Functioning Society*. Both gala events were held in the CAS Library courtyard and were attended by representatives of both chambers of the Parliament of the Czech Republic, the scientific and academic community and the CAS leadership. The lectures were streamed to the public through iVysílání (iBroadcast) of Czech Television and CAS social networks.

During the Czech Presidency of the Council of the European Union, the Czech Academy of Sciences focused on three thematic areas in which CAS institutes collaborate through Strategy AV21 research programmes: food, energy and resilience. **Two major international conferences** were held in relation to the Czech EU Council Presidency, which were attended by a number of academic and political figures and representatives of the professional community. On 13-14 October, a *Conference on genome editing for food safety and crop improvement* was held in cooperation with EU-SAGE, with discussion of the possibilities of using targeted genome editing methods in crop breeding at national and international levels. The second conference, *Facets of Resilience*, which opened up fundamental issues faced by contemporary society across science, government institutions and the public sphere, took place on 21-23 November.


The twenty-third annual **Brain Week festival**, which is part of Brain Awareness Week (BAW), took place from 14-20 March. Brain Week is organised every year by the CAS in cooperation with the Institute of Experimental Medicine and the Czech Society for Neuroscience. The main programme of the 2022 festival consisted of eleven science popularisation lectures by Czech theoretical and clinical neuroscientists. Jiří Paleček from the Institute of Physiology summarised the mechanisms of pain, radiologist and neurologist Josef Vymazal presented the current results of research into the treatment of the brain tumour glioblastoma, and psychiatrist Martin Anders analysed the impact of psychological stress on mental health. The founder of the Brain Week tradition, neuroscientist Josef Syka from the Institute of Experimental Medicine, explained the complex system by which speech is transmitted through hearing to the brain centres. The programme also included discussion meetings, workshops, film screenings, etc.

After a two-year hiatus due to the covid-19 pandemic, on 2-4 June the PVA EXPO PRAHA exhibition centre in Letňany once again hosted the **Science Fair**, the largest popular science event in the Czech Republic. The event included a spectacular science show, lectures, workshops and exhibits from the Expo in Dubai. The Science Fair offered a unique opportunity to see what the Czech Academy of Sciences (and other institutions) do, all in one place. Almost all of the 50+ CAS research institutes prepared its own stand and an activity. Scientists enthusiastically showed and explained their work to science fans of all ages. The event was a huge success, with at least 430 media mentions. The most significant coverage was a report on the Czech Television Events programme and a live broadcast on Czech Television Studio 6. Before the fair, four CAS institutes promoted the event on Czech Television's Home Alone programme (Sama doma).

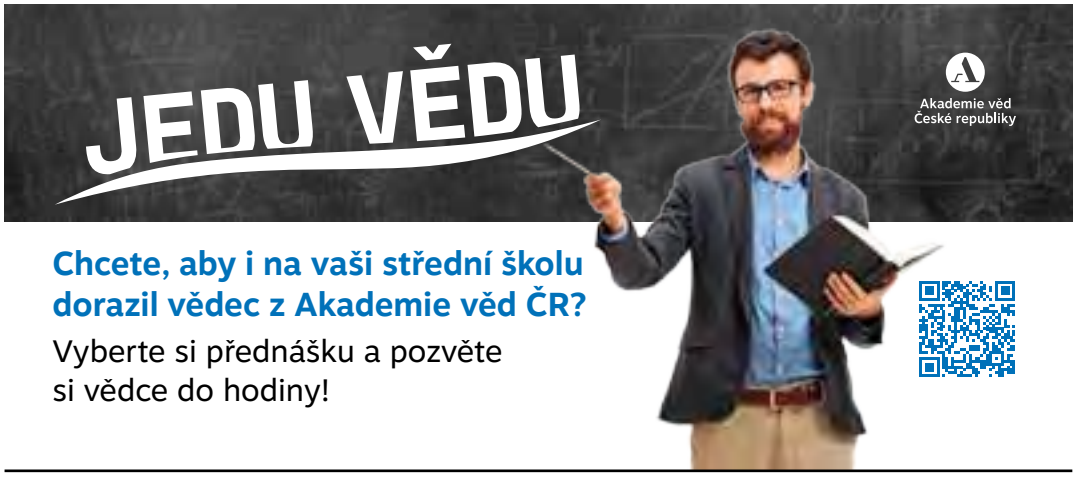
After a two-year covid-19 break, **Researchers' Night** was held once again on 30 September at the headquarters of the Czech Academy of Sciences and the CAS Library on Národní třída. A lecture programme, exhibitions, a theatre performance and other accompanying activities were prepared for the general public. The theme for 2022 was "with all the senses". About 500 visitors attended the event.


From 31 October to 6 November, the second annual **CAS Week** festival took place, building on the 20-year tradition of the largest science festival, the **CAS Week of Science and Technology**. The festival presented CAS scientists' current and most important achievements through lectures, workshops, exhibitions, film screenings with discussions, and above all presentation of CAS institutes through an open doors day. The programme in the CAS building on Národní třída was dedicated to the centenary of the Oriental Institute. Festival visitors had the opportunity to taste oriental food, attend a concert of Arabic music, a workshop on Japanese lantern making or origami, as well as lectures and debates on the Orient and Oriental studies. The opening ceremony of the festival was once again hosted by Czech Television presenter Daniel Stach. Guests invited by CAS President Eva Zažímalová included the Minister of Culture Martin Baxa, Japanese Ambassador Suzuki Hideo and Andy W. M. Tseng from the Taipei Economic and Cultural Office. Evening discussion events on current social topics such as e.g. energy, resilient society and climate change were held in the Přítomnost cinema.

In the absence of restrictive anti-epidemic measures, it was possible to hold award **ceremonies** where medals in different disciplines and grant awards were presented to promising scientists. Three internationally cutting-edge scientists were awarded the *Academic Premium*, and six outstanding prospective researchers received the *Lumina Quaeruntur Fellowship*, which they will use to set up new scientific teams at the CAS. Twenty-five young scientists were awarded the *Otto Wichterle Award* in late June. At the beginning of October, the "Research Professor" degree was bestowed upon ten scientists. CAS Awards were presented to another 14 scientists. All of these events earned a deserved spotlight in the media.

On 12-14 September 2022, the third annual Wichterle Camp was held at the Třešť' Castle CAS Conference Centre. Fourteen of the 2022 Otto Wichterle Award winners attended. The programme included presentations of the award winners' research and other workshops and meetings, the content of which was based on participants' needs. The conference also included practical training in media presentation. It was held before the awards ceremony at Villa Lanna so that the award-winning scientists could use their skills to respond to the heightened media interest in their work at that time. All of the project activities enabled the young award-winning researchers to create new ties and provided them with knowledge and skills that can be used in their research work and presentation.

The **Open Science** project afforded another year of science internships for secondary school students from across the entire country in 2022. A total of 901 secondary school students sent in 1,656 applications. Students applied most often for internships in biology, chemistry and the medical sciences. 212 students were selected to take part in 115 science internships under the guidance of 96 instructors from 34 CAS institutes. The range of internship topics covered all three Research areas. The internships culminated in the **2022 Open Science Student Science Conference**, which took place on 24 and 25 November 2022 in the new premises of the Institute of Physics in Prague. Over 150 secondary school students gathered to present the results




of their year-long research efforts. During the two-day event, nearly a hundred papers were presented in the three Research areas, namely Life and chemical sciences; Mathematics, physics and earth sciences; and the Humanities and social sciences. The secondary school students presented to the jury the topics they had been working on during their year-long internships and their research results.

The annual **Summer Science Camp** was dedicated to primary and secondary school teachers. At the camp, teachers expanded their knowledge and skills through workshops, lectures and discussions geared towards enhancing lessons. Experiments were selected with a view to keeping costs low for schools and to their inclusion in the framework educational programmes for the relevant school level. Along with gaining new knowledge, teachers had the opportunity to establish contacts with CAS staff, learn about activities offered by the CAS to teachers and students, and become familiar with current topics and trends in the field. In 2022, two courses were held: one for physics and mathematics teachers, and a second for chemistry and biology teachers.

In October, the 10th annual **School of the Czech language and literature for teachers** was organised by the CAS in cooperation with the Czech Language Institute and Institute of Czech Literature. The aim of this event is to introduce interesting themes and current trends in Czech language and literature that teachers can use in their pedagogical practice. As always, the three-day course was packed with activities, including lectures, a guided tour of the *Old Masters* exhibition in the Schwarzenberg Palace (National Gallery), a guided screening of the animated series *The Library Science Detectives* and workshops by lecturers from the Library of the CAS.

Through the CAS' new science popularisation project **I love science**, successful young scientists from all disciplines make in-person visits to schools and give online input into secondary school and grammar school lessons. The participating scientists and science popularisers, including in particular the Otto Wichterle Award winners, offer secondary school students a new perspective on the subject matter they are currently discussing at school through short, unconventional lectures. The scientists also present their own professional journey which led them to their scientific research and their current employer, the Czech Academy of Sciences. The aim of the project is to make the world of contemporary science and research accessible to young people to inspire them to consider embarking on a scientific career themselves. In addition, the lectures help secondary school teachers refresh their teaching practice. In 2022 (from September to the end of the year), nine lectures were held through the project I love science, including seven in-person and two online. So far, eight grammar and secondary schools have joined the project from the following cities and towns: Prague, České Budějovice, Pilsen, Tišnov, Mimoň, Vrchlabí, Beroun and Česká Třebová. The lectures were shared with 225 secondary school students.

Many positive responses from teachers, secondary school students and the general public were the motivation for the creation of another series of **Undistorted Science**, which was first launched in 2014. The latest (eighth) series was completed in 2022 and draws on the themes of Strategy AV21 research programmes. All of the episodes were once again subtitled in Czech and English. The episode topics included e.g. physics, economics, biology, medicine, technology and contemporary Czech history. Scientists from CAS institutes serve as expert guarantors for the episodes. In 2022 development began on the second volume of the successful book *Undistorted Science*, which had been published in 2021. Teachers continued to have access to teacher guidance papers containing supplementary questions, quizzes and riddles on selected episodes of the series. Teachers use them as additional teaching material in primary or secondary school classes. The popularity of the series is evidenced by the fact that it already has 58,000 subscribers and almost nine million views on YouTube.


The CAS has also traditionally promoted science by holding exhibitions. The exhibition Copies and *Forgeries in Portrait Miniature* continued at the **Science and Art Gallery** until the end of January. It was followed by the exposition *The Mysterious World of Plants Below Ground* (1 March - 20 May, Institute of Botany), which presented photographs, drawings, watercolours and linocuts by scientists who are exploring the hidden half of plants, as well as a six-metre-long and more than four-metre-high model of the underground part of a meadow. The exhibition also commemorated the 60th anniversary of the founding of the Institute of Botany and was associated with the publication of Jitka Klimešová's science popularisation book *Bodies of Plants*.

The exhibition *Czechoslovakia in the Orient: The Orient in Czechoslovakia 1918-1938* (23 August - 6 November 2022, Masaryk Institute and Archives) presented the scientific, political and economic relations of interwar Czechoslovakia with the vast territory stretching from the Middle East to the Far East. It featured interesting objects imported from the Orient by travellers and scientists, Czechoslovak production inspired by

oriental motifs and products intended for export to these countries.

During the CAS Week in November, the exhibition **Photogenic Science** opened in the gallery. The main idea behind the Photogenic Science project is to connect science and art. The ninth edition of the photo competition included an exhibition where visitors could see the aesthetic charms of the research world that contestants had captured, and the ever-popular wall calendar. The participants were CAS employees who submitted photos both to the main category dedicated to scientific research and to the open category, whose 2022 theme was Scientists and Adventure. For the first time the project had an Instagram account, which served as a time-lapse and promotional social channel and was a great success with the public. Photographs, images taken during the preparation of exhibitions, the work of the jury and a special category of video were intermittently posted. A total of 244 photographs and 12 videos from 90 employees from 28 CAS institutes were submitted to the 2022 competition.

věda **foto**genická

In 2022, four issues of the official magazine of the Czech Academy of Sciences **A / Science and Research** were published. The main topic of the March issue was conspiracies *(A 1/2022)*, the June issue focused on forests *(A 2/2022)*, the September issue dealt with the heart *(A 3/2022)* and the December issue reported on asteroids *(A 4/2022)*. The A / Science and Research magazine scored in the 20th annual Zlatý středník competition, which recognises the best corporate media and communication projects in the Czech Republic and Slovakia. The magazine won third place in the Public Sector and Political Communication category. In the podcast category, the *Science within Reach* project was recognised as "top rated". The show is available on all major podcast platforms, including Spotify, Google Podcasts and Apple Podcasts. 30 episodes were created in 2022.

Two issues of the popularisation magazine **AΩ / Science for Everyone** were published in 2022. The main topic of the spring issue was the Sun *(AΩ1/2022)* and the autumn issue focused on hunger *(AΩ2/2022)*. In addition, 10 issues of the internal electronic newsletter **AB / Academic Bulletin** were published. The newsletter is intended for the employees of Czech Academy of Sciences institutes.

News from the Czech Academy of Sciences and its institutes are popularised through **websites** and **social networks**. The homepage of the CAS website was modified in the spring and three new sections were added: Events at the Academy, Video and Audio, and Magazines. The CAS is also popular on social networks, with long-term growth in the number of fans. Facebook was the most followed social network at the end of 2022 (55,639 followers), followed by Instagram (19,270) and Twitter (12,303). A new LinkedIn profile (2,686 followers) and a Twitter account in English (682) were launched.

The Czech Academy of Sciences continuously popularises science through its **audiovisual works**, which range from videos for social networks, to vignettes and reports and documentaries. During 2022, the Audiovisual Technology Division of the Centre of Administration and Operations provided streaming and technical support for important events (lectures, conferences, Brain Week, the Czech Academy of Sciences Week, international events within the Czech EU Presidency, etc.). The *Science Up Close* series of popularisation videos is available on the Czech Academy of Sciences YouTube channel.

A programme called *Scout*, which primarily targets young people, is also available on the YouTube channel. In 2022, another 15 videos on current topics, such as the fire in the Bohemian Switzerland, were added. In collaboration with Czech Television, a second series of the TV show **Scout for Children** was created for Czech Television :D.

In October and December, the Audiovisual Technology Division of the Centre of Administration and Operations presented the work of CAS scientists at the screening of the documentaries *Vanishing Soil* and *Stormy Weather* from the *Silent Threats* series at the OECD in Paris. Both the screening and the subsequent discussions opened up avenues for cooperation for the future. Another documentary, *Movements*, and the documentary series Silent Threats, including the discussion events, can still be viewed on CT i-vysílání (iBroadcast). Silent Threats was also featured on TV Noe last year.

# Publications

The Czech Academy of Sciences supports the publication of selected scientific and popular science publications from all of the scientific disciplines through the Academia publishing house, which is part of the Centre of Administration and Operations, and other CAS institutes. Books by CAS authors are also published by other Czech and prominent international publishing houses.

The Czech Academy of Sciences supports the publication of high-quality publicly accessible scientific and popular science publications, by which it helps disseminate scientific research results and advance knowledge.


*M. Rychlík: A History of People. The Diversity of Mankind in 73 Chapters*

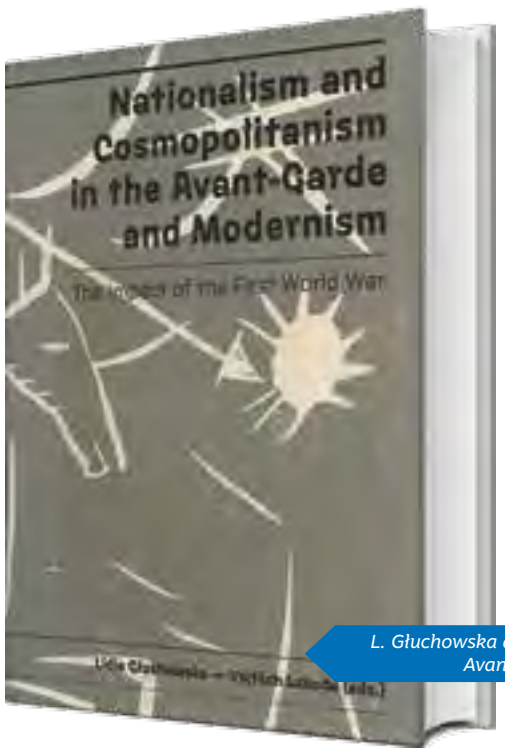
In compliance with Guideline of the Academy Council of the CAS No. 13/2018 on Support of Publication Activities, the CAS supports proposals for publication of original scientific work, critical editions of important sources and significant monuments, translations of important scientific or popular science works, and popular science works encompassing original research results as a major component.

In 2022, through the Publishing Support Programme, and based on recommendations from the Committee for the Support of CAS Publishing Activities, the Czech Academy of Sciences supported publishing at the following 12 CAS institutes: the Institute of Archaeology in Brno, Institute of Archaeology in Prague, Institute of Philosophy (Filosofia publishing house and Oikoymenh publishing house), Institute of History, Masaryk Institute and Archives, Oriental Institute, Institute of Art History (Artefactum publishing house), Institute of Czech Literature, Institute of Contemporary History, Institute of State and Law, Institute of Slavonic Studies and Centre of Administration and Operations (Academia publishing house).

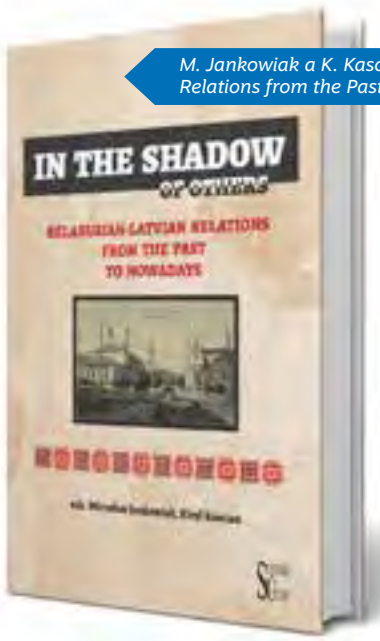
This support of CZK 18.1 million enabled the publication of 114 books, 52 of which were published by Academia Publishing House and 62 by CAS institutes - and another 120 books are in the publication preparation phase.

Some of the noteworthy works made possible through the Publishing Support Programme in 2022 include the following original scientific works: an extensive and richly illustrated book by M. Rychlík, *A History of People. The Diversity of Mankind in 73 Chapters* (Academia), a remarkable monograph by M. V. Mark et al. about the phenomenon of global change *Climate Change - Causes, Impacts and Adaptations* (Academia), a prestigious work by O. Konrád and R. Kučera with a strong international element titled *Paths out of the Apocalypse. Physical Violence in the Fall & Renewal of Central Europe, 1914-1922* (Masaryk Institute and Archives, Oxford - see p. 29), L. Głuchowska and V. Lahoda (eds.) *Nationalism and Cosmopolitanism in the Avant-Garde and Modernism. The Impact of the First World War* (Artefactum, Karolinum), and M. Jankowiak and K. Kascian (eds.) *In the Shadow of Others: Belarusian-Latvian Relations from the Past to Nowadays (Institu-*


*M. V. Marek a kol.: Climate Change - Causes, Impacts and Adaptations.*




*L. Głuchowska a V. Lahoda (eds.): Nationalism and Cosmopolitanism in the Avant-Garde and Modernism. The Impact of the First World War.*




*M. Jankowiak a K. Kascian (eds.): In the Shadow of Others: Belarusian-Latvian Relations from the Past to Nowadays*


*P. Janoušek a kol.: A History of Czech Literature in the Protectorate of Bohemia and Moravia.*


*A. Jedličková a kol.: Narrative Modes in 19th Century Czech Prose.*


*J. L. Austin: How to Do Something with Words.*


*T. Sobek: Unnatural Law.*


*te of Slavonic Studies)*, a monumental opus by P. Janoušek et al. *A History of Czech Literature in the Protectorate of Bohemia and Moravia* (Institute of Czech Literature, Academia), a monograph on the diachronic poetics of narration by A. Jedličková et al. titled *Narrative Modes in 19th Century Czech Prose* (Institute of Czech Literature, Karolinum), a new translation of J. L. Austin's Harvard Lectures: *How to Do Something with Words* (Filosofia publishing house) and T. Sobek's unique publication on the normative sources of law and morality, *Unnatural Law* (Institute of State and Law).

The Academia Publishing House is the largest CAS publishing house and a leader among Czech publishers. In its editions programme it publishes works from all scientific disciplines - original scientific monographs and works by Czech scientists, classic scientific works, translations of foreign books, popular-educational literature, non-fiction literature, encyclopaedias, dictionaries, language textbooks, manuals and university textbooks, the popular-educational magazine *Živa* and high-quality Czech and translated foreign fiction.

In 2022, the Academia Publishing House published a total of 109 books, seven new brochures in the *Science Around Us* series and five new brochures in the *Strategy AV21* series. Five monographs were published with Strategy AV21 programme support.

# Cooperation

## with Scientific Organisations

The Czech Academy of Sciences is a long-standing supporter of the activities of scientific societies in the Czech Republic. Scientific societies link renowned experts from universities, the Czech Academy of Sciences and ministerial research institutes, as well as students and other individuals interested in the given scientific disciplines. Many scientific societies are interdisciplinary in nature and some focus on specific disciplines that are not represented in academic or other scientific institutions. Most of the societies are members of international associations in their field that operate on a global or European level. In 2022, the CAS supported 137 projects in collaboration with the Council of Scientific Societies.

The Czech Academy of Sciences is a long-standing supporter of the activities of scientific societies, including the Learned Society of the Czech Republic and scientific societies associated in the Council of Scientific Societies of the Czech Republic. In 2022, the CAS supported 137 projects in collaboration with the Council of Scientific Societies.

The CAS provides systematic, long-term support to scientific societies associated in the **Council of Scientific Societies of the Czech Republic** (hereinafter the Council of Scientific Societes). Since 2019, the Council of Scientific Societes has operated as an independently registered association, affiliated with the CAS Academy Council through the Committee for Cooperation with Scientific Societies. The Council of Scientific Societes currently associates 89 scientific societies with more than 30,000 members. The Czech Speleological Society and the Society for the Protection of Laboratory Animals were accepted as new members at the plenary meeting on 27 April 2022. At the meeting, Doc. Lubomír Hrouda was re-elected chair for the 2022-2026 term and a new Council of Scientific Societes Executive Committee was established.

In 2021, scientific societies published a total of 31 internationally noted journals, six of which have an impact factor, e.g. *Fottea* (Czech Phycological Society - IF 2.43), *Preslia* (Czech Botanical Society - IF 2.23), *Journal of Geosciences* (Czech Geological Society - IF 1.78) and *Geography* (Czech Geographical Society - IF 1.50). The societies also published 37 national professional journals, 15 web-based journals (many of the previously mentioned journals have web-based variants), and 38 newsletters or bulletins.

The number of published books and conference proceedings was comparable to previous years. Proceedings of exceptionally large conferences included e.g. *T. Marvan (ed.): Logic, Methodology and Philosophy of Science and Technology. Bridging across Academic Cultures* (Czech Division for Logic, Methodology and Philosophy of Science). There were more books in the social sciences category; e.g. *H. Krutílková*: *Disciplined Agitators. Women in Political Parties in Moravia before 1914* (Matice moravská) and *M. Hlavačka, J. Kopáček*: *Lanna et Lanna*: *Family and business* (Society for Economic and Social History). A total of 85 monograph books and proceedings were published.

In this first "post-covid" year, there was a significant increase in the organisation of conferences, especially international ones, which could again be "live" or streamed. The biggest events in 2022 included the *European Polymer Congress* (Czech Chemical Society, Congress Centre, 859 participants), *56th Conference: Advances in Organic, Bioorganic and Pharmaceutical Chemistry* (Czech Chemical Society, Liblice, 200 participants), *MESIA - Middle Europe Societies for Immunology and Allergology conference* (Czech Immunological Society, 200 participants) and the *Equadiff 15* conference (Union of Czech Mathematicians and Physicists and Masaryk University, 300 participants). Annual congresses include the *XXV. Congress of the Czech Geographical Society* and the *18th Congress of the Slovak Geographical Society* (225 participants), *Ecology 2022 - 8th Conference of the Czech Ecological Society* (Czech Ecological Society, 150 participants), *Parasitological Days, Jirovec's Protozoological Days* (Czech Parasitological Society), *29th Congress of the Czechoslovak Society for Microbiology* (350 participants) and the *XXXIX. Congress of Czech and Slovak Allergologists and Clinical Immunologists and the XVIIIth Congress of Czech and Slovak Immunologists* with the motto "Allergology and Immunology - the post-Covid-19 era" (1,000 participants).

These examples show the continuing links between Czech and Slovak scientific societies. Exclusively Czech gatherings included the massive *12th Congress of Czech Historians* (Association of Historians of the Czech Republic, 588 participants). Notable conferences included the *European Cave Rescue Association Meeting* (Czech Speleological Society, 145 participants - a practical international conference for rescuers organised by the newly admitted society) and the *Conference on Nature Restoration Law 2022* (Czech Ornithological Society). In total, more than 350 scientific gatherings were held.

Scientific societies support teaching in all types of schools. In 2022, they organised over 200 activities to support learning. These include regular events such as mathematics, chemistry, geography, science or astronomy knowledge competitions, specialised field courses for secondary school and university students and teachers, often with participation by members of the public. The number of events for doctoral students at the interface between teaching and practical science has recently increased - e.g. the *31st Annual Student Conference Week of Doctoral Students* (Czech Astronomical Society). Didactic and publishing activities for secondary schools are also growing; the Union of Czech Mathematicians and Physicists, which publishes the traditional journals *Maths Teacher*, *Mathematics-Physics Perspectives*, and *Advancements in Mathematics, Physics and Astronomy* has the most publications. There has also been an increase in participation in large popularisation events for the general public, such as *Chemistry at the Silesian Ostrava Castle* (Czech Chemical Society), the *Physics Teachers' Invention Fair* (Union of Czech Mathematicians and Physicists) and *Science Fest* (Society for Biochemistry and Molecular Biology). There is a noticeable predominance of natural science disciplines, but there are also events with practical disciplines, e.g. the *Experts to Schools event* (Czech Economic Society) focused on economic and legal topics. Almost half of the scientific societies recognise both teachers and students for their publications or teaching.

Most scientific societies usually focus on lecture and popularisation activities. In 2022, nearly 500 of these activities took place. The Czech So-


ciety for Ornithology (the largest scientific society with 6,800 members) stands out for its wide range of popularisation and consulting activities, mainly its *Ornithological Academy* and *Ornithologist on the Line*, and management of the *Pan-European Common Bird Monitoring Scheme* and *database of bird distribution in the Czech Republic*, into which its members entered 689,000 data in 2022. The website with the most traffic continues to be www.astro.cz, which received 1,500,000 visits.

All activities of the scientific societies associated in the Council of Scientific Societies can be found in the database rvs.paleontologie.cz. In 2022, 2,785 records of separate events were entered into this database.

**The Learned Society of the Czech Republic** (hereinafter the "Society') connects prominent scientists from all disciplines. Its goals are to encourage freedom in the cultivation of science in all its manifestations, foster a drive for knowledge and joy from the quest for knowledge, disseminate scientific findings among the public, help improve educational quality and support development of a creative, rational and humanely responsible environment in Czech society. Prof. Pavel Jungwirth was the Chair of the Society until 17 May 2022. Prof. Libor Grubhoffer was then elected at the XXVIII. General Assembly to lead the Society for another two-year period. The Society had 107 regular fellows, 51 international fellows and 15 emeritus fellows at the end of 2022.

The Society organised a number of lectures on current scientific and educational issues, including fourteen lectures and one discussion forum (with five speakers) at plenary sessions open to the public, a panel discussion on *Global Challenges in Environment and Health* with three international speakers at a special lecture in Brno and five lectures at the XXVIII. General Assembly. The Society held eight working sessions. Prof. Urs Heftrich spoke as part of the *Palacký lecture* series. A special lecture was given by Prof. Erling Norrby, former Permanent Secretary of the Royal Swedish Academy of Sciences and a long-time member of the Nobel Committee, during a visit to the Czech Republic.

The Learned Society organised a competition for secondary school students and awarded nine students. It established a new prize for undergraduate and graduate students, which was presented to three students; in conjunction with the Experientia Foundation, it established and awarded the *Via Chimica* Chemistry Prize for undergraduate students. It also awarded one Learned Society award in the scientific researcher category and two prizes in the junior scientific researcher category. It also recognised one teacher for promoting interest in science and research in secondary schools, creating conditions for individual student work and outstanding student work in competitions. The awards are funded by the Science Support Foundation of the Learned Society of the Czech Republic, which is led by Prof. Martin Loebel. The most significant prizes that the Society awarded in 2022 were five medals of the Learned Society of the Czech Republic, *Societas Scientarium Bohemica*, *Ad Laudem et Honorem*, for merit in the development of science. All the awards were presented at a ceremony during the XXVIII. General Assembly of the Society on 16 May 2022.

The Society and the United Nations Information Centre in Prague jointly awarded the Climate Change Communication Prize, which was presented at a special Learned Society lecture; several presentations on environmental topics were made during the event. A professional excursion to the Vysočina Region and part of the South Bohemian Region was organised. Chair Libor Grubhoffer represented the Learned Society at the General Assembly of the Learned Society of Slovakia. Vice-Chair Pavel Jungwirth attended the General Assembly of the Mainz Academy of Sciences.

The Learned Society published several statements on current public affairs. It sent an open letter to the Russian Academy of Sciences, thanked Russian scientists for their stance on the invasion of Ukraine, and issued a joint statement in support of Ukraine (with the Czech Medical Academy and the Engineering Academy of the Czech Republic). The Council of the Learned Society of the Czech Republic called on the governments of European Union Member States and the European Council to grant honorary membership to Ukraine. The Society sent an open letter to the Minister of Education, Youth and Sports on the reform of funding for children and youth centres and leisure time centres and the risk posed to knowledge competitions; it also sent a statement on the intended ill-considered reforms of Czech higher, secondary and primary education. Members of the Learned Society also spoke out about the criminalisation of amateur entomologists.

The Society's website at www.learned.cz and its Facebook and Twitter accounts provide information about the activities of the Society and its members. Lectures or presentations from lectures are also published on the website. The Society collaborated with the Czech Academy of Sciences, the UN Information Centre Prague, Charles University, Faculty of Science of Masaryk University, Institute of Chemical Technology in Prague, Experientia Foundation and other organisations.

# CAS Awards

Each year the Czech Academy of Sciences recognises outstanding scientists for excellent research results that focus on societal priorities, have strengthened the international prestige of Czech science and were first published or implemented during the past five years. In 2022, the results of the scientific and popularisation work of CAS researchers were recognised with many specific prizes, medals, honours and other awards. CAS scientists received prizes not only from the CAS but also from other Czech and international organisations and institutions. The following pages provide an overview of the most important awards.

**The President of the Czech Academy of Sciences presented the following prizes in 2022:**

**The Award of the Czech Academy of Sciences for outstanding results of research, experimental development and innovations, achieved in the following research projects:**

**Team of authors, nominated by the Institute of Photonics and Electronics,** composed of: Mgr. Marek Piliarik, Ph.D., Hadrien Marc Louis Robert, Ph.D., Ing. Kristýna Holanová, Łukasz Bujak, Ph.D., Mgr. Milan Vala, Ph.D., Verena Puttrich, Ph.D., a RNDr. Zdeněk Lánský, Ph.D.,

for the scientific outcome *Photothermal spatial light modulator for ultrasensitive 3D nanoscopy*

**Ivanu Jarićovi, MSc., Ph.D.,** nominated by the Biology Centre, for the scientific outcome *Societal extinction of species*

**Dr. Giedre Šabasevičiūtė,** nominated by the Oriental Institute, for the scientific outcome *Sayyid Qutb: An Intellectual Biography*

**The Award of the Czech Academy of Sciences for young researchers for outstanding results of research, experimental development and innovations achieved in research tasks supported by the CAS until the age of 35 years** was presented to:

**Ing. Ivo Šulák, Ph.D.,** from the Institute of Physics of Materials for the following scientific outcomes:

a) *High temperature degradation mechanisms of advanced multiphase materials for critical gas turbine components*
b) *Effect of advanced coatings on fatigue resistance of nickel superalloys for critical gas turbine components: high temperature degradation mechanisms*

**RNDr. Martin Volf, Ph.D.,** from the Biology Centre, for the scientific outcome: *Localized induction mechanisms turn trees into mosaics of diverse anti-herbivore defence strategies*

**The Award of the President of the Czech Academy of Sciences for promotion or popularisation of research, experimental development and innovations** was presented to:
**Ing. Vladimír Ždímal, Dr.,**
Institute of Chemical Process Fundamentals

**Doc. PhDr. Petr Hlaváček, Ph.D.,**
Institute of Philosophy
**Mgr. Balázs Komoróczy, Ph.D.,**
Institute of Archaeology, Brno

## Honorary Medals awarded to Czech and foreign researchers in 2022

**Honorary Medal of the Czech Academy of Sciences "De scientia et humanitate optime meritis"**
**Prof. RNDr. Pavel Pudlák, DrSc.,**
Institute of Mathematics
**Prof. Ing. Miloslav Šimek, CSc.,**
Biology Centre

**The Bernard Bolzano Honorary Medal for Merit in Mathematical Sciences**
**Prof. Ing. Ladislav Lukšan, DrSc.,**
Institute of Computer Science

**The Ernst Mach Honorary Medal for Merit in Physical Sciences**
**Prof. Jiří Chýla, CSc.,**
Institute of Physics
**Prof. RNDr. Ivan Pelant, DrSc.,**
Institute of Physics

**The Jaroslav Heyrovský Honorary Medal for Merit in Chemical Sciences**
**Prof. Ing. Jiří Hanika, DrSc., dr. h. c.,**
Institute of Chemical Process Fundamentals
**Prof. RNDr. Antonín Vlček, CSc., FRSC,**
J. Heyrovsky Institute of Physical Chemistry

**The Gregor Johann Mendel Honorary Medal for Merit in Biological Sciences**
**Prof. Dr. DDr.h.c. Christian Körner,**
University of Basel, Switzerland
**Prof. RNDr. Jan Kubečka, CSc.,**
Biology Centre
**Prof. RNDr. Julius Lukeš, CSc.,**
Biology Centre
**Prof. RNDr. František Marec, CSc.,**
Biology Centre

**Doc. RNDr. Václav Pižl, CSc.,**
Biology Centre
**Prof. RNDr. Karel Prach, CSc.,**
Biology Centre
**Ing. Michal Pravenec, DrSc.,**
Institute of Physiology

**The Karel Engliš Honorary Medal for Merit in Social and Economic Sciences**
**Prof. PhDr. Ivo Čermák, CSc.,**
Institute of Psychology

**The Josef Dobrovský Honorary Medal for Merit in Philological and Philosophical Sciences**
**Prof. Alain de Libera,**
Collège de France, Paris, France
**Prof. PhDr. Olga Lomová, CSc.,**
Faculty of Arts, Charles University

**The František Palacký Honorary Medal for Merit in Historical Sciences**
**Prof. PaedDr. Mgr. Miroslav Vaněk, Ph.D.,**
Institute of Contemporary History
**Doc. PhDr. Lubomír Tyllner, CSc.,**
Institute of Ethnology

## Significant awards given to CAS staff by institutions outside the CAS

**The National Government Award Czech Head 2022** was awarded to
**Prof. RNDr. Petr Pyšek, CSc.,**
Institute of Botany

**The Award of the President of the Senate of the Parliament of the Czech Republic** was presented to
**PhDr. Vojtěch Kyncl, Ph.D.,**
Institute of History

**The Order of the Legion of Honour of the French Republic**
was received by the President of the CAS
**Prof. RNDr. Eva Zažímalová, CSc., dr. h. c.**

**The French state decoration for merit in education, science and culture, the Order of the Academic Palms with the rank of Knight** was awarded to
**RNDr. Irena G. Stará, CSc.,**
Institute of Organic Chemistry and Biochemistry

**The Award of the Minister of Education, Youth and Sports for outstanding results in research, experimental development and innovation** was awarded to
**Doc. PhDr. Michal Bauer, Ph.D.,**
Institute of National Economy

**The Minister of Health Award for medical research and development** was awarded to
**Ing. Mgr. Jaroslav Hlinka, Ph.D.,**
Institute of Computer Science
**Ing. Iva Pichová, CSc.,**
Institute of Organic Chemistry and Biochemistry

**The Golden Linden Award of the Minister of Defence of the Czech Republic for merit in the field of contemporary history and oral history** was awarded to
**Prof. PaedDr. Mgr. Miroslav Vaněk, Ph.D.,**
Institute of Contemporary History

**The František Běhounek Award for outstanding results in research, development and innovation in European collaborative projects awarded by the Minister of Education, Youth and Sports** was received by
**Doc. Dr. rer. nat. Radislav Sedláček, Ph.D.,**
Institute of Molecular Genetics

**The Josef Hlávka Medal, which is intended for prominent figures, founders and other important personalities of Czech public universities, Czech science and art in recognition of their lifetime work for the benefit of Czech science, art and education,** was awarded to
**Ing. Iva Pichová, CSc.,**
Institute of Organic Chemistry and Biochemistry.

**The Award of the President of the Czech Science Foundation** was awarded to
**Doc. Ing. Filip Šroubek, Ph.D., DSc.,**
Institute of Information Theory and Automation
**Doc. Ing. Václav Veverka, Ph.D.,**
Institute of Organic Chemistry and Biochemistry
**Mgr. Petr Plecháč, Ph.D. & Ph.D.,**
Institute of Czech Literature
**Prof. RNDr. Martin Reichard, Ph.D.,**
Institute of Vertebrate Biology

**The Award of the Technology Agency of the Czech Republic** was bestowed upon
**Ing. Alexandr Dejneka, Ph.D.,**
Institute of Physics - in the Partnership category

**The Medal of the Learned Society of the Czech Republic for meritorious contributions to the advancement of science** was awarded to
**Prof. RNDr. Jan Konvalinka, CSc.,**
Institute of Organic Chemistry and Biochemistry

**The Emil Votoček Medal for lifetime contribution awarded by the Rector of the University of Chemistry and Technology** was presented to
**Prof. Martin Hof, Dr. rer. Nat., DSc.,**
Ústav fyzikální chemie J. Heyrovského

**The Neuron Foundation Award in the field of chemistry** was awarded to
**Prof. Ing. Pavel Hobza, DrSc., dr. h. c., FRSC,**
Institute of Organic Chemistry and Biochemistry

**The Silver Commemorative Medal of Charles University** was awarded to
**Prof. PaedDr. Mgr. Miroslav Vaněk, Ph.D.,**
J. Institute of Contemporary History

**The Rector's Prize of the University of Chemistry and Technology** was awarded to
**PhDr. Bc. Věra Dvořáčková, Ph.D.,**
Masaryk Institute and Archives

**The winners of the L Oréal UNESCO competition for women in science** are:
**Mgr. Evgenija Chitrova, Ph.D.,**
Institute of Physics
**Mgr. Ing. Eva Krupičková Pluhařová, Ph.D.,**
J. Heyrovský Institute of Physical Chemistry

**The Dagmar and Václav Havel Foundation VIZE 97 Prize** was awarded to
**Doc. RNDr. Petr Hadrava, DrSc.,**
Institute of Astronomy, and
**PhDr. Alena Hadravová, CSc., DSc.,**
Institute of Contemporary History

**The South Bohemia Region Governor's Award for Corporate Social Responsibility in 2020-2021** was awarded to the **Biology Centre**.

**The silver commemorative medal of the Faculty of Science of Charles University** was awarded to:
**RNDr. Martin Bilej, DrSc.,**
Institute of Microbiology
**RNDr. PhDr. Zdeněk Hostomský, CSc.,**
Institute of Organic Chemistry and Biochemistry

**The Gregor Mendel Prize of the Genetic Society - for a significant contribution in the field of genetics and/or molecular biology in the Czech or Slovak Republic** was awarded to
**Mgr. Jiří Pospíšil, Ph.D.,**
Institute of Microbiology

**The honorary Climate Change Communication Prize for lifelong efforts to improve the quality of life of people and the environment** was awarded by the Learned Society of the Czech Republic and the UN Information Centre to
**MUDr. Radim Šrám, DrSc.,**
Institute of Experimental Medicine - in memoriam

**The Young Scientist Award of the Learned Society** was bestowed upon
**Mgr. Jiří Dynda, Ph.D.,**
Institute of Slavonic Studies

**The Sanofi Prize for Pharmacy - Scientific Work of Doctoral Students, awarded by the French Embassy in the Czech Republic and SANOFI,** was awarded to
**Ing. Eliška Grosmanová**
Institute of Macromolecular Chemistry

**The Environment and Climate Research "Make Our Planet Great Again" Prize of the French Embassy in the Czech Republic for doctoral research,** was awarded to
**Mgr. Zuzana Kluková**
Institute of Thermomechanics


Doktor biologických
-ekologických
prof. RNDr. Jiří
Masojídkovi, CSc

# Scientific “Research Professor” Degrees

awarded in 2022

The scientific degree “Research Professor” was established by Decision XXI at a session of the CAS Academy Assembly on 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, most recently in Resolution No. 614 of 24 May 2006. The awarding of the scientific degree 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 has adopted the Rules for Granting the ‘Research Professor’ Degree by the Czech Academy of Sciences.

The scientific degree of “Research Professor” is conferred upon researchers with outstanding scientific qualifications demonstrated by production of far-reaching and original scientific work that contributes to the advancement of research in a specific scientific field and characterises the awardee as a scientist of distinguished stature. Degrees are decided upon by the Science Council of the CAS.”

At its 10th session on 30 January 2003, the CAS Science Council established a Committee for the Research Professor Degree as an auxiliary and advisory body for matters related to the awarding of the “Research Professor” scientific degree. The Science Council decides on the awarding of scientific degrees solely on the basis of proposals from the Committee for the Research Professor Degree and the results of scientific degree award proceedings, which take place in one of the 33 standing commissions for the disciplines in Research areas I, II and III. The dissertation defence commissions currently have a total of 390 members, 164 of whom are from CAS institutes, 189 from universities and 37 from other institutions.

**In 2022, the CAS Science Council awarded the “Research Professor” scientific degree to the following researchers:**

**Doc. RNDr. Ing. Martin Kalbáč, Ph.D., DSc.**
Jaroslav Heyrovský Institute of Physical Chemistry

Dissertation: *Towards controlled functionalization of single-layer graphene*
Commission: Physical Chemistry
Scientific degree awarded: Research professor in Chemical Sciences

**PhDr. Dagmar Dreslerová, Ph.D., DSc.**
Institute of Archaeology, Prague

Dissertation: *Landscape and People in the Agricultural Prehistory*
Commission: Archaeology
Scientific degree awarded: „Research professor in Historical Sciences“

**RNDr. Stanislav Kamba, CSc., DSc.**
Institute of Physics

Dissertation: *Soft-mode spectroscopy of ferroelectrics and multiferroics*
Commission: Physics of Condensed Matter Systems
Scientific degree awarded: “Research professor in Physico-Mathematical Sciences”

**Doc. JUDr. Martin Štefko, Ph.D., DSc.**
Institute of State and Law

Dissertation: *Medical Opinions in Labour Law*
Commission: Law Sciences
Scientific degree awarded: „Research professor in Social and Human Sciences“

**Dmitry Gavinsky, MSc., Ph.D., DSc.**
Institute of Mathematics

Dissertation: *Quantum-mechanical communication protocols: their limitations and super-classical capabilities*
Commission: Mathematical Structures
Scientific degree awarded: „Research professor in Physico-Mathematical Sciences“

**PhDr. Miloslav Chytráček, Ph.D., DSc.**
Institute of Archaeology, Prague

Dissertation: *Fürstengrabhügel der Hallstattzeit bei Rovná in Südböhmen. Manifestationen der sozialen Eliten der Eisenzeit im Böhmischen Becken*
Commission: Archaeology
Scientific degree awarded: „Research professor in Historical Sciences“

Photos from the “Research Professor” degree ceremony in October 2022 at the Library of the CAS

**Doc. PhDr. Bohumil Vykypěl, Ph.D., DSc.**
Czech Language Institute

Dissertation: *Views on the History of Czech and Czech History*
Commission: Bohemistics
Scientific degree awarded: „Research professor in Philological Sciences

**Dr. Hervé Lesot, Ph.D., DSc.**
Institute of Animal Physiology and Genetics

Dissertation: *Mouse tooth engineering: a step-by--step approach*
Commission: Molecular Biology and Genetics
Scientific degree awarded: „Research professor in Molecular Biological and Medical Sciences“

**Mgr. Emil Jeřábek, Ph.D., DSc.**
Institute of Mathematics

Dissertation: *Bounded arithmetic and complexity*
Commission: Mathematical Structures
Scientific degree awarded: „Research professor in Physico-Mathematical Sciences“

**MUDr. Pavel Vodička, CSc., DSc.**
Institute of Experimental Medicine

Dissertation: *Genetic, molecular and environmental factors involved in the risk of colorectal malignancies, their prognosis and therapy reponse*
Commission: Biomedicine
Scientific degree awarded: „Research professor in Molecular Biological and Medical Sciences“

# Přílohy

**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 until 31 December 2022**

| | | |
|---|---|---|
| a) | Number of submitted requests for information | 9 |
| | Number of decisions issued rejecting an application | 1 |
| b) | Number of appeals lodged against a decision rejecting an application | 0 |
| c) | Number of court judgments on review of legality of a decision rejecting an application | 0 |
| d) | Number of exclusive licences granted | 0 |
| e) | Number of complaints filed under Section 16a of the Act | 0 |

**List of abbreviations used**

| | |
|---|---|
| CAS | Czech Academy of Sciences |
| CTU | Czech Technical University in Prague |
| ERC | European Research Council |
| EU | European Union |
| GA CR | Czech Science Foundation |
| TA CR | Technology Agency of the Czech republic |
| R&D | Research and Development |
| R&D&I | Research, Development and Innovation |
| R&D&I Coucil | Research, Development and Innovation Council |
| CAS TTO | Technology Transfer Office of the CAS |
| KTT | Knowledge and technology transfer |

The names of the institutes of the CAS appear in abbreviated form and do not contain the letters “CAS, v. v. i.”.

**2022 Annual Report on the Activities of the Czech Academy of Sciences**

**Published by the CAS Head Office in collaboration with the Centre of Administration and Operations in 2023**
Národní 1009/3, 110 00 Prague 1

**Editors:** Markéta Pravdová, Jana Cmarková, Viktor Černoch
**Editorial collaboration and proofreading:** Irena Vítková
**Graphic design:** Josef Landergott

**Printing: TISKÁRNA PROTISK, s.r.o.**

**Photographs and illustrations:** Jana Plavec / Czech Academy of Sciences, CAS institutes’ archives, Shutterstock, Photogenic Science

Akademie věd
České republiky

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 take part in education, primarily by educating young researchers in doctoral study programmes, as well as through the pedagogical activities of CAS researchers at universities.

The CAS also develops collaboration with applied research and industry. The Academy-'s numerous joint international projects and exchanges of researchers with partner institutions abroad reinforce the integration of Czech science into the international context.

Akademie věd
České republiky

Czech Academy of Sciences
Národní 3, 110 00 Prague 1
IČO: 60165171

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