2020
Annual Report

of the Czech Academy of Sciences

Top research in the public interest

Czech Academy of Sciences

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Dear Readers,

Welcome to the Annual Report of the Czech Academy of Sciences, in which you will find specific information about our main activities in 2020. It was not the easiest of years for the Czech Academy of Sciences, above all because we – like all of Czech society – grappled with the covid-19 pandemic. We did our utmost to help combat the disease and I am very pleased that the Czech Academy of Sciences was able to play a meaningful role in these efforts. Immediately after the pandemic began, we offered equipment and staff scientists to help with covid-19 patient testing. We also developed new testing methods, tested materials for production of protective gear to prevent the spread of the virus and continuously analysed the socioeconomic, legal and psychological impacts of the pandemic. We coordinated these efforts with our university partners. You can find an overview of these activities, which continue to grow, on our website and social media under the hashtag#Veda_proti_covidu.

Despite all of the problems and new tasks we faced in 2020, the Czech Academy of Sciences (CAS) maintained its position as the most productive Czech scientific research institution. According to the prestigious Nature Index, a ranking based on publication in 82 leading science journals that does not account for the size of the scientific community in a given country, the Czech Academy of Sciences is clearly the most prolific publisher among scientific institutions in the country, followed by Charles University, Masaryk University, the University of Chemistry and Technology and Palacký University in Olomouc. The Czech Academy of Sciences is 14th worldwide in the Nature Index's ranking of state-financed institutions – ahead of much better funded institutions such as the National Institute for Health and Medical Research in France or the Los Alamos National Laboratory in the USA. The quality of research at the CAS is also evidenced by numerous awards presented to Czech Academy of Sciences researchers. One particularly noteworthy 2020 award winner is Professor Václav Hořejší of the Institute of Molecular Genetics of the CAS, who received the 2020 Czech Head National Prize of the Government of the Czech Republic. These examples, along with many other data which are detailed in specific chapters of this Annual Report, show that we are striving to use and add value to public funds in optimal ways.

Despite all of the difficulties stemming from the covid-19 pandemic we were able to engage the entire Czech Academy of Sciences in combatting the disease, across our different research areas and in close collaboration with universities and Czech companies and industry. I consider this a true success. We have seen that we are capable of joining forces and working together rationally during a crisis. In this context, the Czech Academy of Sciences drafted a proposal to establish a multi-disciplinary National Virology Centre at the CAS that would emphasise applied use of research, which would improve the Czech Republic's preparedness for possible future epidemics, strengthen the resilience of our economy and create a platform for building consensus among scientists' opinions to provide unified recommendations for government.

I am certain that efficient collaboration between the academic and business sectors and the state administration is a key prerequisite for the development of a society based on quality research and knowledge as well as an effective innovation process. This goal, however, is hindered by the fact that science and research in the Czech Republic has long been institutionally underfunded. I consider it important to appeal to the state administration in this regard; currently, for example, in relation to use of European funding through the National Renewal Plan. I believe that it is our duty to work together to find ways of using this funding to create the best investment in the future and to ultimately benefit both Czech science and Czech society.

prof. RNDr. Eva Zažímalová, CSc.

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Mission and structure

of the Czech Academy of Sciences

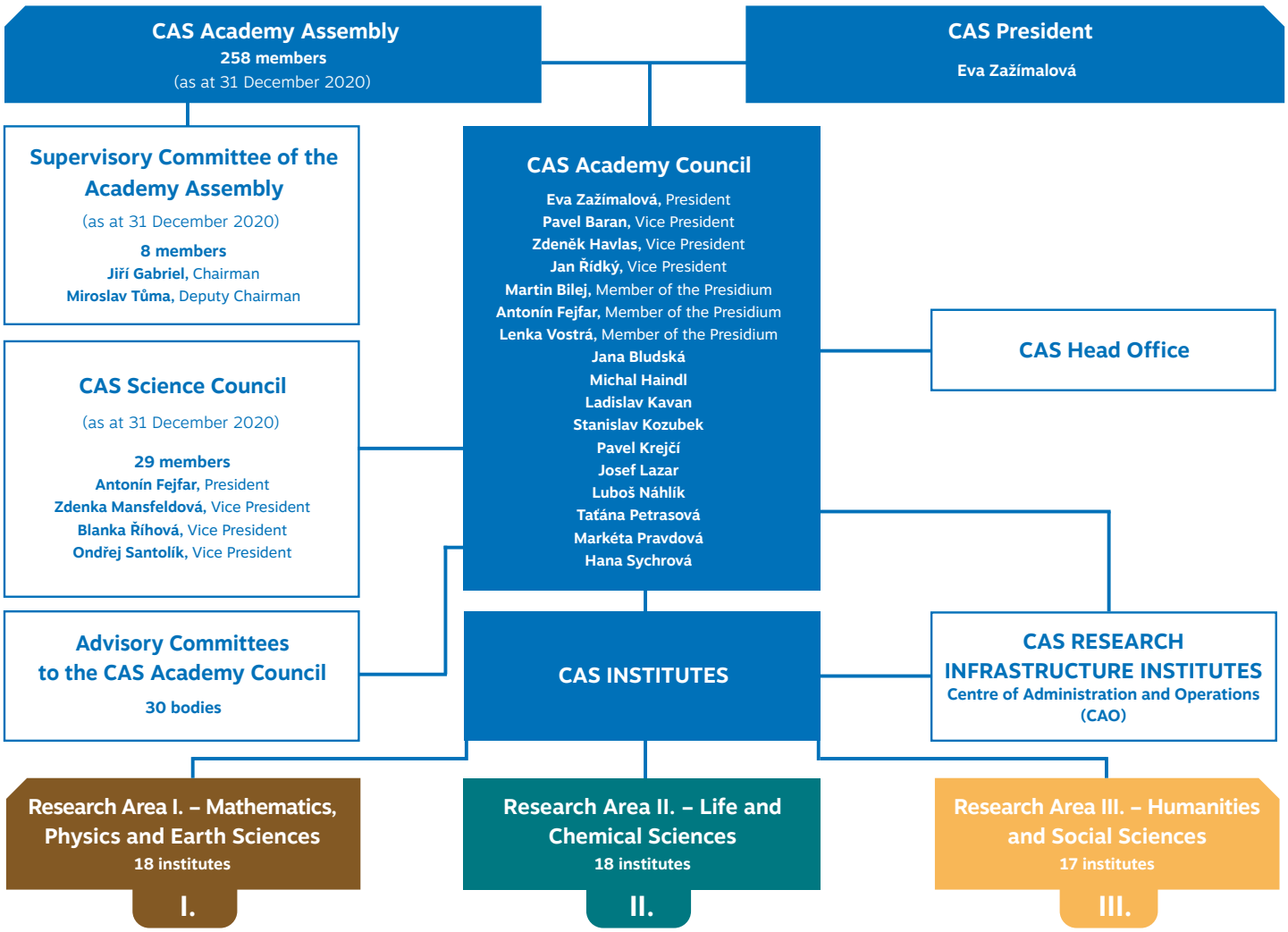
The Czech Academy of Sciences (CAS) was established by Act No. 283/1992 Coll. The CAS conducts research through its institutes which are established as public research institutions. More than 11,000 employees work at the Academy, over 7,000 of whom are university-educated.

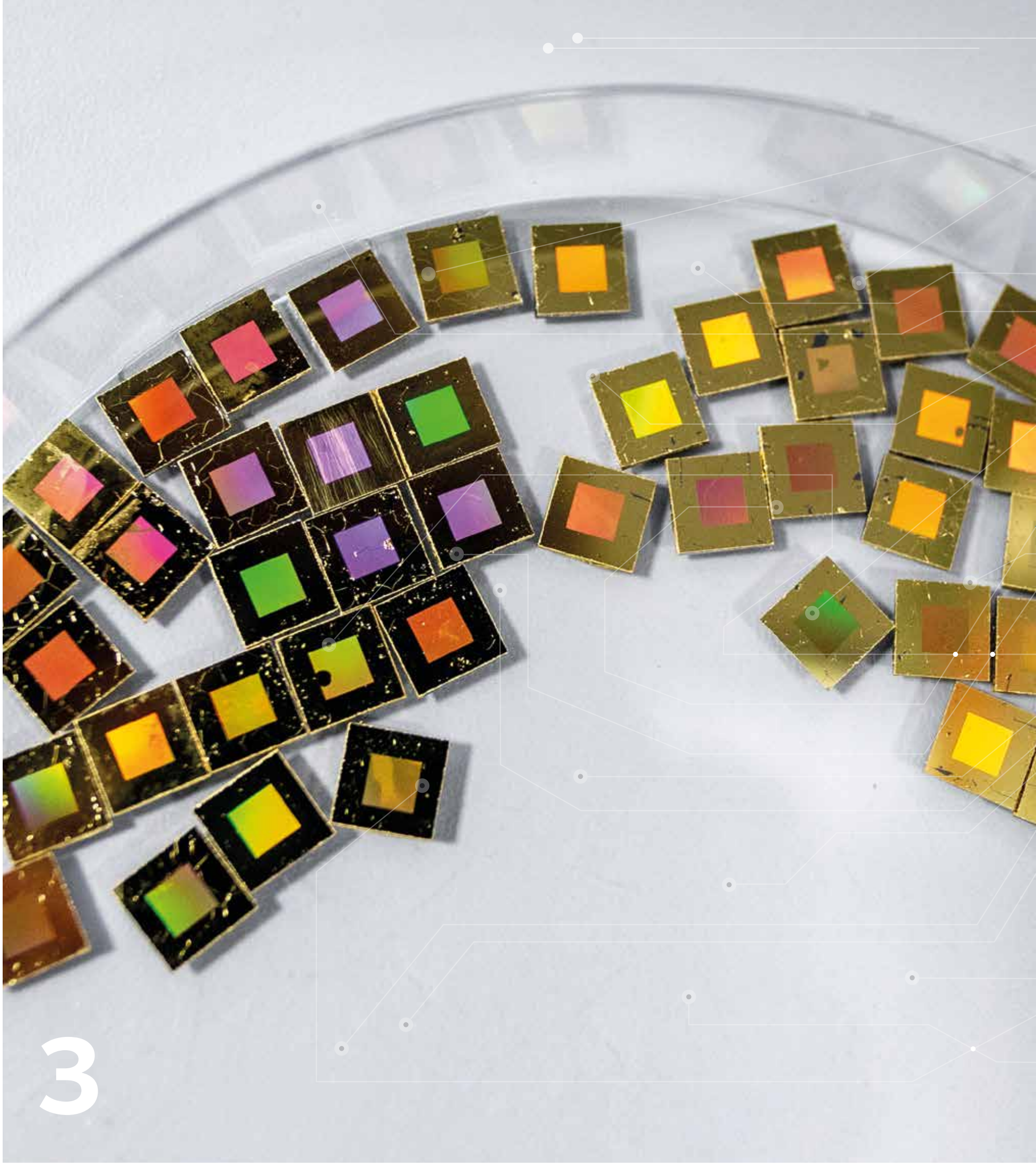
The primary mission of the CAS and its institutes is to conduct research in a broad spectrum of natural, technical and social sciences and the humanities. This research, whether highly specialised or interdisciplinary in nature, aims to advance the development of knowledge at an international level, 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 cooperation 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 structure of the CAS is illustrated on the following page.


CAS Academy Assembly
258 members
(as at 31 December 2020)
CAS President
Eva Zažímalová
Supervisory Committee of the Academy Assembly
(as at 31 December 2020)
8 members
Jiří Gabriel, Chairman
Miroslav Tůma, Deputy Chairman
CAS Academy Council
Eva Zažímalová, President
Pavel Baran, Vice President
Zdeněk Havlas, Vice President
Jan Řídký, Vice President
Martin Bilej, Member of the Presidium
Antonín Fejfar, Member of the Presidium
Lenka Vostrá, Member of the Presidium
Jana Bludská
Michal Haindl
Ladislav Kavan
Stanislav Kozubek
Pavel Krejčí
Josef Lazar
Luboš Náhlík
Taťána Petrasová
Markéta Pravdová
Hana Sychrová
CAS Head Office
CAS Science Council
(as at 31 December 2020)
29 members
Antonín Fejfar, President
Zdenka Mansfeldová, Vice President
Blanka Říhová, Vice President
Ondřej Santolík, Vice President
Advisory Committees to the CAS Academy Council
30 bodies
CAS INSTITUTES
CAS RESEARCH INFRASTRUCTURE INSTITUTES
Centre of Administration and Operations (CAO)
Research Area I. – Mathematics, Physics and Earth Sciences
18 institutes
I.
Research Area II. – Life and Chemical Sciences
18 institutes
II.
Research Area III. – Humanities and Social Sciences
17 institutes
III.
Section 1
of Mathematics, Physics and Computer Science
Astronomical Institute (ASÚ)
Institute of Physics (FZÚ)
Institute of Mathematics (MÚ)
Institute of Computer Science (ÚI)
Nuclear Physics Institute (ÚJF)
Institute of Information Theory and Automation (ÚITA)
Section 2
of Applied Physics
Institute of Photonics and Electronics (ÚFE)
Institute of Physics of Materials (ÚFM)
Institute of Plasma Physics (ÚFP)
Institute of Hydrodynamics (ÚH)
Institute of Scientific Instruments (ÚPT)
Institute of Theoretical and Applied Mechanics (ÚTAM)
Institute of Thermomechanics (ÚT)
Section 3
of Earth Sciences
Institute of Geophysics (GFÚ)
Institute of Geology (GLÚ)
Institute of Atmospheric Physics (ÚFA)
Institute of Geonics (ÚGN)
Institute of Rock Structure and Mechanics (ÚSMH)
Section 4
of Chemical Sciences
Institute of Analytical Chemistry (ÚIACH)
Institute of Inorganic Chemistry (ÚACH)
J. Heyrovský Institute of Physical Chemistry (ÚFCH JH)
Institute of Chemical Process Fundamentals (ÚCHP)
Institute of Macromolecular Chemistry (ÚMCH)
Institute of Organic Chemistry and Biochemistry (ÚOCHB)
Section 5
of Biological and Medical Sciences
Institute of Biophysics (BFÚ)
Institute of Biotechnology (BTÚ)
Institute of Physiology (FGÚ)
Institute of Microbiology (MBÚ)
Institute of Experimental Botany (ÚEB)
Institute of Experimental Medicine (ÚEM)
Institute of Molecular Genetics (ÚMG)
Institute of Animal Physiology and Genetics (ÚŽFG)
Section 6
of Bio-Ecological Sciences
Biology Centre (BC)
Institute of Botany (BÚ)
Institute of Vertebrate Biology (ÚBO)
Global Change Research Institute (ÚVGZ)
Section 7
of Social and Economic Sciences
Main Library (KNAV)
Economics Institute (NHÚ)
Institute of Psychology (PSÚ)
Institute of Sociology (SOÚ)
Institute of State and Law (ÚSP)
Section 8
of Historical Sciences
Institute of Archaeology, Brno (ARÚB)
Institute of Archaeology, Prague (ARÚ)
Institute of History (HÚ)
Masaryk Institute and Archives (MÚA)
Institute of Art History (ÚDU)
Institute of Contemporary History (ÚSD)
Section 9
of Humanities and Philology
Institute of Ethnology (EÚ)
Institute of Philosophy (FLÚ)
Oriental Institute (OÚ)
Institute of Slavonic Studies (SLÚ)
Institute of Czech Literature (ÚČL)
Institute of the Czech Language (ÚJČ)



Czech Academy of Sciences

in the system of research, development and innovation

The Czech Academy of Sciences (CAS) is part of a Czech tradition of scientific institutions that dates back almost 300 years and 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. This tradition is anchored in collaboration between the CAS and its institutes and the entire spectrum of educational and cultural institutions in the Czech Republic. In this regard, collaboration between CAS Institutes and universities, which are partners in many basic and applied research centres, has proven to be particularly beneficial. In recent years, in response to growing societal demand for practical application of research findings, the CAS has begun working closely with many businesses and state administration offices. In this realm the CAS maximises the potential of the *Strategy AV21* platform, striving to engage the application sphere in *Strategy AV21* research programmes in significant ways and to connect these programmes more closely with existing national strategies, particularly the *Innovation Strategy of the Czech Republic 2019–2030, National RIS3 Strategy, National Research, Development and Innovation Policy of the Czech Republic 2021+* and the *National Economic Strategy of the Czech Republic*.

Although the CAS grappled with the covid-19 pandemic in 2020 like all of Czech society, it continued to emphasise high quality research. It worked to strengthen its partnerships with universities. The CAS also supported educational activities by instructing young researchers in doctoral programmes and through the pedagogical activities of CAS researchers at universities. The CAS continued to collaborate with the business sector, seeking new contacts, supporting transfer of research to application areas and developing an organisational and legal environment enabling research transfer. The CAS also continued its successful efforts with both chambers of the Czech Parliament and the Czech government, which have led to significant progress in cooperation with these bodies. The aim is to provide Parliament, the government and other state and regional administrative offices qualified expert information to improve the quality of decision-making processes (e.g. through expert Avex opinions or joint memoranda with specific ministries).

The CAS' research efficacy is also demonstrated by the fact that the CAS maintained its position as the most productive Czech scientific research institution in the prestigious Nature Index ranking. The CAS continues to act as a highly effective component of the national research, development and innovation (R&D&I) system with a broad base of research teams capable of conducting excellent research on the European and global levels that benefits Czech society in many valuable ways. The CAS' most important results and activities are described in the subsequent chapters of this Report and documented in the Report annexes. The work of CAS Institutes that were involved in combatting the covid-19 pandemic deserves special attention and is described in a separate chapter of the Annual Report.

CAS representatives were actively engaged in the preparation of a number of conceptual R&D&I documents which are of fundamental importance to the further advancement of Czech research and development, namely:

- Preparation of the National Renewal Plan in the context of the National Economic Strategy of the Czech Republic
- Implementation of the Innovation Strategy of the Czech Republic 2019–2030: "Czech Republic: The Country for the Future"
- Update of the National RIS3 Strategy
- Development of the National Research, Development and Innovation Policy of the Czech Republic 2021+ (R&D&I 2021+)
- Implementation of Methodology M17+
- Major amendment to the Act on Support of Research and Development from Public Funds
- Development of the Czech state budget for 2021–2023
- Implementation of memoranda regarding support of research, development and innovation in the Czech Republic

Preparation of the National Renewal Plan in the context of the Economic Strategy of the Czech Republic

The CAS plays an active role in the preparation of the *National Renewal Plan*, which is part of *the National Economic Strategy of the Czech Republic* and which contains a proposal for distribution of CZK 182 billion in funding allocated to the Czech Republic from the *EU Recovery and Resilience Facility and Technical Support Instrument*. The plan is due to be submitted to the Czech government for approval in late February 2021 and sent to the European Commission by 30 April 2021. After it is discussed by the European Commission it will be submitted to the Council of the EU for approval. The *EU Recovery and Resilience Facility and Technical Support Instrument* is one of the results arising from the 2021–2027 EU multi-year funding agreement made at the EU Council session on 17–21 July 2020. The aims of the instrument are to help EU member states recover from the impacts of the pandemic and to support investments into the environmental and digital transformation of the European economy. The document also addresses health care, education and the labour market, support of entrepreneurship and research, development and innovation. The CAS is advocating for the establishment of a *National Virology Centre* under the National Renewal Plan. At its session on 7 December 2020, the Academy Assembly expressed unilateral support to the CAS management in its efforts to establish a focused, localised virology centre in collaboration with relevant partners in other institutions.

Implementation of the Innovation Strategy of the Czech Republic 2019–2030: "Czech Republic: The Country for the Future"

The innovation strategy created opportunities to anchor science and research as key components of economic transformation and public policy in the Czech Republic. As in the previous year, CAS representatives took part in implementation of the strategy by participating in regular meetings of Innovation Strategy pillar guarantors. Particular attention was paid to implementation of *Innovation Strategy Action Plans*. The goal of reducing the administrative burden born by science and research is an important part of the document; the corresponding working group is led by Pavel Baran, who is both the Research, Development and Innovation Council (R&D&I Council) Deputy Chairman and CAS Vice President. The Innovation Strategy is an ambitious document that follows on the *National RIS3 strategy* and focuses on presenting the Czech Republic as a country that aims to become a leading innovator during the next 10 years. The Innovation Strategy is also an essential background document for the forthcoming *National Economic Strategy of the Czech Republic*.

Update of the National RIS3 Strategy

In 2020, preparation of the *National Research and Innovation Strategy for Intelligent Specialisation of the Czech Republic 2021-2027 (National RIS3 Strategy)* continued, as the document is an essential prerequisite for EU cohesion policy R&D&I interventions. This strategy reflects, inter alia, the conclusions of the previous programming period

of 2014–2020, current analyses developed for the needs of R&D&I support in the Czech Republic and new European Union-level strategic documents developed after 2018. CAS representatives took part in preparing and commenting on the document through the *RIS3 Steering Committee* and other working groups, as well as through *National Innovation Platforms*. After several commenting rounds, the *National RIS3 Strategy* was submitted to the R&D&I Council for discussion and subsequently to the Czech government, which will send it on to the European Commission for approval.

Development of the 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 national strategic R&D&I document. It is a strategic framework for development of oriented and applied basic research, experimental development and innovation. CAS representatives actively participated in the preparation of this important document, which also constitutes a prerequisite for drawing on funding from the *European Structural Investment Funds*. Special attention was paid to changes resulting from major social challenges as well as new technological trends (particularly measure no. 27). Current issues include e.g. climate change, environmental sustainability, energy, health care, quality of life, food security, the aging population, digitalisation and robotisation. The CAS is addressing many of these issues through *Strategy AV21*.

Implementation of Methodology 2017+

The third round of the national R&D&I system evaluation was completed in November 2020. It included evaluation of selected high-quality research results through peer review by remote evaluators (Module 1) and bibliometric analysis (Module 2) for specific fields and research organisations. The results are accessible on the R&D&I website. In this context it is useful to remember that *Methodology 2017+* includes evaluation for the purposes of management and funding of the entire R&D&I system, on the specific provider level and for the management needs of research organisations. Although *Methodology 2017+* is primarily focused on the national level, it also defines methodological collaboration among providers, including the CAS, where internal evaluation will serve the specific management needs of its institutes. The CAS welcomes Methodology 2017+. The results from Modules 1 and 2 will be incorporated into the materials utilised for internal evaluation of CAS Institutes.

Major amendment to the Act on Support of Research and Development from Public Funds

Another task critical to the future of the CAS and the R&D&I system is the elaboration of a major amendment to Act No. 130/2002 Coll., on Support of Research and Development from Public Funds. CAS representatives played an active role in the preparation of the amendment, which was completed in spring 2020; after it was discussed by the R&D&I Council it was submitted for an inter-ministerial commenting process, during which the CAS voiced a number of crucial comments. After comments had been addressed, the amendment was presented to the Chamber of Deputies of the Parliament of the Czech Republic on 28 December 2020, where it is recorded as Chamber Bill no. 1118. The amendment will introduce, inter alia, a fundamental change by introducing a new type of support. Aside from institutional and targeted funding, a significant part of the resources will be provided as system funding, which will incorporate a large part of the funding that was hitherto provided as targeted or institutional funding. The amendment will also introduce instruments to reduce the administrative load across the entire R&D&I system and, specifically for the CAS, in relation to grant procedures. Last but not least, the amendment will anchor the transferability of grant projects. Overall, the amendment signifies yet another step in the right direction and may be welcomed as such.

Development of the Czech state budget for 2021–2023

At its extraordinary session on 24 July 2020, the R&D&I Council approved draft R&D&I funding from the state budget of the Czech Republic for 2021 with an outlook to 2022 and 2023. A total of CZK 6,769 billion was proposed for the CAS for 2021 and the same amount, CZK 6,769 billion, for 2022 and for 2023. These figures include CZK 210 million for financing of ELI Beamlines, CZK 10 million for ERC.CZ project support and CZK 349 million for the National Sustainability Programme I. After discussions with providers, the R&D&I Council modified its mid-term outlook at its 359th session on 21 August 2020 and proposed CZK 6,769 billion for the CAS for 2021, CZK 6,769 billion for 2022 and CZK 6,971 billion for 2023.

Subsequently the Ministry of Finance of the Czech Republic submitted a preliminary draft schedule of income and expenditures for the sections of the state budget of the Czech Republic for 2021–2023. In this draft, CZK 6,586 billion was listed for the CAS section of the state budget for 2021 and CZK 210,000 for expenditures covered by EU budget allocations and in the mid-term outlook CZK 6,586 billion was listed for 2022 and for 2023. The CAS took note of the submitted state budget funding proposal for 2021–2023, but objected in regard to the persisting underfinancing of the CAS. In a letter dated 1 September 2020, ref. no. KAV-3597/P/2020, the CAS requested an increase in funding for the CAS state budget section to CZK 6,832 billion for 2021, CZK 7,092 billion for 2022 and CZK 7,361 billion for 2023, in relation 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. 1054 on 19 October 2020, which listed state budget funding of CZK 6,769 billion for the CAS for 2021 and CZK 210,000 from EU budget funding, and CZK 6,769 billion in the mid-term outlook for 2022–2023. The current draft 2021 CAS budget is thus based on this government draft law on the state budget of the Czech Republic. The law on the state budget of the Czech Republic was approved by the Chamber of Deputies of the Parliament of the Czech Republic on 18 December 2020, with CZK 6.789 billion allocated for the CAS.

Implementation of memorandum regarding support of research, development and innovation in the Czech Republic

The Memorandum regarding support of research, development and innovation in the Czech Republic was signed by the Prime Minister and Chairman of the R&D&I Council Andrej Babiš, Minister of Education, Youth and Sports Robert Plaga, President of the CAS Eva Zažímalová and Chairman of the Czech Rectors Conference Petr Sklenička at the end of 2019. In the Memorandum, the signatories declare that in cooperation with the R&D&I Council and in relation to the possibilities afforded by the state budget, they will advocate for systematic increasing of state budget funding for institutional support for the long-term conceptual development of research organisations equalling at least 4% per year. The long-term goal is to increase direct institutional support to the Czech Academy of Sciences and universities up to 70% of their total budgets. It is therefore a document of vital significance for the financial stabilisation of key actors in Czech science and research – namely, the CAS and universities – which is employed annually during budget negotiations with the Czech government.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Organisational measures

Implementation of CAS events planned for 2020 was significantly affected by the long-term adverse epidemiological situation in the Czech Republic caused by the covid-19 disease.

Only one regular session of the CAS' highest body – the Academy Assembly – took place in 2020. On 18 March 2020, the CAS Academy Council had to cancel the LVI. Session of the Academy Assembly originally convened for 9 April 2020 due to the state of emergency and extraordinary measures that had been announced in the Czech Republic which prohibited larger events, among other things.

After a thorough assessment of the materials submitted by the Academy Council for the agenda of the LVI. session of the Academy Assembly, it was deemed that approval of two of the materials could not be postponed until the next session of the Academy Assembly; namely, the 2019 Annual Report of the Czech Academy of Sciences and the 2019 CAS Financial Report along with its final 2019 financial statement. The Academy Assembly discussed and approved both items through per rollam voting, which took place on 11-15 May 2020 through an electronic form.

On-line LVI. Session of the Academy Assembly

The second Academy Assembly per rollam voting took place on 9-12 November 2020. Through this voting, the Academy Assembly approved modifications to the Procedural and voting rules of the Academy Assembly, which enabled a session of the Academy Assembly to be held remotely online with voting by secret ballot for CAS bodies.

The LVI. session of the Academy Assembly took place on 7 December 2020. As a result of the renewed state of emergency and extraordinary measures in the Czech Republic due to the covid-19 disease, the session took place remotely for the first time in CAS history. 219 members of the Academy Assembly participated through a ZOOM video conference. It was the fourth session in the 8th term of office of the 2018-2022 Academy Assembly. The Academy Assembly members approved, inter alia, the CAS Financial Report and draft budget for 2021. Voting by secret ballot for the CAS President for 2021-2025 took place at the session – through an on-line voting application for the first time in CAS history. The Academy Assembly agreed by secret ballot to propose the appointment of E. Zažímalová to the office of CAS President for a second term of 2021-2025 effective 25 March 2021, and charged the Academy Council with taking the necessary measures for her appointment in compliance with the Act on the CAS and CAS Statutes.

At the LVI. session the Academy Assembly also expressed support for the CAS management's efforts to establish a focused, localised virology centre in collaboration with relevant partners from other institutions using National Renewal Plan institutional funding and charged the CAS President with discussing the matter with the Czech government and its Prime Minister and expressed full support for these discussions. Through brief videos, the Academy Assembly commemorated the exceptional character of the recently deceased honourable CAS President Prof. R. Zahradník as well as CAS Institutes' active engagement in mitigation of pandemic impacts on Czech society in 2020.

Aside from Academy Assembly sessions, other events took place in the CAS' work in 2020: changes were made to the composition of the Academy Council's Advisory Bodies at the member and administrative levels, including the CAS Council for Higher Education and Researcher's Training Cooperation, CAS Academic Media and Public Relations Council, Collegium of PR specialists, Editorial Council and CAS Housing Committee, and changes were made to the statutes of the CAS Information Technology Committee and of the CAS Housing Committee.

Due to expiring mandates or termination of employment, the Academy Council appointed new chairs and members to the supervisory boards of ten CAS Institutes. An Academy Council regulation pertaining to CAS Institute supervisory boards was issued. Based on evaluation of institutes' annual reports, the Academy Council discussed the 2020 Report on CAS Institute Supervisory Boards. Informational workshops about the work of supervisory boards were held for board presidents and secretaries.

The President of the CAS appointed six new CAS Institute directors in 2020 based on selection processes and recommendations from the boards of the relevant CAS Institutes.

> Implementation of CAS events planned for 2020 was significantly affected by the long-term adverse epidemiological situation in the Czech Republic caused by the covid-19 disease.

The CAS Academy Council consistently emphasises the importance of collaboration in R&D between various institutions on the national and international levels. In 2020, this concept was successfully implemented through initiation of collaborative efforts with significant partners both generally and in relation to specific projects.

In terms of cooperation with the state sector, the CAS concluded a memorandum on cooperation with the Ministry of Culture of the Czech Republic on 18 August 2020, which aims to utilise the potential of information sharing, discussions and joint research to increase the level of knowledge and protection in relation to culture, cultural heritage, monument care and archaeological monument care and other issues in the competence of the Ministry of Culture. The outcomes of this cooperation may serve the state administration as a basis for responsible decision-making within its work. On 28 February 2020, Addendum no. 2 to the Declaration of cooperation between Czech Radio and the CAS was signed, thus extending cooperation with this institution until March 2021.

In regard to regional cooperation, the CAS entered into an agreement on cooperation with the Liberec Region on 11 February 2020 and with the Moravian-Silesian Region on 11 June 2020.

The CAS concluded more than 15 international agreements on cooperation in 2020 and extended the duration of several previous agreements. New international collaborative links were forged with Taiwan in particular. New agreements on cooperation e.g. with the Slovak Academy of Sciences and the Hungarian Academy of Sciences were concluded.

2020 saw the issuance of CAS Academy Council Directive No. 9/2020, which amended CAS Academy Council Directive No. 10/2019, on the Programme for International Cooperation of Early Career Researchers, which sets forth the rules for stays of international cooperation programme candidates at foreign research institutes. The CAS Academy Council also issued Directive No. 10/2020 on support for ERC project applicants, which sets forth the rules for support of CAS Institute researchers who have submitted project proposals to the European Research Council (ERC) and aims to raise the quality and quantity of project proposals submitted to the ERC as well as the CAS' success rate in ERC grant applications.

The previously concluded Memorandum on support and cooperation with the Chamber of Deputies of the Czech Parliament led to the publication of another six expert CAS opinions on current socially relevant research issues ("AVexes"): the Antibiotics Crisis, Planet in a Greenhouse, Will Our Soil Remain Alive, Climate Change – a Contemporary Phenomenon, Damage to Human Health in the Ústi nad Labem Region and a special AVex opinion on a highly current topic, Viruses and the Fight against Them.

In terms of cooperation with universities, in 2020 the CAS placed particular emphasis on expanding cooperative ties with universities in neighbouring countries and continued in discussions on potential cooperation with Leipzig University. The focal point of cooperation with Czech universities moved from negotiations on agreement between the CAS and university rectors to discussions between faculties and specific CAS Institutes, which are jointly preparing documents for accreditation of study programmes and which work together to educate doctoral students.

Given that the sustainability phase of the BIOCEV project ended in 2020, the Academy Council continued its rigorous exploration of options for a new organisational and legal format for the project. The feasibility of possible development scenarios was assessed in collaboration with relevant CAS Institute directors.

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 2020, the CAS held 30 calls for grant applications. The CAS Academy Council continued to strive to simplify the laborious administrative aspects of grant procedures. CAS Academy Council Directive No. 4/2020 was issued, thus amending CAS Academy Council Directive No. 4/2018 on grants provided by the CAS to its institutes. The CAS continued to endeavor to raise awareness among its institutes by holding regular informational workshops about current issues and resolution of concrete practical problems faced by the institutes.

In 2020, the Academy Council continued its committed efforts to support and recognise excellent scientific results and researchers at CAS Institutes. In 2020, amendments were made to the directive on CAS awards, the directive on principles for awarding CAS medals and the directive on the Academy Premium – Praemium Academiae.

More than 14 internal regulations were approved and issued by the CAS in 2020. Aside from the regulations listed in the subsequent sections of this chapter, the CAS issued e.g. a directive on internal CAS regulations, guidelines for listing affiliations in research, development and innovation results, and amended guidelines for the Sample election procedural rules for elections at CAS Institutes.

In regard to the extraordinary epidemiological situation caused by the pandemic, a number of regulations enabling implementation of remote sessions of CAS bodies, advisory bodies, selection and evaluation committees were issued. In this context, amendments were made e.g. to the guidelines on CAS Institute supervisory boards, the directive on Rules for filling CAS Institute

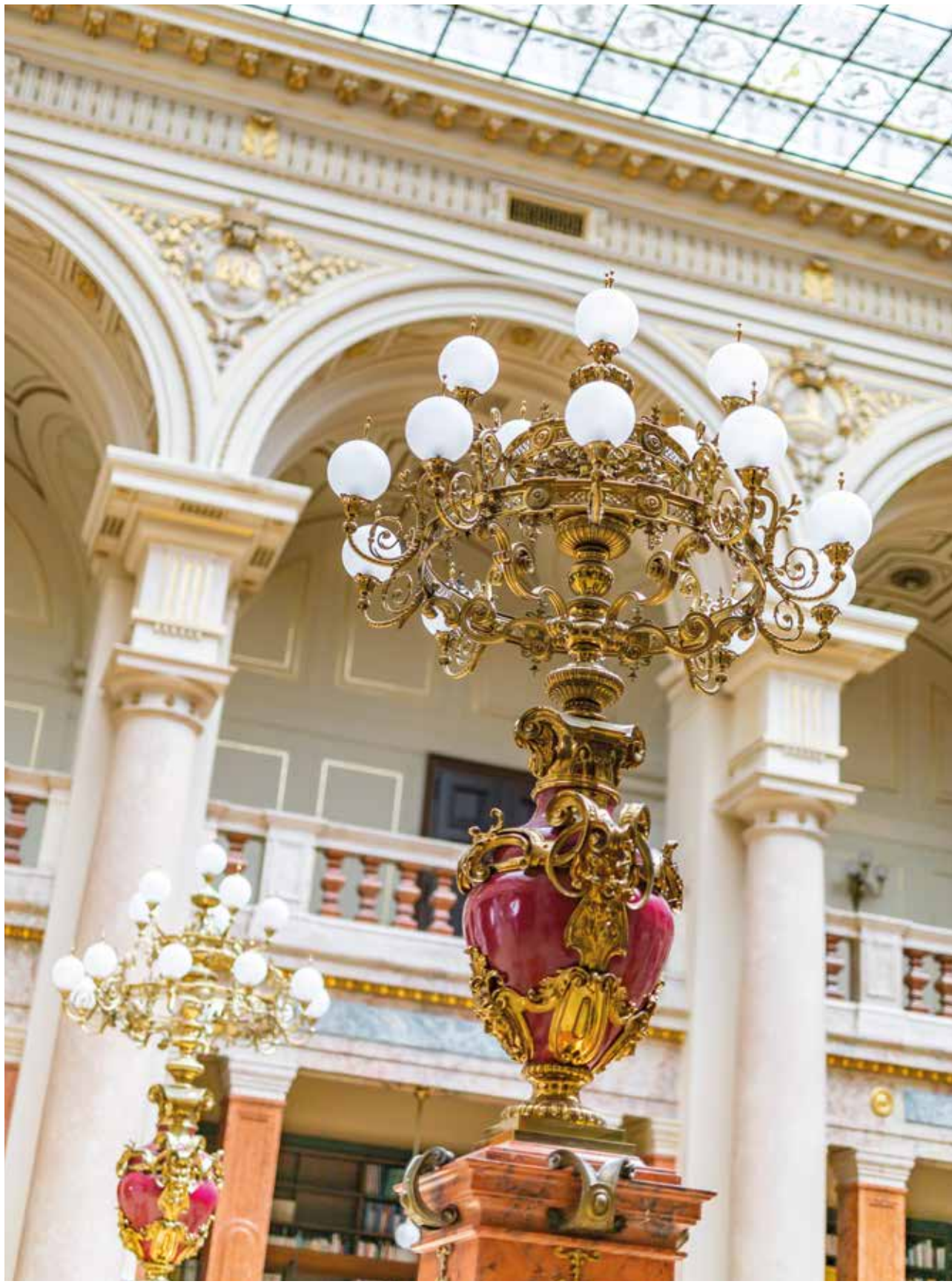
director positions, and the directive on Rules for awarding of the "Research Professor" degree at the CAS.

A key topic in 2020 was the continuing preparation and implementation of the first phase evaluation of the CAS Institutes' research and professional activities for the period of 2015–2019 (hereinafter the "evaluation") in compliance with the schedule and procedure set forth in the document "Methodology of evaluation of research and professional activities of the research institutes of the Czech Academy of Sciences for the period 2015–2019", which was approved by the Academy Council in 2019 and specified at its subsequent sessions.

In early 2020, the Academy Council approved the composition of subject area panels and evaluation committees. The unprecedented situation caused by the covid-19 pandemic hindered the first evaluation phase launch scheduled for 1 April 2020. The Academy Council was regularly informed of the development of preparations and implementation of the first evaluation phase at research institutes. Several corresponding informational workshops were organised for the evaluated institutes. According to the approved schedule the first phase was to be completed by the end of June 2020. As a result of the adverse epidemiological situation and the delayed start of evaluation in some panels, the deadline for completion of the first phase was extended to 16 July 2020 for these subject area panels. In September 2020, the Academy Council discussed the Report on implementation of the first evaluation phase. The results of the first evaluation phase were presented to the evaluated institutes and the public at an on-line seminar on 16 October 2020.

The Academy Council also focused its attention on organisational preparations for the second phase of the evaluation, which was postponed to 2021 due to the persisting adverse global epidemiological situation forecast. In addition, the meetings of subject area committees and evaluated institutes will take place remotely.

In 2020, the Academy Council continued to pay particular attention to the Open Access and



European Open Access Cloud initiatives, which process information and activities to date relating to open access to scientific information both in the Czech Republic and the European environment.

In regard to information technology, in 2020 the CAS continued in rigorous negotiations with Microsoft regarding the CAS' status in terms of billing for Microsoft services. The CAS management is advocating to maintain the CAS' status as an academic institution in regard to the number of students engaged at CAS Institutes.

The Academy Council continued to address the purchase of economic-information systems (EIS) for CAS Institutes. The CAS management assists Institutes and provides methodological guidance during the preparation of EIS tenders as needed.

Two addenda to founding documents of CAS Institutes were issued.

In 2020, the Academy Council approved a new draft organisational structure for the CAS Head Office and new Organisational Rules for the CAS Head Office, effective 1 July 2020.

In 2020, a contract was concluded with the company Gordic on provision of the new Ginis file service for the CAS Head Office that meets the requirements of the National Standards for File Service Electronic Systems. The implementation process for the new file service took place in autumn 2020 and the live operation launch was scheduled for 1 January 2021.

In 2020, the Academy Council, in compliance with the directive on the procedure for issuance of prior consent of the founder and other handling of property, issued prior consent as defined by the law on public research institutions, which included, primarily, consent with purchase of scientific instruments and equipment for the purpose of main activity performance at institutes, primarily in Research Areas I and II, including purchase of property for the ELI project. Additionally, several requests for consent with institute participation in legal entities and establishment of easements pertaining to construction of public networks were also approved.

As the amendment to the directive on the procedure for issuance of prior consent of the founder and other handling of property came into force, the obligation imposed on institutes to obtain the founder's previous permission to conclude some types of contracts, particularly lease agreements, was annulled as at 20 January 2020.

The Academy Council continued to pay special attention to long-term projects, particularly the ongoing reconstruction of the Hybernská building, acquisition of the Washington building for the needs of CAS Institutes, and participation in the Žižkov Freight Railway Station revitalisation project, which could be beneficial in the search for suitable premises for some currently dislocated CAS Institutes scattered across multiple sites.

Several meetings with representatives of the Office for Government Representation in Property Affairs took place pertaining to the transfer of jurisdiction over the management of state property, namely parcels at the Bulovka University Hospital campus in Liben, with the intention of subsequently transferring them to the ownership of CAS Institutes, which have buildings on the corresponding parcels.

In regard to archaeological heritage preservation, the Czech Academy of Sciences concluded six archaeological research agreements in 2020 with organisations with authorisations pursuant to the state monument preservation law.

In 2020, the CAS management continued to support International Advisory Boards (IAB) at CAS Institutes. In compliance with the directive on IAB support, in 2020 new IAB were established at more CAS Institutes, including the Institute of Art History, Institute of Biotechnology, Institute of Macromolecular Chemistry, Institute of Hydrodynamics and the Nuclear Physics Institute.

The Academy Council also paid notable attention to protection of personal data per the general directive (GDPR) and Act No. 110/2019 Coll., on Personal Data Processing. In 2020, it approved an amendment to the guideline on processing of personal data per the requirements of the general directive (GDPR), relating to processing of personal data by CAS Institutes.

The Academy Council also concerned itself with the issue of technology transfer and continued in its efforts to redefine the role of the Technology Transfer Office of the CAS (TTO). A new vision for the TTO is currently being developed.

In regard to inter-ministerial commenting proceedings, in 2020 the CAS assessed and took positions on more than 118 government documents submitted by ministries or other state bodies.

In 2020, in compliance with Act No. 106/1999 Coll., on Free Access to Information, the CAS received three requests for information. The requests were processed by the statutory deadlines. In one of the cases, the requested information was provided to the applicant; in the second, the request was rejected because the issue did not fall under the jurisdiction of the CAS; and in the third, the request for information was postponed.

The President of the CAS bestowed patronage on 10 science and research events in 2020.

5

Selected results

All 54 research institutes of the CAS, which operate as public research institutions, contributed to the scientific results achieved in 2020. CAS Institutes are grouped into three main 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 2020; nine of the most fascinating outcomes from the three areas are featured on the following pages.

SELECTED SCIENTIFIC RESEARCH RESULTS FROM RESEARCH AREA I. INSTITUTES

OUT-OF-FIELD DOSES IN PROTON THERAPY OF PAEDIATRIC TUMOURS

Nuclear Physics Institute of the CAS

Out-of-field doses were determined. A range shifter or patient-specific beam compensators can be used for proton energy reduction.

Comparative measurements of scattered radiation in the Proteus C-235 IBA facility (Cyclotron Centre Bronowice, Krakow) using anthropomorphic phantoms of 5- and 10-year-old children with shallow brain tumours were conducted. Out-of-field doses were determined for proton treatment, including a range shifter or a patient-specific 3D printed beam compensator for proton energy reduction. Out-of-field doses from secondary photons and neutrons were lower for the 3D printed pre-absorber than for the range shifter.

Anthropomorphic phantom of a 10-year-old child

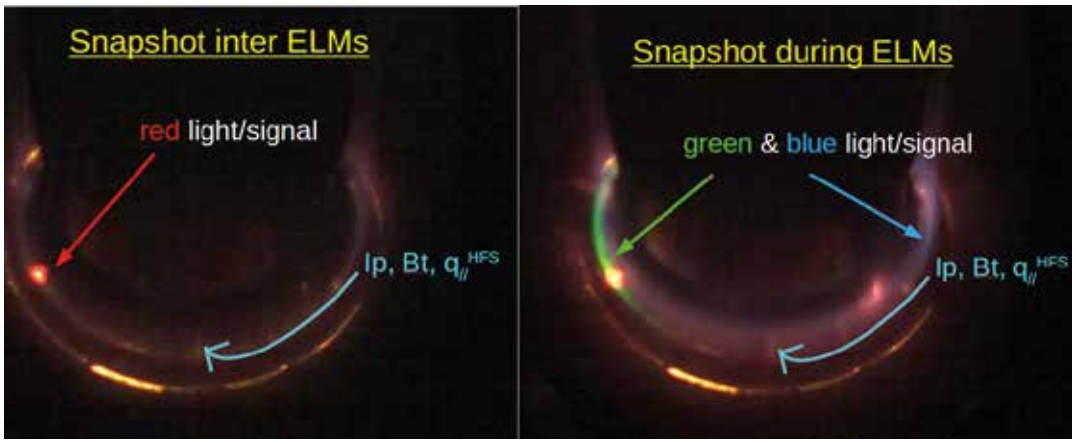
Bibliographic references:

A. Wochnik, L. Stolarczyk, I. Ambrožová, M. Davídková, M. De Saint-Hubert, S. Domański, C. Domingo, Ž. Knežević, R. Kopeć, M. Kuć, M. Majer, N. Mojżeszek, V. Mares, I. Martinez-Rovira, M. Á. Caballero-Pacheco, E. Pyszka, J. Swakoń, S. Trinkl, M. Tisi, R. Harrison, P. Olko, Out-of-field doses for scanning proton radiotherapy of shallowly located paediatric tumours – a comparison of range shifter and 3D printed compensator, Physics in Medicine and Biology, 2020 Nov 17, doi: 10.1088/1361-6560/abcb1f.

HEAT EXHAUST FROM THE COMPASS TOKAMAK DIVERTOR USING THE LIQUID METAL MODULE

Institute of Plasma Physics of the CAS

Conventional solid metals are severely limited when exposed to a plasma with the parameters of future fusion devices. Use of liquid metals is one promising alternative. Two unique experiments using liquid metals (Li and LiSn alloy) were performed on the COMPASS tokamak to investigate the possibility of heat exhaust under steady-state and transient thermal loads. This world premiere demonstrated an excellent capability of liquid metals to transfer/exhaust the heat from divertor area up to the level of 12 MW/m2 (to handle the divertor heat loads up to 12 MW/m2), the values expected at ITER.



Typical visible camera images of the COMPASS *divertor during a H-mode plasma discharge with the liquid metal divertor module filled with liquid lithium in between ELMs (left) and during one ELM (right).*

Bibliographic references:

R. Dejarnac, J. Horáček, M. Hron, M. Jeřáb, J. Adámek, S. Atikukke, P. Bartoň, J. Cavalier, J. Cecrdle, M. Dimitrova, E. Gauthier, M. Iafrati, M. Imríšek, M. A. Roldan, G. Mazzitelli, D. Naydenkova, A. Prishvitcyn, M. Tomeš, D. Tskhakaya, G. Van Oost, J. Varju, P. Veis, A. Vertkov, P. Vondráček, V. Weinzettl, Overview of power exhaust experiments in the COMPASS divertor with liquid metals. Nuclear Materials and Energy. 2020, 25 (December), 100801. ISSN 2352-1791.

ASSESSMENT OF PROPERTIES AND QUALITY OF ROCK MASS WITH A SIGNIFICANT DEGREE OF ANISOTROPY WITH REGARD TO ITS FUNCTION AS A GEOLOGICAL BARRIER IN THE PROCESS OF HIGH-LEVEL RADIOACTIVE WASTE DISPOSAL

Institute of Geonics of the CAS

Between 2017 and 2020, a study of rock mass properties was carried out at the former Rožná uranium mine, where there is a large fault zone (R1). In situ and laboratory work was designed to allow determination of the extent of the influence of the studied fault zone on the surrounding rock mass and also to capture the effect of the high degree of rock anisotropy on its properties. The knowledge obtained is crucial for the determination of a sufficiently safe distance of the repositories from fault zones of similar size.

Bibliographic references:

Z. Bukovská, I. Soejono, L. Vondrovic, M. Vavro, K. Souček, D. Buriánek, P. Dobeš, O. Švajgera, P. Waclawik, J. Řihošek, K. Verner, J. Sláma, L. Vavro, P. Koníček, L. Staš, Z. Pécskay, F. Veselovský, Characterization and 3D visualization of underground research facility for deep geological repository experiments: A case study of underground research facility Bukov, Czech Republic. Engineering Geology, 259: 105186. doi: 10.1016/j.enggeo. 2019. 105186. ASEP ID: 0505451.

A. Bercakova, R. Melichar, K. Soucek, Mechanical properties and failure patterns of migmatized gneiss with metamorphic foliation under UCS test. Rock Mechanics and Rock Engineering. 2019. 53: 2007–2013. doi: 10.1007/s00603-019-02012-2. ASEP ID: 0511743.

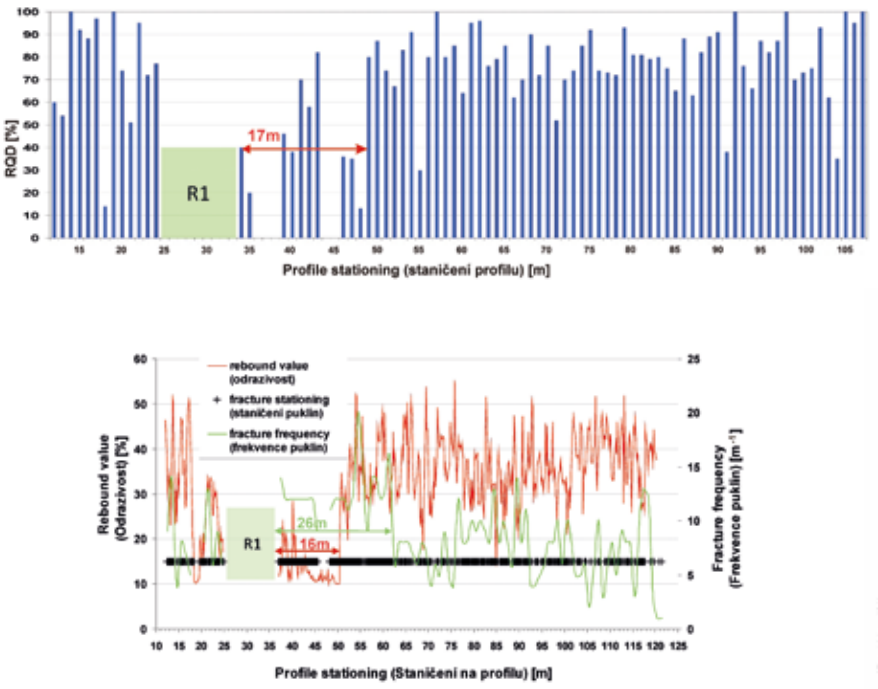
P. Konicek, K. Soucek, M. Vavro, L. Stas, P. Waclawik, L. Vavro, L. Vondrovic, Selection of quasi-homogenous units of rock mass due to engineering classification systems (URF Bukov, Czech Republic). 2020. In Rock Mechanics for Natural Resources and Infrastructure Development – Full Papers: Proceedings of the 14th International Congress on Rock Mechanics and Rock Engineering (ISRM 2019) (S. A. B. da Fontoura, R. J. Rocca, J. F. Pavón Mendoza eds.), p. 583–589. Foz do Iguassu, Brazil. Proceedings in Earth and Geosciences, vol. 6, CRC Press/Balkema. ASEP ID: 0517138.

Z. Bukovská et al. 2020. Data acquisition from the deep horizons of the Rožná Mine – Final summary. Technical report no. 464/2020, SÚRAO, 692 pp. ASEP ID: 0524098.

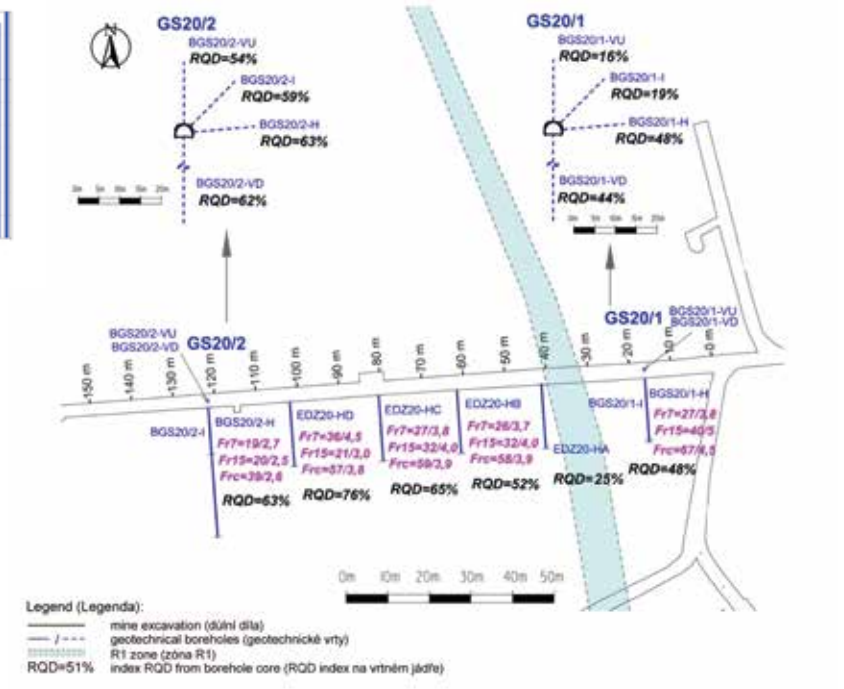
Z. Bukovská et al. 2020. Data acquisition from the deep horizons of the Rožná Mine – Final summary. Technical report no. 464/2020/ENG, SÚRAO, 48 pp.

K. Souček et al. 2018. Comprehensive geological characterization of URF Bukov – part II Geotechnical characterization. Technical report no. 221/2018, SÚRAO, 218 pp. ASEP ID: 0486874.

K. Souček et al. 2017. Comprehensive geological characterization of URF Bukov – part II Geotechnical characterization. Final report no. 221/2018/ENG, SÚRAO, 246 pp. ASEP ID: 0505936.



Rock Quality Designation (RQD) *on a borehole core and fracture number and frequency on the borehole walls with respect to borehole position towards the R1 zone (profile on level 20 of the Rožná mine).*

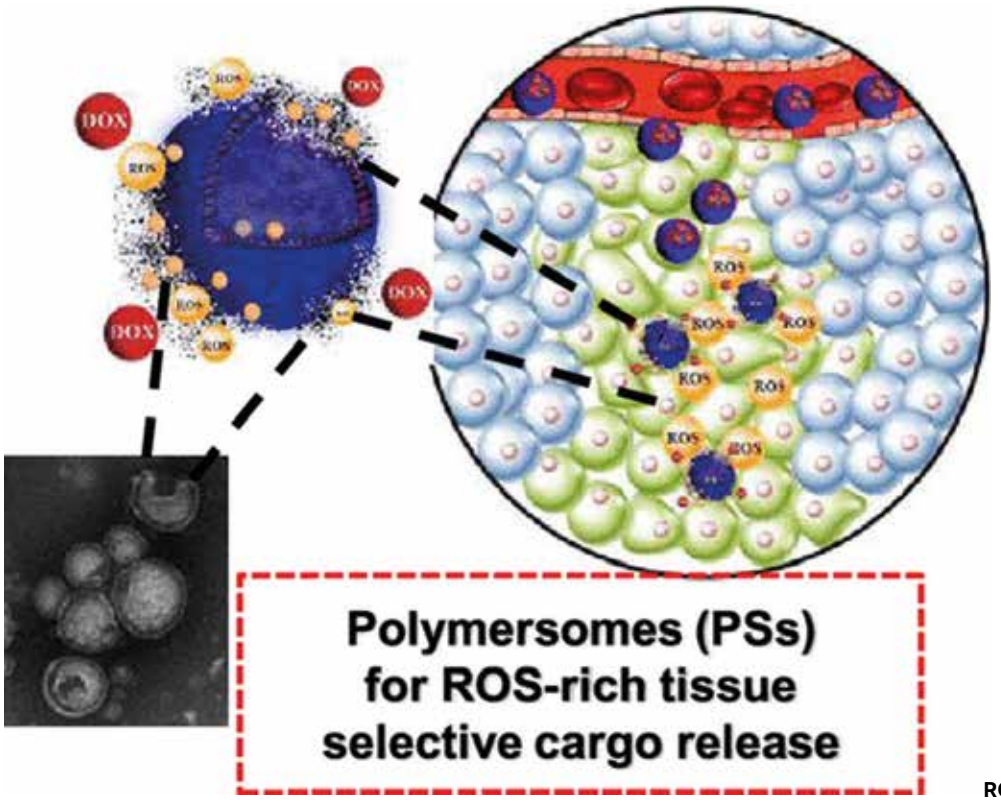


R1 zone influence on the RQD values *determined from structural geological mapping performed on the mine wall (top) and on the fracture frequency on the mine wall, or the reflectivity value determined by Schmidt hammer (bottom). Profile on the 20th level of the Rožná mine.*

SELECTED SCIENTIFIC RESULTS FROM RESEARCH AREA II. INSTITUTES

POLYMERSOMES RESPONSIVE TO REACTIVE OXYGEN SPECIES FOR TARGETED DRUG DELIVERY TO TUMOURS AND INFLAMED TISSUES

Institute of Macromolecular Chemistry of the CAS



ROS-responsive polymersome function scheme.
Polymersomes for ROS-rich tissue selective cargo release.

Chemists have developed polymersomes responsive to reactive oxygen species (ROS) based on polymers with arylboronic acid esters of the pinacol type for the targeted delivery of drugs to inflamed and tumour tissues with a biodegradation rate controlled by a spacer structure. Chemical degradation of the polymersomes by ROS produced by these tissues selectively releases the drug at the destination. High efficacy has been demonstrated with the antitumour drug doxorubicin.

Bibliographic references:

E. Jäger, V. Sincari, L. J. C. Albuquerque, A. Jäger, J. Humajova, J. Kucka, J. Pankrac, P. Paral, T. Heizer, O. Janouskova, R. Konefał, E. Pavlova, O. Sedlacek, F. C. Giacomelli, P. Pouckova, L. Sefc, P. Štěpánek, M. Hruby, Reactive Oxygen Species (ROS)-Responsive Polymersomes with Site-Specific Chemotherapeutic Delivery into Tumours via Spacer Design Chemistry. Biomacromolecules 2020, 21, 1437-1449. DOI: 10.1021/acs.biomac.9b01748.

CELL-SURFACE LOCALISATION OF CYTOKININ RECEPTORS

Institute of Experimental Botany of the CAS

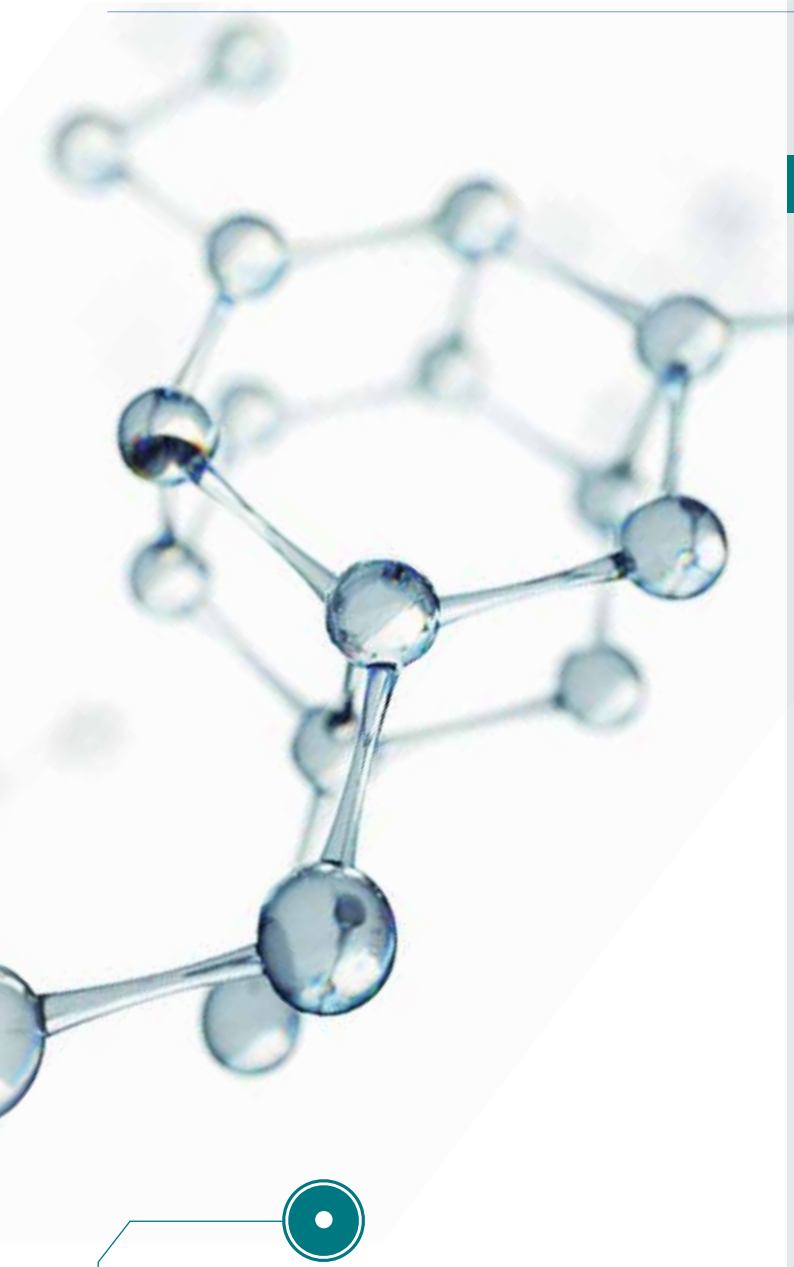
Scientists at the Institute of Experimental Botany have demonstrated that cytokinin signals are not carried solely through receptors localised within cells, but that functional cytokinin receptors are also found on the cell surface.

Their work has shown that cytokinin receptors, which are essential for initiating molecular-biological processes in plants, are also localised on the cell surface. The use of several innovative methods (fluorescently labelled or chemically bound cytokinins on large gel particles) and advanced microscopy refuted the traditional view that these receptors are only located inside cells. We also described the pathways of receptor transport from the intracellular space to its surface and vice versa.

Bibliographic references:

K. Kubiasová, J. C. Montesinos, O. Šamajová, J. Nisler, V. Mik, H. Semerádová, L. Plíhalová, O. Novák, P. Marhavý, N. Cavallari, D. Zalabák, K. Berka, K. Doležal, P. Galuszka, J. Šamaj, M. Strnad, E. Benková, O. Plíhal, L. Spíchal, Cytokinin fluoroprobe reveals multiple sites of cytokinin perception at plasma membrane and endoplasmic reticulum. Nature Communications. 2020, 11(1), 4285. ISSN 2041-1723

I. Antoniadi, O. Novák, Z. Gelová, A. Johnson, O. Plíhal, R. Simerský, V. Mik, T. Vain, E. Mateo-Bonmatí, M. Karady, M. Pernisová, L. Plačková, K. Opassathian, J. Hejátko, S. Robert, J. Friml, K. Doležal, K. Ljung, C. Turnbull, Cell-surface receptors enable perception of extracellular cytokinins. Nature Communications. 2020, 11(1), 4284. ISSN 2041-1723



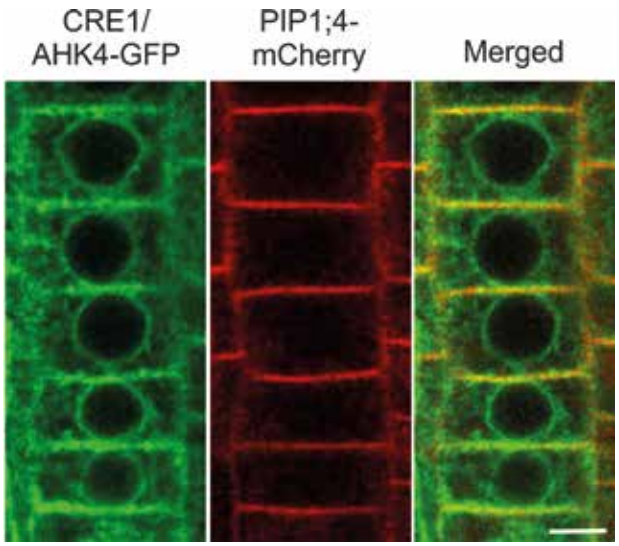
MITOCHONDRIA-ADAPTOR TRAK1 PROMOTES KINESIN-1 DRIVEN TRANSPORT IN CROWDED ENVIRONMENTS

Institute of Biotechnology of the CAS

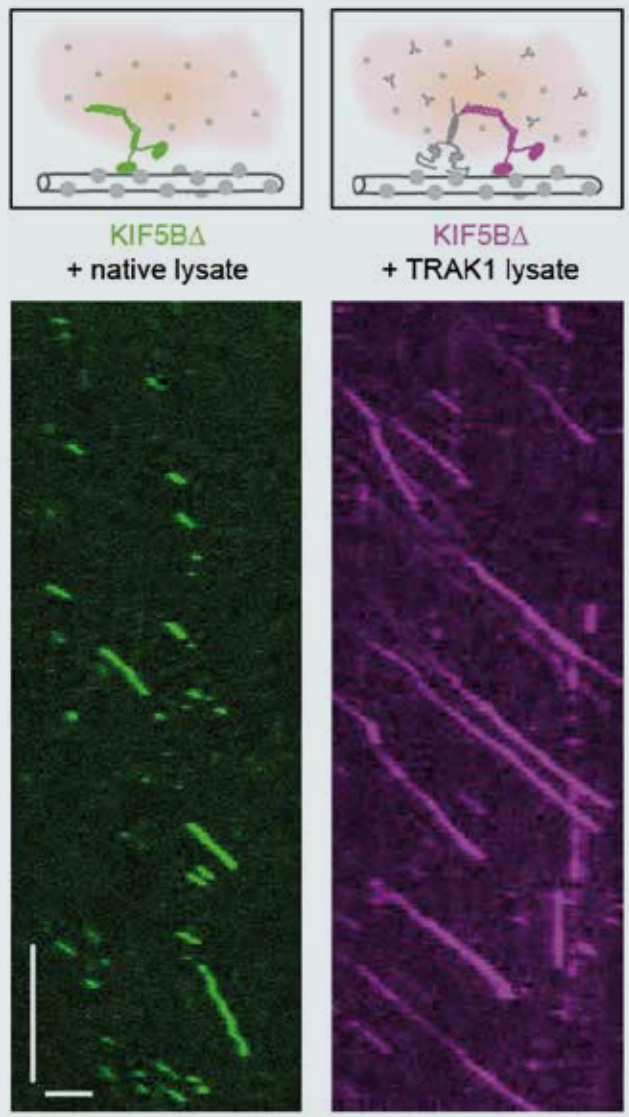
Trafficking of cellular cargo, such as organelles, along microtubules is one of the fundamental functions of molecular motors. However, the mechanisms of this trafficking are unclear. Scientists described how TRAK protein facilitates long-range cargo trafficking driven by the molecular motor kinesin. They showed that TRAK binds to microtubules and to kinesin, which anchors kinesin to the microtubule and increases its run length, rendering the kinesin-driven transport more efficient.

Bibliographic references:

V. Henrichs, L. Grycova, C. Barinka, Z. Nahacka, J. Neuzil, S. Diez, J. Rohlena, M. Braun, Z. Lansky, Mitochondria-adaptor TRAK1 promotes kinesin-1 driven transport in crowded environments. Nature Communications, 2020, 11(1):3123.



Localisation of the CRE1/AHK4
cytokinin receptor in Arabidopsis root cells.



Adaptor protein TRAK1
increases the processivity of the molecular motor kinesin-1 (KIF5B).

SELECTED SCIENTIFIC RESULTS FROM RESEARCH AREA III. INSTITUTES

CHOICE SIMPLIFICATION: A THEORY OF MENTAL BUDGETING AND NAIVE DIVERSIFICATION

Economics Institute of the CAS

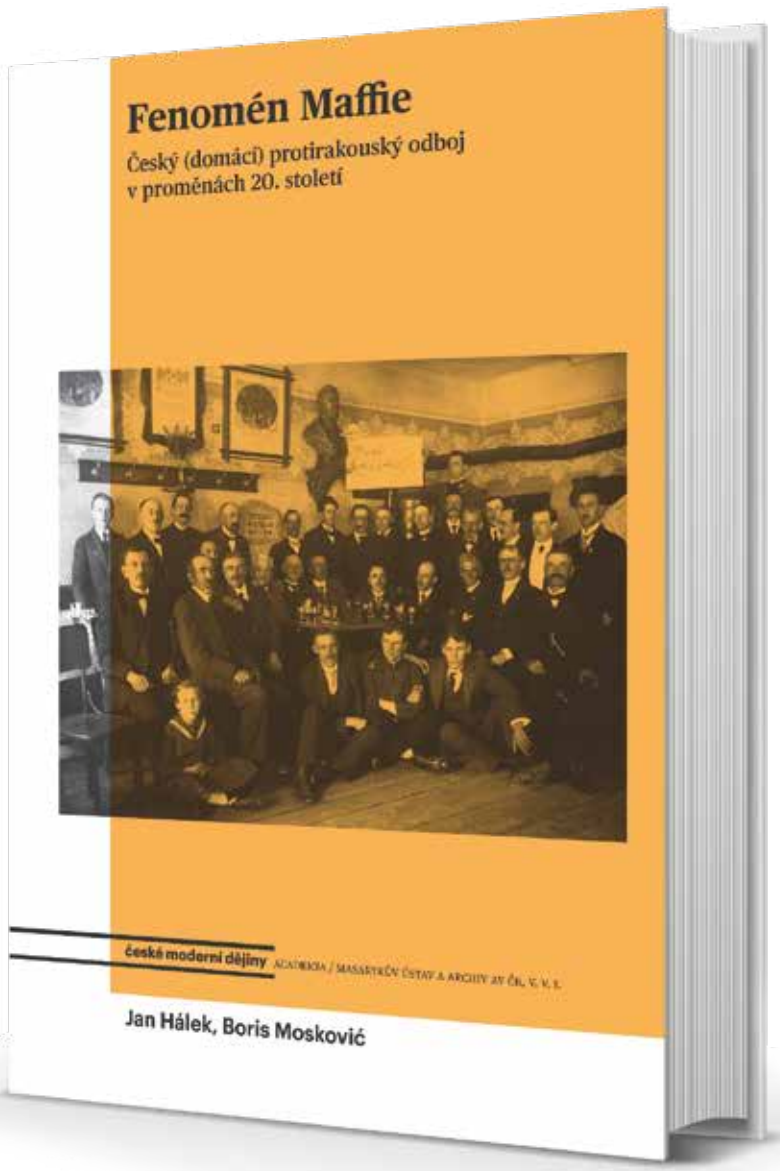
The paper applies the theory of rational inattention to multiproduct consumption decisions. The study shows that consumers simplify their choices by restricting attention. Their decisions depend on the degree of substitutability, on the number of choices and whether price shocks are factored in. Consumers often create mental budgets for different kinds of products. The conclusions are important for deepening our understanding of consumer behaviour in everyday situations.

Bibliographic references:

B. Kőszegi, F. Matějka, Choice simplification: a theory of mental budgeting and naive diversification. Quarterly Journal of Economics. 2020, 135(2), 1153-1207. ISSN 0033-5533.

THE MAFFIE PHENOMENON. CZECH (LOCAL) ANTI-AUSTRIAN RESISTANCE IN THE CHANGING 20TH CENTURY

Masaryk Institute and Archives of the CAS



This monograph, which is the main output of a three-year research project, is a summary of the project's results. It focuses on the construing of the image of the Maffie as the central organisation of the anti-Austrian resistance and on its development and changes in the decades after the First World War. To date this subject has been almost wholly neglected in historiographic research.

Bibliographic references:

J. Hálek, – B. Mosković, The Maffie Phenomenon. Czech (Local) Anti-Austrian Resistance in the Changing 20th Century. Praha: Academia, 2020. Czech Modern History, 9. ISBN 978-80-200-3154-9.

Book cover: *The Maffie Phenomenon. Czech (Local) Anti-Austrian Resistance in the Changing 20th Century*

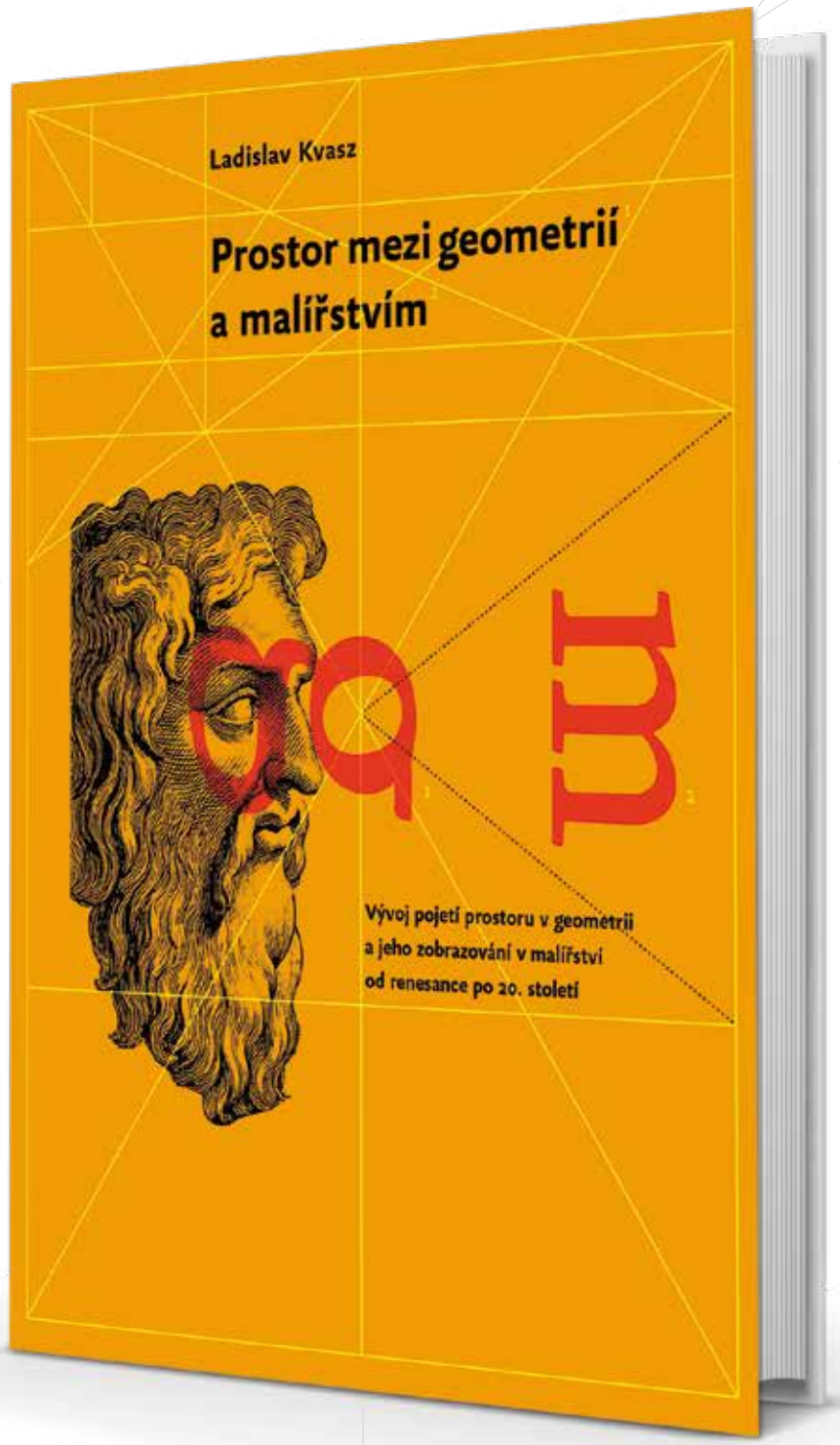
SPACE BETWEEN GEOMETRY AND PAINTING: THE DEVELOPMENT OF THE UNDERSTANDING OF SPACE IN GEOMETRY AND ITS REPRESENTATION IN PAINTING FROM THE RENAISSANCE TO THE 20TH CENTURY

Institute of Philosophy of the CAS

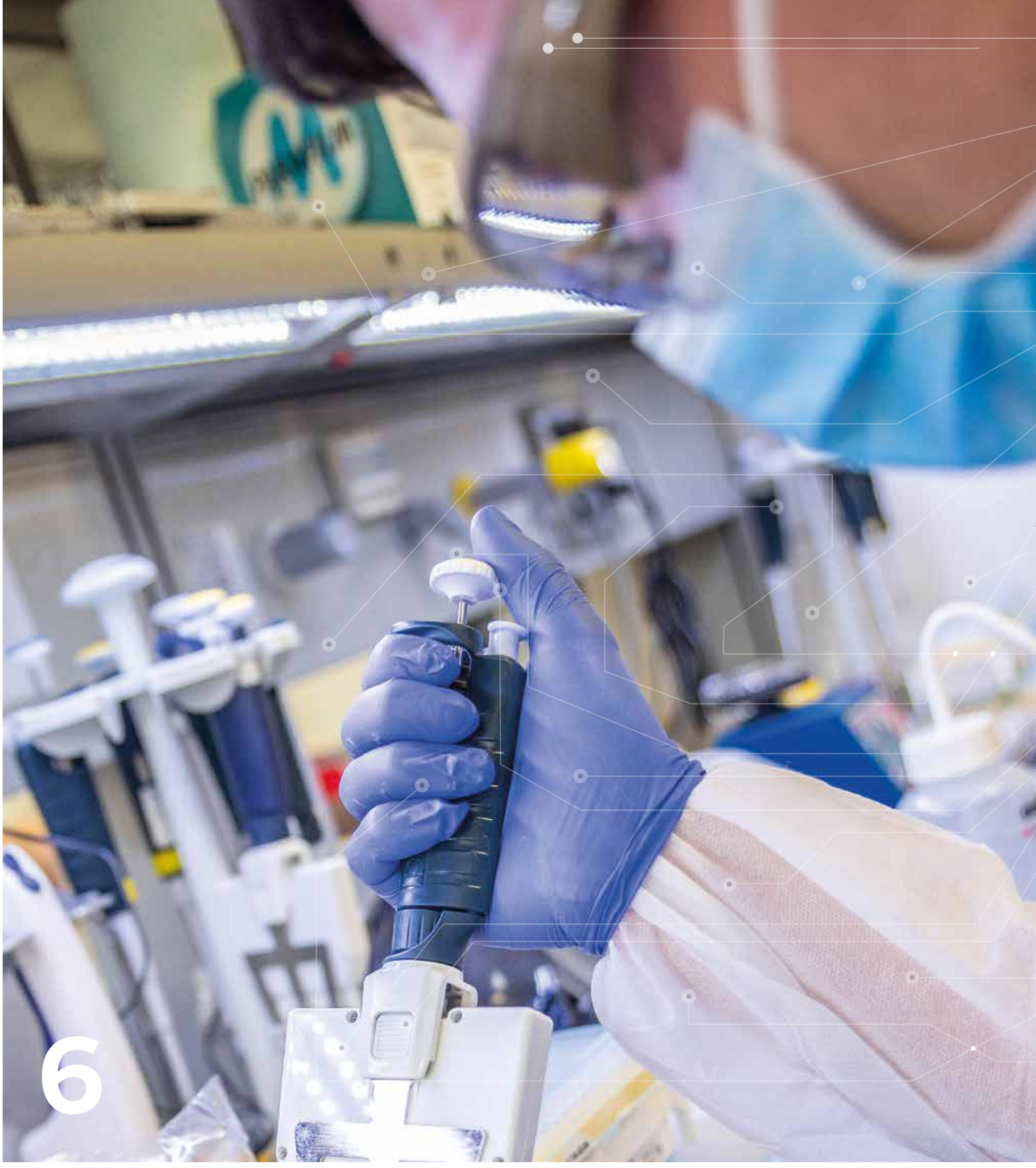
The book shows how abstract and often complicated mathematical ideas were expressed in painting in a concrete and intuitively understandable form. For art historians and fine art lovers, the book provides a new, mathematical perspective on paintings from e.g. Lorenzetti, Leonardo, Caravaggio, Manet, Picasso and Kupka. Mathematicians will appreciate the connection between the history of geometry and the history of painting, which enriches the interpretation of the history of geometry with a new context.

Bibliographic references:

L. Kvasz, Space between geometry and painting: the development of the understanding of space in geometry and its representation in painting from the Renaissance to the 20th century. Prague: Slovart, 2020. ISBN 978-80-7529-915-4.



Book cover: *L. Kvasz, Space between geometry and painting: the development of the understanding of space in geometry and its representation in painting from the Renaissance to the 20th century.*



CAS Institutes

in the fight against covid-19

The covid-19 pandemic impacted the life and work of the CAS intensely and deserves a special, separate chapter in the Annual Report. The coronavirus showed how ill prepared our globalised society is for threats of this kind. Virologists, immunologists and molecular geneticists from CAS Institutes were among the first to warn of possible pandemic development scenarios and the risks associated with the spread of the virus in the population. Virus and antiviral research has a long, successful tradition at the CAS. The team of Professor Antonín Holý was already studying the derivatives of nucleosides and nucleotides, the basic genetic information units of all organisms, including viruses, already in the 1960s. By chemically treating these derivatives, Antonín Holý created substances that selectively prevent the synthesis of viral nucleic acids, yet do not influence the natural processes within cells. These discoveries later led to the development and production of highly effective antivirals.

Mindful of this tradition and science's responsibility for the healthy advancement of society, many CAS Institutes joined efforts to combat covid-19 immediately after the outbreak began.

COVID-19 testing

Immediately after the outbreak of the pandemic began, the CAS offered equipment and scientist staff members to help with covid-19 patient testing.

Several CAS Institutes from Research Area II. took part in covid-19 testing as soon as the necessary permits had been obtained (the Biology Centre, BIOCEV, Institute of Molecular Genetics, Microbiology Institute, Algatech Třeboň, Institute of Botany, Institute of Biophysics and the Institute of Biotechnology).

Hundreds of samples from hospitals and nursing homes were tested on a daily basis at BIOCEV, the joint biotechnological and biomedical centre of the CAS and Charles University. A team of scientists from BIOCEV, in collaboration with the Catholic University in Leuven, Belgium, the National Reference Laboratory for Influenza of the State Health Institute and the Institute of Haematology and Blood Transfusion, quickly introduced reliable SARS-CoV-2 detection methods. Scientists also verified detection procedures that are not dependent on supply of commercial diagnostics which were developed by the Institute of Organic Chemistry and Biochemistry with other teams.

Starting in March 2020, the Biology Centre examined samples for SARS-CoV-2 at a capacity of approximately 100 tests per day. Clinical samples were processed in strict laboratory conditions with a high level of BSL-3 security at the Institute of Parasitology at the Biology Centre. In May 2020, the Biology Centre launched full operation in a new laboratory that had been adapted for coronavirus sample testing, thus increasing the capacity to 150 tests per day. Plant virologists from the Institute of Plant Molecular Biology of the Biology Centre also worked in the newly equipped laboratory.

A new RNA isolation method developed by scientists from the Jan Konvalinka laboratory at the Institute of Organic Chemistry and Biochemistry proved very promising for mass testing and engagement of robotics labs at the Institute of Molecular Genetics and BIOCEV. It was validated in the laboratories of the State Health Institute, Motol University Hospital and Bulovka University Hospital. The initial results were very good and showed that the new method is on par with traditional methods and enables testing on a truly massive scale.

Other scientists from the Institute of Organic Chemistry and Biochemistry helped combat the disease by describing the structure of proteins found in the new coronavirus and how it outsmarts human immunity. The discovery of a team led by Evžen Bouřa and Radim Nencka may be useful in the future, inter alia, for suitable adjustment of developed drugs. They published their research results in the prestigious journal Nature Communications.

At the Bulovka University Hospital, scientists installed a robot to facilitate covid-19 testing of samples (nicknamed Robot Pipette). The machine is composed of a universal robotic manipulator, precise pumps capable of replacing manual pipetting and precise built-in lab scales that verify every sample after pipetting to ensure that the allocated quantity of fluid has been transferred. The instrument was developed by researchers from the Czech Institute of Informatics, Robotics and Cybernetics at the Czech Technical University in Prague and the Nuclear Physics Institute.

Use of special biosensors

A team led by Hana Lísalová of the Institute of Physics developed a ground-breaking technology capable of precisely detecting SARS-CoV-2 from saliva that can also determine the quantity of the virus in the sample. The team of researchers worked on the project from the very start of the pandemic. They had been working

on the biosensor in a previous project – a portable suitcase to determine food purity. The Institute of Physics announced that the coronavirus detection technology was ready to be transferred to practical application: the CARDAM R&D Institute will produce a prototype of the instrument for daily control testing, for example, of employees entering their workplaces.

A joint project between researchers from the Institute of Chemical Process Fundamentals and SPM – Security Paper Mill is an example of efficient collaboration between science and industry. For the past five years they have been developing hygienic paper that destroys bacteria. After the coronavirus pandemic broke out, they enhanced the technology with a virucidal effect. A special mixture of zinc or silver, incorporated directly into the paper, can destroy microorganisms and viruses within 30 minutes. The discovery will be useful wherever people come into contact with paper and there is a heightened risk of infection – on bank notes, medical documentation, even archives, because some bacteria can survive for up to 20 years.

Testing nanomaterials and face masks

Immediately after the coronavirus pandemic broke out, experts from the Institute of Chemical Process Fundamentals began testing materials for production of antiviral protective equipment. They use special equipment that was originally developed to verify air quality filters. The unique method that they use to analyse the materials was published by the researchers several years ago in academic journals. At that time they proved that it is possi-

ble to very specifically determine how well various materials capture aerosol particles 20-400 nanometres in size, while the size of the covid-19 virus particles are 80-159 nanometres, depending on how much the virus is enveloped in other substances after the water evaporates from the droplets. Researchers are also currently working with the Czech Technical University and the Technical University in Liberec to develop a new generation of Czech-made respirators.

The Institute of Chemical Process Fundamentals also demonstrated, through testing, basic shortcomings in the efficacy of face masks and respirators from several Chinese shipments. The Prague City Hall therefore purchased a new testing device valued at approximately CZK 4 million for the researchers.

Likewise, the Department of Electron Microscopy at the Institute of Scientific Instruments also offered free analysis of nanomaterials which seemed promising in reducing the spread of covid-19 (materials for manufacture of face masks, filters and other products). The scientists and technical employees of the Institute of Scientific Instruments also participated in a project to produce printed parts for face shields used as protective equipment.

The Institute of Physics began producing protective face masks with Czech companies. Just a few dozen seconds instead of a few dozen minutes – that is how much time it takes to print key

parts of the new RP95-M half masks in comparison to interim production on 3D printers. These masks are designed to provide the highest level of protection and are based on an original design developed at the Czech Technical University. The company CARDAM, a subsidiary of the Institute of Physics, and the firms Beneš a Lát and České zbrojovky, launched serial production of these higher quality, less costly models. The production capacity is 50,000 face masks per week.

During the spring 2020 lockdown, researchers from the Institute of Macromolecular Chemistry developed a new membrane oxygenator that can help patients with minor breathing difficulties owing to air enriched with 45% oxygen. In contrast to conventional machines, it is a very simple device and can even be used in households.

The Nuclear Physics Institute enabled hospitals to use its electronic accelerator for sterilisation purposes. The accelerator is located in the civil defence shelter under the Vítkov Memorial in Prague and is capable of cleaning tools made of plastic, textiles, rubber and pulp.

Not only biologists and chemists – economists, IT experts, solicitors and psychologists, too

Researchers and economists from the Economics Institute very actively provided expertise for the Czech government. Through the IDEA think-tank alone they developed more than 20 scientific studies to help combat the coronavirus. They created economic models of covid-19 impacts on the Czech economy, the development of unemployment rates and the labour market and they also gave the Czech government a number of concrete recommendation measures to reduce the epidemic's impacts. Štěpán Jurajda and Jan Švejnar are members of the National Economic Council. Daniel Munich and Filip Matějka are active members of the economic advisory team of the Czech government's Crisis management group, where they take part in development of National Testing Strategy mathematical models. Štěpán Jurajda, as a member of the R&D&I Council, is a National Renewal Plan guarantor, specifically for covid-19 impacts on the labour market, the school system and education.

Researchers from the Institute of Computer Science, the Institute of Information Theory and Automation and CERGE-EI, a joint institute of the Economics Institute and Charles University, collaboratively developed a project titled "A city for people, not for the virus", to innovate a general software tool for simulating epidemics on a graph of social contacts. The model can function as a watchdog of the currently used Anti-epidemic system.

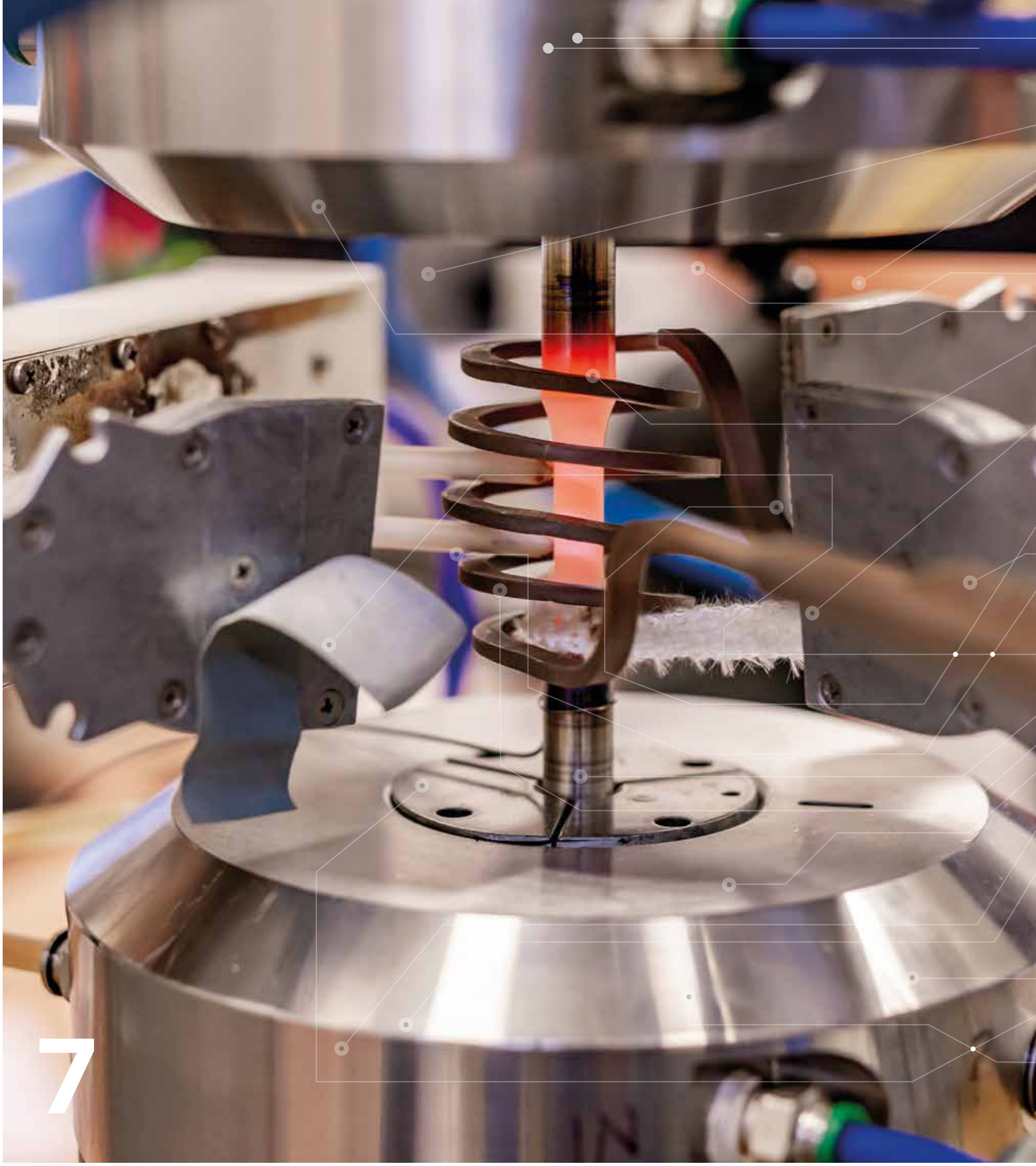
The Institute of Computer Science and the Karel Čapek Centre for Values in Science and Technology created a website called "Ethics of the epidemic". Documents such as *Ethics and the legal basis for development of recommendations for decision-making on allocation of scarce resources in provision of health care services during the covid-19 pandemic*, published by the Institute of State and Law, can be downloaded from the site.

The Institute of Psychology, in addition to developing several studies on e.g. attitudes towards face masks (in collaboration with the Institute of Sociology) and adaptation of communication while wearing face masks, systematically developed recommendations for the public on how to cope with isolation and restrictions and the generally extremely psychologically challenging period. The Institute also put forth three psychological Rs (respect, rationality, resilience) for the public in autumn 2020 that were subsequently disseminated through Czech society by the media and accepted by state institutions (the Ministry of the Interior of the Czech Republic, Police Directorate, etc.). Scientists from the Institute of Psychology gave numerous media interviews about coping with isolation. As the only institute in the Czech Republic with data from isolation studies, they comprehensibly communicated information about how people's experience may evolve using an appealing analogy of a simulated flight to Mars. The Institute of Psychology is also the expert patron of the covid-19 mobile application, which provides clear information to Czech citizens as well as expert information and recommendations.

Communication during the pandemic

The pandemic also drew attention to how ill prepared we are in communications. A huge amount of distorted news, half-truths and disinformation about covid-19 flooded the public sphere and demonstrated the vulnerability of the Internet and social networks. In addition, scientists were incapable of warning global politicians of the imminent pandemic and convincing them of the need to adopt some restrictive decisions in a timely fashion. Even science of excellence has its limits and does not provide 100% certainty. That makes communication between the decision-making sphere and science all the more important, and here the Czech Academy of Sciences plays an essential and significant role.

The unflagging explanatory and educational work of outstanding scientists from CAS Institutes and their ability to formulate complicated covid-19 pandemic issues comprehensibly in the mass media helped both politicians and Czech society navigate through the fight against the disease and provided hope of overcoming the pandemic. CAS scientists diligently addressed issues around the development of the pandemic, impacts of government measures, testing and later development of vaccines and vaccination from many different perspectives. Information about research results were continuously published on the CAS website. The Media Communications and Promotion chapter details many other ways that CAS Institutes helped combat the covid-19 pandemic.



Strategy AV21

Top research in the public interest

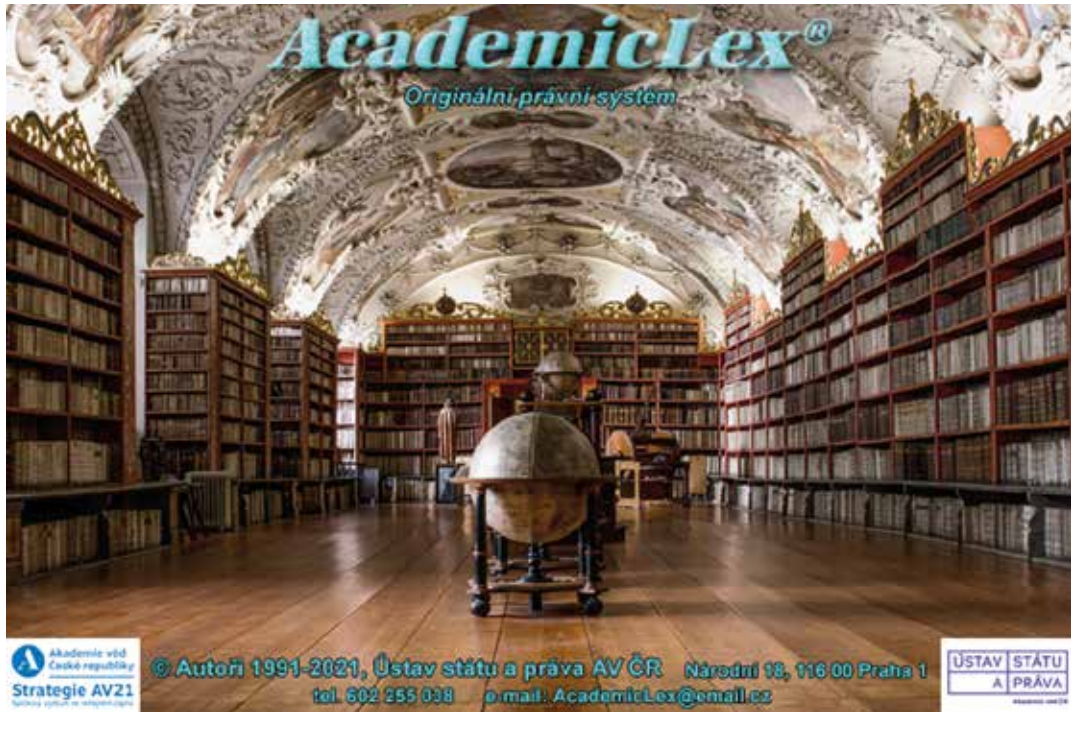
Strategy AV21, approved by the CAS Academy Assembly in 2014, is the result of the CAS' ongoing efforts to help address contemporary social problems, and is aptly characterised by the motto "Top research in the public interest". Strategy AV21 research programmes focus on current, socially important issues. 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 humanities. The engagement of all CAS Institutes, as well as many external academic institutions, in Strategy AV21 is further evidence of its success. Given that the Strategy AV21 goals are closely aligned with the goals of the National Research and Innovation Strategy for Intelligent Specialisation of the Czech Republic (RIS3), representatives of Strategy AV21 participated in the RIS3 strategy update and specific thematic work for RIS3 national innovation platforms.

2020 was the first year that all CAS Institutes participated in Strategy AV21 research programmes, along with many external institutions.

The sixth year of Strategy AV21 implementation became an extraordinary, unexpected challenge for the coordinators and researchers of the ongoing 20 research programmes and one associated activity. The covid-19 pandemic slowed down, or even prevented, implementation of some research programme tasks. Researchers thus had to search for alternative solutions to deal with the difficult situation, which they did successfully in many cases. Conferences and workshops were either cancelled or shifted to on-line environments. For example, instead of a planned public visit to the TOKAMAK facility at the Institute of Plasma Physics, a 3D video-tour was created that viewers could watch from the comfort of their own homes. There are many examples of similarly creative approaches. Five new research programmes – Food for the Future, Water for Life, Landscape Preservation and Revitalisation, Society in Motion and The City as a Laboratory of Change and Safe Construction – faced a difficult start in 2020.

2020 was also a turning point for Strategy AV21 in terms of its expansion among CAS Institutes. For the first time, all of the CAS Institutes engaged in Strategy AV21 research programmes. This was an important milestone in general acceptance of the Strategy concept as a way of strengthening interdisciplinary collaboration among different institutes across all three research areas.

Unfortunately, the ban on gathering during the coronavirus pandemic made it impossible to hold a traditional gala lecture at the Žofín Palace in Prague by Jiří Neužil, head of the Molecular Therapy Laboratory at the Institute of Biotechnology. Titled "New approaches to cancer treatment: Focus on mitochondria", the lecture had been planned as the ninth in the "Czech Academy of Science: Top research in the public interest" series. Due to the state of emergency, the third Strategy AV21 conference planned for May 2020, where research programme results were to be presented to the public and legislators, was also cancelled. Unfortunately, the situation did not improve during the autumn and therefore the fourth conference, planned for the autumn, had to be cancelled as well. Thus the only meeting that the researchers had in 2020 was the February coordinators' meeting.



Thanks to support of the Memory in the Digital Age research programme, a unique programme called AcademicLex was developed which fit seamlessly into the concept of on-line education and digitalisation of education, which is so sorely needed during a pandemic. Some 1,200 students used the programme during its first year of operation. It contains up to 200,000 documents in metadata and 100,000 full texts. The database contains the complete set of post-1918 legal regulations, post-1950 supreme court case law and other documents. It was developed at the Institute of State and Law in collaboration with other universities (Faculty of Law at Charles University and University of West Bohemia in Pilsen, the Computer Science Department at Masaryk University).

Since 2016, the Institute of Mathematics has been collaborating with the company Doosan-Bobcat EMEA from Dobříš through the Hope and Risks in the Digital Age research programme to develop simulation mathematical models of processes needed to develop new compact excavators and loaders. They have created successful solutions for e.g. material fatigue, engine cooling, corresponding noise and phase transitions during windshield defrosting.

Bobcat E27 excavator,
which the Institute of Mathematics helped develop.

The Institute of Experimental Botany in Olomouc and scientists from the company Zemědělský výzkum, spol. s r. o. Troubsko made an important discovery identifying part of the hereditary information of clover that is responsible for higher yields and other desirable plant traits. The research team's results will enable breeding of new clover varieties with higher nutritional value for cattle. The research took place at the Biotechnological Centre for Plant Genotyping of the National Centres of Competence programme of the Technology Agency of the Czech Republic. It was supported by the *Food for the Future* Strategy AV21 programme through the Institute of Experimental Botany Application Laboratory for Agricultural Research.

Aeroponic cutting board
during rooting of sequenced plants of the meadow clover reference population

An important output of the Strategy AV21 programme are Avex expert opinions for legislators. In an effort to offer lawmakers expert support for their legislative decision-making processes, several expert opinions were elaborated (Antibiotics Crisis, Planet in a Greenhouse, Will Our Soil Remain Alive, Viruses and Our Fight Against Them). Additionally, Strategy AV21 expert brochures were published (including e.g. Garden irises and their breeding in the Czech Republic, Research of thermonuclear plasma on the COMPASS tokamak, Referendums and representative democracy).

The Strategy AV21 Council put great effort into comprehensive management and assessment of research programmes and associated activities. On the basis of the evaluation of 2020 results that took place in October, research programmes were classified into two success-level groups which subsequently affected recommendations for improvements as well as funding for the next year.

List of Strategy AV21 research programmes

VP01
Hopes and Risks of the Digital Era
Doc. RNDr. Barbara Zitová, Ph.D.
Institute of Information Theory and Automation
09/06/2015 – 31/12/2021

VP02
Systems for the Nuclear Power Industry
Doc. RNDr. Radomír Pánek, Ph.D.
Institute of Plasma Physics
09/06/2015 – 31/12/2021

VP03
Efficient Energy Conversion and Storage
Ing. Jiří Plešek, CSc.
Institute of Thermomechanics
09/06/2015 – 31/12/2021

VP04
Natural Hazards
RNDr. Josef Stemberk, CSc.
Institute of Rock Structure and Mechanics
09/06/2015 – 31/12/2020

VP05
New Materials Based on Metals, Ceramics and Composites
Prof. RNDr. Ludvík Kunz, CSc., dr. h. c.
Institute of Physics of Materials
09/06/2015 – 31/12/2021

VP06
Diagnostic Methods and Techniques
Ing. Ilona Müllerová, DrSc.
Institute of Scientific Instruments
09/06/2015 – 31/12/2021

VP07
Wellbeing in Health and Disease
Doc. MUDr. Jakub Otáhal, Ph.D.
Institute of Physiology
09/06/2015 – 31/12/2021

VP10
Molecules and Materials for Life
Ing. Jiří Brus, Dr.
Institute of Macromolecular Chemistry
09/06/2015 – 31/12/2021

VP11
Europe and the State: Between Barbarism and Civilisation
Prof. PhDr. Petr Sommer, CSc., DSc.
Institute of Archaeology, Prague
09/06/2015 – 31/12/2021

VP12
Memory in the Digital Age
PhDr. Luboš Velek, Ph.D.
Masaryk Institute and Archives
09/06/2015 – 31/12/2021

VP14
Forms and Functions of Communication
Mgr. Alice Koubová, Ph.D.
Institute of Philosophy
09/06/2015 – 31/12/2020

VP15
Global Conflicts and Local Interactions: Cultural and Societal Challenges
Doc. PhDr. Marek Hrubec, 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 – 31/12/2021

VP17
Light at the Service of Society
Ing. Tomáš Mocek, Ph.D.
Institute of Physics
01/01/2017 - 31/12/2021

VP18
Preclinical Testing of Potential Pharmaceuticals
MUDr. Jan Kopecký, DrSc.
Institute of Physiology
01/01/2017 – 31/12/2021

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 – 31/12/2021

VP22
Society in Motion
Doc. Ing. Daniel Münich, Ph.D.
Economics Institute
01/01/2020 – 31/12/2021

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

M2
Research infrastructure support for Strategy AV21
Ing. Tomáš Wencel, MBA
CAS Centre of Administration and Operations
14/07/2015 – 31/12/2021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Projects from operational programmes

of EU Structural Funds

In 2020, CAS Institutes were involved in 193 research projects falling under EU Structural Funds operational programmes. CAS Institutes served as coordinators or beneficiaries of 162 projects, of which 56 were launched in 2020, 64 were ongoing, and 42 were completed during the course of the year. A summary of CAS Institutes' participation in the projects, categorised by operational programme, is provided in Table No 2. More detailed information about projects launched in 2020, including one-year projects, is presented in Table No 3. The total amount of approved support for the entire duration of the specified projects is CZK 1,379,966,000.

Tab. 1: Participation of CAS Institutes in operational programme projects in 2020

Operational programme	Projects launched	Projects ongoing	Projects completed	TOTAL
Integrated Regional Operational Programme	0	2	0	2
OP Enterprise and Innovation for Competitiveness	1	1	4	6
OP Prague - Growth Pole of the Czech Republic	0	2	1	3
OP Research, Development and Education	53	52	29	134
OP Employment	1	5	2	8
OP Environment	0	1	1	2
Interregional Cooperation OP Interreg Europe	0	0	1	1
Transnational Cooperation OP Interreg Central Europe	0	0	2	2
Cross-border Cooperation OP Interreg V-A Austria – Czech Republic	0	1	2	3
Cross-border Cooperation OP Interreg V-A Slovakia – Czech Republic	1	0	0	1
TOTAL	**56**	**64**	**42**	**162**

Tab. 2: Operational programme projects launched in 2020

Beneficiary coordinator	Project	Total approved support for the project in thousands of CZK
OP Enterprise and Innovation for Competitiveness		
ÚCHP	Research and Development of CASND Atomizer II drying equipment for production of encapsulated substances	**367**
OP Research, Development and Education		
ASÚ	EU-ARC.CZ ALMA observatory data processing cluster	**2,349**
ASÚ	Support of international cooperation in astronomy	**7,103**
BC	International mobility of researchers and administrators of the Biology Centre	**20,895**
BC	Marie Curie Fellowships – Bensaoud, Salomaki, Horváthová	**8,998**
BC	Anchoring the Biology Centre CAS in the European Research Area	**24,543**
BTÚ	International mobility of researchers of the Institute of Biotechnology CAS	**6,781**
BÚ	IBOAT – Institute of Botany: Opportunities for career growth and talent acquisition	**36,398**
FLÚ	Enhancing professional development at the Institute of Philosophy	**19,716**
FLÚ	Technology as a medium of human existence: a benjaminian techno anthropology	**4,514**
FGÚ	IPHYS Mobility II	**11,993**
FGÚ	IPHYS Mobility II MSCA	**5,789**
FGÚ	Optogenetic manipulation of interneurons in a rodent model of schizophrenia	**3,050**
FGÚ	Development of HR capabilities, internationalisation, popularisation and IP utilisation II	**13,306**
FZÚ	Future of Czech participation at the Pierre Auger Observatory II (AUGER-CZ)	**8,808**
FZÚ	European support of the Czech participation in construction of CTA observatory (CTA-CZ)	**10,758**
FZÚ	Investments for data processing and detector testing for the CERN-CZ RI	**14,998**
FZÚ	International mobility MSCA-IF IV FZÚ	**14,776**
FZÚ	Mobility of researchers FZÚ 2	**67,996**
FZÚ	Strategic activities for intensive capacity development of the Institute of Physics	**48,362**

MÚ	Institute of Mathematics CAS strives for a HR Award – implementation of professional HR management	**11,797**
MBÚ	International mobility of researchers of the Institute of Microbiology CAS No. 2	**20,833**
MBÚ	International mobility of researchers MSCA-IF III (Institute of Microbiology CAS)	**3,049**
SOÚ	International mobility SOÚ II	**3,217**
SOÚ	Public(s), education and education policy: values, attitudes, reasoning and experience	**13,366**
ÚČL	The limits of Literary Studies II.	**3,321**
ÚČL	Development of research and popularisation resources of the Institute of Czech Literature CAS	**24,504**
ÚEM	International mobility of employees from the Institute of Experimental Medicine CAS	**7,093**
ÚEM	Development of capacities of the Institute of Experimental Medicine CAS	**17,055**
ÚFA	Development of research and development capacities at the Institute of Atmospheric Physics CAS	**8,804**
ÚFCH JH	Modernisation and upgrade of nanomaterials and nanotechnologies for environmental protection and a sustainable future	**73,680**
ÚFCH JH	Optimisation of analytical methods for environmental and biomedical diagnostics	**7,101**
ÚFCH JH	Capacity development of ÚFCH JH for research and development	**16,504**
ÚFM	International mobility of employees of IPM	**7,022**
ÚFP	IPP - Mobility II	**7,495**
ÚFP	PALS-RI 2	**21,384**
ÚFP	Advanced liquid metal technologies for fusion applications (ALIMAT-F)	**92,818**
ÚCHP	ICPF Mobility II	**7,094**
ÚJF	Facility for antiproton and ion research - participation of the Czech Republic - OP II.	**23,646**
ÚJF	SPIRAL2 - Systeme de Production d'Ions Radioactifs Accélérés en Ligne – participation of the Czech Republic OP II.	**5,330**
ÚMG	Upgrade of CCP II infrastructure	**96,192**
ÚMG	Modernisation of the national infrastructure for chemical biology	**188,461**
ÚMG	Modernisation of the national infrastructure for biological and medical imaging Czech-BioImaging	**267,733**
ÚMG	International mobility of IMG researchers II	**9,460**
ÚOCHB	IOCB Mobility II	**19,683**
ÚOCHB	IOCB MSCA Mobility III	**3,101**
ÚOCHB	IOCB MSCA Mobility IV	**4,914**
ÚSMH	Positioning the zircon fission track partial annealing zones by fission track and micro-Raman spectroscopy: a key to understanding thermochronology, zircon material properties of and hydrocarbon maturity	**3,515**
ÚT	Mobility support for researchers from the Institute of Thermomechanics CAS, Part II	**2,501**
ÚT	Development of strategic management of the Institute of Thermomechanics CAS	**6,452**
ÚTAM	Human resource development of the ITAM CAS	**3,266**
ÚVGZ	CzeCOS UPgrade	**11,704**
ÚVGZ	Mobility CzechGlobe 2	**3,309**
ÚŽFG	Improvement of strategic management at the Institute of Animal Physiology and Genetics AS CR in research and development human resources	**37,284**
OP Employment		
BC	MOTÝL Butterfly Nursery	**2,497**
OP Environment		
ÚFA	Replacement of heating source - Milešovka	**943**
Cross-border Cooperation OP Interreg V-A Slovakia – Czech Republic		
ÚBO	Monitoring of wild cats	**12,338**

Practical application of research

The mission of the Czech Academy of Sciences encompasses an emphasis both on excellence in science and on the socio-economic relevance of the research conducted by its institutes. Relevance is understood in this context in the broadest sense, i.e. in terms of increasing the competitiveness of the national economy as well as the benefits and applicability of research results to non-commercial uses. This undoubtedly includes e.g. the application of research results from biological fields to environmental protection and the use of social scientists' expertise in the state administration.

A new conceptual document, the “Strategy for knowledge transfer in the CAS environment” was formulated based on a series of discussions with institute directors, knowledge and technology transfer experts and scientists involved in transfer or research for practical applications.

Strategy for knowledge transfer in the CAS environment

With the approaching end of the terms of office of the CAS Academy Council and Science Council and the conclusion of Academic TTO funding for the Technology Transfer Office of the CAS from the Research, Development and Education operational programme, it was necessary to define a knowledge transfer strategy in the CAS environment for the upcoming period. Formulation of the strategy was based on a series of discussions with institute directors and individuals charged with transfer tasks and scientists involved in transfer or research for practical applications. Despite the complications stemming from the restrictions caused by the anti-epidemic measures, extensive and in-depth interviews were conducted at institutes, albeit not at all, but certainly at those where collaboration with the application sector and knowledge transfer are relevant.

These efforts resulted in the “Strategy for knowledge transfer in the CAS environment”, which was submitted to the Academy Council. Given that it is a rather essential conceptual document, it was also presented to the Science Council; an extensive discussion was planned at the Science Council because it is a much more suitable forum for strategic and conceptual considerations than the Academy Council. Unfortunately, that discussion had to be cancelled due to the start of the second wave of the coronavirus pandemic, which further intensified as the year drew to a close. Thus, it is clear that the task of adopting the Strategy for knowledge transfer in the CAS environment will fall to the new Academy Council and discussion about the strategy will take place in the new Science Council.

Support of spin-offs and start-ups

In 2020, the Ministry of Industry and Trade working group (in which CAS representatives took part) published a brief brochure with methodological advice and recommendations for the establishment of spin-offs and start-up companies at public research institutions and universities. The brochure is the result of efforts under the National Innovation Strategy “Czech Republic, the Country for the Future”. Although the anti-epidemic measures effectively suspended the working group’s activities, at least this document became the first step to increasing the legal security of institutes seriously considering establishing a spin-off or start-up. A survey among CAS Institutes showed that there are a number of spin-offs and start-ups in the conceptual and preparation phases of development. There is thus good reason to anticipate that knowledge transfer and transmutation of results into practice through the establishment of spin-offs and start-ups at the CAS will soon become common practice. This would constitute an important step forward because international experience has proven that knowledge transfer has a solid future.

Evaluation of socio-economic relevance in the CAS environment

The first phase of evaluation took place in 2020. A second phase had also been planned but it had to be postponed until 2021 due to the anti-epidemic measures and related restrictions. The evaluation, particularly setting of parameters and criteria, has a very significant impact on research for practical applications, knowledge and technology transfer and collaboration with the application sphere in the broadest sense. Regular evaluation is effectively the only direct tool that the CAS employs to communicate what it expects from CAS Institutes, teams and individuals. It thus has a visible effect on their behaviour, preferences and the direction of their research.

The socio-economic relevance criteria of research results and teams had been broadly discussed in previous years, both at the CAS Technology Transfer Council and in the relevant evaluation preparation working groups. Two key principles have been embedded into the evaluation:

- Basic and applied research are not differentiated; all results are evaluated according to a unified scale which includes scientific excellence and socio-economic relevance criteria; this is based on the assumption that a result may be both of high scientific quality and socio-economically relevant,
- Evaluation of socio-economic relevance is based on potential rather than impact that has already been demonstrated.

Social relevance is understood in terms of the application potential of a result. Results evaluated for social relevance are either inspired by practice, created with an awareness of future practical application or developed per an assignment formulated or co-formulated by an application partner. The evaluation is intended to clarify whether a given result has application potential. The actual demonstration of the practical use of results is up to the application partner where the result was created in collaboration with the application partner, or will be the task of knowledge and technology transfer.

Given that it is an evaluation of research, the evaluation must include assessment of the innovativeness and creativity of the solution. The CAS clearly states that its mission is to focus primarily on research of high scientific quality and therefore socio-economic relevance evaluation emphasises professional criteria, similarly to basic research, i.e. innovativeness, complexity, seminality, etc. CAS research relies on public funding, i.e. outside of the market environment. Use of public funding is justified by the fact that when it comes to research, the market fails. Practice and experience have shown that emphasising previously demonstrated socio-economic relevance would lead to a preference for simple solutions to elementary problems, an approach that is not compatible with the CAS mission.

Link to national Methodology 2017+

The issue of evaluating applied research became a national issue in 2020. Methodology 2017+ was inspired by CAS evaluations that had taken place in prior years. However, evaluation of Methodology pillars I and II showed that the results of applied research, primarily at technical universities, generally received worse assessments than results of basic research. Determining the reason why is not a simple matter and continues to be the subject of discussion in R&D&I Council working groups. CAS representatives are involved in these groups. Whatever the outcome will be, it is an extraordinarily important step because it is clear that Methodology 2017+ is beginning to finally fulfil its intended function and is capable of revealing a great deal about the Czech research environment. It is becoming very clear now that merely calculating research results according to the Register of Information on Results (i.e. known as the coffee-grinder - an evaluation mechanism overly focused on points) would have zero informative value.

The applied research results of the first two M17+ pillars inevitably beg the question of whether applied research in the Czech Republic is truly worse, whether the problem is about setting criteria or reporting and presenting results, or whether it is a deeper systemic issue related to the Czech research environment. One pregnant question is why applied research in the CAS environment manifests better evaluation results. The fact that the CAS places primary emphasis on the scientific quality of research (even applied research) and evaluating research according to its application potential, not only according to its previously demonstrated socio-economic relevance, most likely plays a role here. In any case the conclusions, which may help improve the environment and conditions under which applied research is conducted in the Czech Republic, are promising.

The issue of public funding of research

In 2020, the methodological guideline "Identification of economic and non-economic activities of research organisations and research infrastructure in research, development and innovation" was completed and approved by the government. This is not an isolated document; a similar methodological guideline was developed at the EU level in parallel called "State Aid Rules in Research, Development & Innovation, Addressing Knowledge and Awareness Gaps among Research and Knowledge Dissemination Organisations" and published at the end of the year.

The issue of public funding is a complex and multi-layered problem that cannot be wholly ignored by the research sector. Research benefitting a commercial entity may, in certain circumstances, constitute indirect public support and can be viewed as a type of market deformation. In order to avoid such situations and ensure that research organisations do not become the target of excessive market deformation criticism from the business sector, the EU set forth rules in its "Framework for State aid for research and development and innovation (2014/C 198/01)" and "General Block Exemption Regulation (GBER)".

Although the volume of CAS activities that could be considered indirect support and market deformation is (so far) small, systemising interpretation of public support rules is an important step. It increases research institutes' legal certainty. CAS representatives played a considerable role in preparation of both documents. In addition, it is safe to assume that the EU state aid rules will be revised and in all likelihood simplified in 2021. There are several reasons for this. First and foremost, the explication is problematic and enables a restrictive interpretation, which we are witnessing in the Czech Republic as well as most EU 13 member states. Furthermore, we now have the Green Deal goals as well as the current experience with the coronavirus pandemic. CAS representatives will definitely take part in commenting on the new rules.

Selected Examples of Research

for Practical Application

Institute of Physics

In collaboration with the company MIT, spol. s r. o., a picosecond thin-disk laser Perla 100 platform system was developed and implemented. The system is composed of femtosecond fibre oscillator modules with a preamplifier, a regenerative thin-disk amplifier with a pulse compressor and a system for converting the basic wavelength of 1,030 nm to the 2nd and 4th harmonic frequencies. The laser will serve as a tool for picosecond micromachining.

Institute of Photonics and Electronics

The basis of power electronics are large-area semiconductor PN junctions. A technology was developed and the composition of colloidal boron solutions was optimised for the preparation of homogeneously n-doped semiconductors with a high concentration of dopants. Two utility models and a patent were developed utilising the research results. The partner is the company ABB s.r.o.

Institute of Physics of Materials

A powder compaction method based on volume forming was patented. The powder to be compacted consists of a metal matrix containing at least one type of strengthening metal oxide with a volume fraction of 1-10%. After compaction, the powder is annealed to provoke secondary recrystallisation. The technology may be applied to the production of refractory materials for mechanically stressed structures up to 1,300° C.

Institute of Plasma Physics

A prototype for hyperspectral imaging in the LWIR spectral region was developed for industrial use. The complete optical electronic system works in the long-wave infrared region and is intended particularly for gas identification. The system includes a software application for controlling the scene scanning process and basic evaluation of spectral profiles. The company Applic s.r.o. plans to manufacture and sell systems based on this prototype.

Institute of Geonics

A 3D geomechanical mathematical model of excavations for the construction of the Bukov underground research facility was designed. The findings will be used in the excavation and construction of a national underground laboratory for investigation of spent nuclear fuel storage processes in relation to rock mass stress deformation. The partner is DIAMO state-owned enterprise, Stráž pod Ralskem, GEAM branch, Dolní Rožínka.

Institute of Computer Science

A new model is being used by an energy market operator, OTE, a.s., gas distribution companies in the Czech Republic and natural gas traders to model typified diagrams of natural gas supply.

Nuclear Physics Institute

A device for measuring the mixed radiation field of photons and neutrons, consisting of a PIN diode and a radiator system with a large effective cross-section, was patented. The device will be used to measure mixed fields of neutrons and photons, which occur very often and in which the separation of photons and neutrons is very difficult.

Institute of Scientific Instruments

An optical fiber sensor for measuring deformation in an environment with ionizing radiation was designed to measure relative deformation on industrial structures based on sensory elements using fiber Bragg gratings. The system uses a pair of fiber gratings, where one measures the mechanical stress and the other compensates for temperature effects. The partners are the Nuclear Physics Institute Řež, a. s., and NETWORK GROUP, s.r.o.

Institute of Rock Structure and Mechanics

A device for material and energy transformation of sewage sludge into high-phosphorus fertiliser was designed in collaboration with the company TARPO spol. s r.o.

Institute of Information Theory and Automation

A unit was designed to support the testing and development of thermal energy control systems in a unified driver-vehicle interface concept, based on inertial systems connected to the vehicle bus, knowledge of vehicle satellite position, sensing of bio-physiological parameters of driver status and vehicle dynamics. The Institute is developing vehicle assistance systems in collaboration with its industrial partner, Škoda Auto a.s.

Institute of Thermomechanics

A radiofrequency plasmatron source with an ignition system was developed in collaboration with the Taiwanese ITRI. A radio frequency power oscillator was developed to power a small argon plasmatron with dielectric barrier discharge preionisation to initiate the discharge. The plasma source system will be applied in surface modification and plasma-assisted synthesis and deposition of functional layers.

Biology Centre

A kit for fast, effective testing of RNA-dependent RNA polymerase inhibitors for tick-borne encephalitis virus was developed. The kit enables testing of potential virus inhibitors even outside of areas designated for hazardous biological agent handling.

Institute of Biotechnology

In collaboration with DYNTEC spol., a recombinant plasmid carrying the gene encoding Paenibacillus phage phiBB_P123 was developed and a corresponding recombinant enzyme was generated, whose function was verified using analytical, enzymatic and biochemical approaches. The plasmid is being developed as a medicinal product to protect bee colonies against bee brood diseases.

Institute of Botany

A method was patented for generating low-temperature plasma in liquids, which is suitable for plasma treatment of liquids, solids and gases. The invention may be used for water purification.

Institute of Physiology

Amphiphilic compounds with neuroprotective effects were patented. They may be used as medication for treating neuropsychiatric disorders associated with glutamatergic neurotransmitter imbalances, such as ischemic central nervous system damage, neurodegenerative changes and central nervous system disorders, affective disorders, depression, post-traumatic stress disorder and diseases related to stress, anxiety, schizophrenia and psychotic disorders, pain, addictions, multiple sclerosis, epilepsy and glioma.

Institute of Microbiology

The patented recombinant tyrosinase preparation solution involves a block copolymer for overcoming tumour drug resistance to chemotherapy, which comprises blocks A and B connected to each other by a covalent bond or a hydrolytically or enzymatically biodegradable link. The invention also includes a polymeric conjugate comprising a block copolymer and a low molecular weight drug, comprising a pharmaceutical composition, and may be applied in medicine.

Institute of Analytical Chemistry

A gas and aerosol monitoring device was developed and tested. Samples are collected in sorbents, using standard silica gel as the sorbent for ^{3}H and standard sodium hydroxide for ^{14}C. Activity values obtained through analysis of the samples serve to determine the balance of ^{3}H and ^{14}C discharged from nuclear facilities. The monitor will be used to monitor radiation in nuclear power plants.

Institute of Inorganic Chemistry

In collaboration with TOSEDA s.r.o., laboratory-scale preparation of graphene oxide and reduced graphene oxide quantum dots was verified. A modified process for the preparation of these two materials enables their easy dispersion into the hydrophobic polymeric environment. Only high quality dispersion makes it possible to prepare a nanohybrid system with exceptional properties, such as high light absorption in the near UV region and extreme temperature resistance.

Institute of Chemical Process Fundamentals

A memory element for storing an n-bit code for $n \geq 2$ formed by a photochemical cell, which comprises a support substrate with an array of electrodes surrounded by a gel electrolyte, was patented. The values of the output Im photocurrents form an n-bit code. The memory element can be used in particular as a carrier for short multi-bit information.

Institute of Experimental Botany

A set of associated red clover SNP markers for phytoestrogen content, polyphenol oxidase activity, and WC1MV and RCMV viral disease resistance was patented. DNA markers in connection with a significant agronomic trait can accelerate the breeding process of red clover.

Institute of Experimental Medicine

A license for a medicinal product for the prevention and treatment of inflammatory and degenerative diseases was used by the company H_2 WORLD HEALTH & BEAUTY COMPANY s.r.o., which is developing production and sale of products and devices on the basis of one of the Institute's patents.

J. Heyrovský Institute of Physical Chemistry

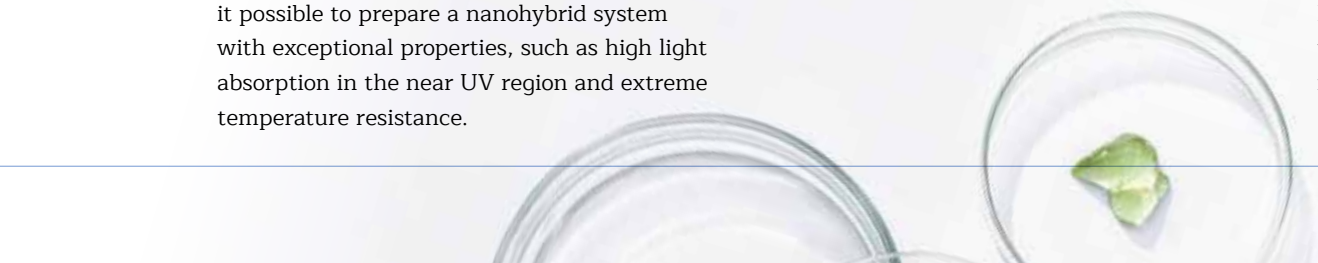
In collaboration with HE_3DA s.r.o., a basic 4V building element of a 48V lithium accumulator was developed for an automotive industry accumulator design. The result aims to increase competitiveness in the international automotive industry battery market.

Institute of Macromolecular Chemistry

A new advanced polyurethane foam dressing containing a chemically bound antioxidant was developed in collaboration with VH Pharma a.s. to accelerate the healing of chronic antimicrobial wounds.

Institute of Organic Chemistry and Biochemistry

A Lyme disease vaccine was patented comprising at least two types of chimeric polyepitope recombinant antigens, which contain immunodominant OspA and OspC antigen regions and at least one adjuvant and/or ferritin II.



Global Change Research Institute

A screening diagnostic kit for histone detection in extracellular histone complexes was patented. Elevated histone levels, either alone or within intact nucleosomes in the bloodstream, are one of the biomarkers in the prognosis and diagnosis of several types of cancer, stroke and sepsis. The result may be applied in oncology and medical diagnostics.

Institute of Animal Physiology and Genetics

Magnetic nanoparticle complexes for transfection and gene editing in mammalian cells were patented. The system can be used to test for non-viral transmission of gene therapy.

Institute of Philosophy

A draft of a new "Service Regulation of the Deputy Minister of the Interior for the Civil Service", which set forth ethics rules for civil servants, was developed.

Economics Institute

A study of Industry 4.0 on the Czech market was developed for the Confederation of Industry of the Czech Republic based on a survey among Czech companies regarding Industry 4.0 technology expansion. The analysis did not reveal a tendency of making less skilled workers redundant but did show that wages. There is not a tendency to make less skilled workers redundant, wages rise at all employee levels and overtime decreases. The study will inform employee associations' decision-making processes and public discourse on the status and impacts of implementation of Industry 4.0 technologies in the Czech Republic.

Institute of Psychology

An application called Coronavirus COVID-19 was developed in collaboration with the Faculty of Arts of Charles University, Ministry of the Interior of the Czech Republic, City of Prague Emergency Medical Services, South Bohemian Region Emergency Medical Services and General Directorate of the Fire Rescue Service of the Czech Republic. The application is a source of comprehensive information for Czech citizens as well as expert information and recommendations. It may be downloaded free here: https://play.google.com/store/apps/details?id=com.appsisto.coronaviruscovid19&hl=cs&gl=US.

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 9,751 in 2019 to 9,968 in 2020. A total of 4,884 employees are paid through extra-budgetary allocations (which equalled 48.99% in 2020 compared to 49.67% in 2019). The number of research institute employees with university degrees who have passed arduous attestations pursuant to the Career regulations of CAS employees with university degrees and have been classified in the relevant qualification levels grew year-on-year from 5,940 to 6,072.

The Czech Academy of Sciences and its Institutes expended a total of CZK 5,520,586,000 on salaries and wages and CZK 182,735.000 for other payments for work (OON). The total average monthly salary at the CAS was CZK 46,154 with year-on-year growth of 4.24% from 2019.

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Chart No. 1: Number of employees and average monthly salary at the CAS

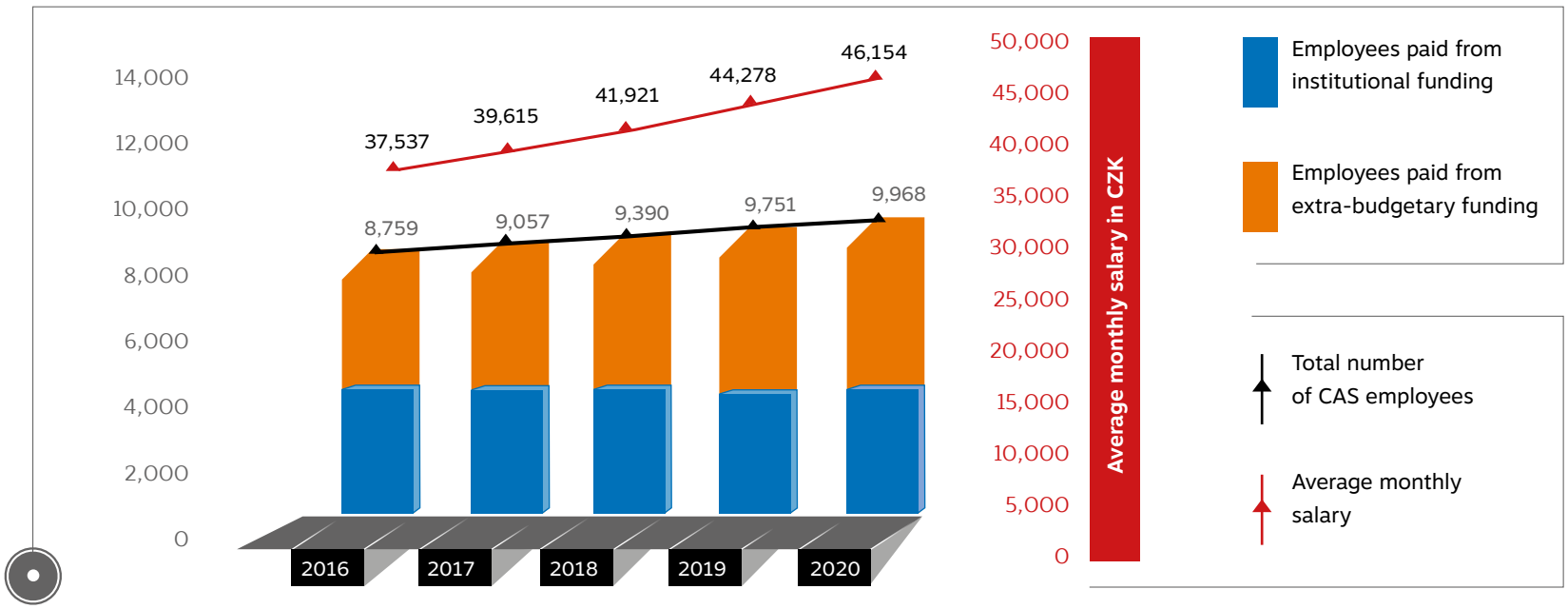


Table No. 3 provides a more detailed look at the number of CAS employees categorised into employees of the CAS Head Office and employees of all CAS research institutes.

Table No. 3: Number of CAS employees

Year	2016	2017	2018	2019	2020
CAS public research institutions	8,685	8,983	9,314	9,672	9,893
CAS Head Office	74	74	75	79	75
CAS TOTAL	**8,759**	**9,057**	**9,390**	**9,751**	**9,968**

At the CAS Head Office, CZK 50,986.644 was expended for salaries and CZK 1,506.455 for other payments for work performed for 74.72 employees (recalculated as average FTE). Deferred liabilities totalling CZK 18,174 for salaries and CZK 16,630 for other payments for work performed were carried over. The average monthly salary of CAS Head Office employees excluding CAS elected officials was CZK 50,871 in 2020.

Elected officials of the CAS (CAS Academy Council chairman, deputy chairs and members) are also remunerated at the Czech Academy of Sciences pursuant to Government Regulation No. 341/2017 Coll., on the Salaries of Employees in Public Services and Administration. For this reason, elected officials are counted among CAS Head Office employees, and therefore the total average salary in the state organisational unit - CAS was CZK 56,864. The average salary rose by 4.77% from 2019.

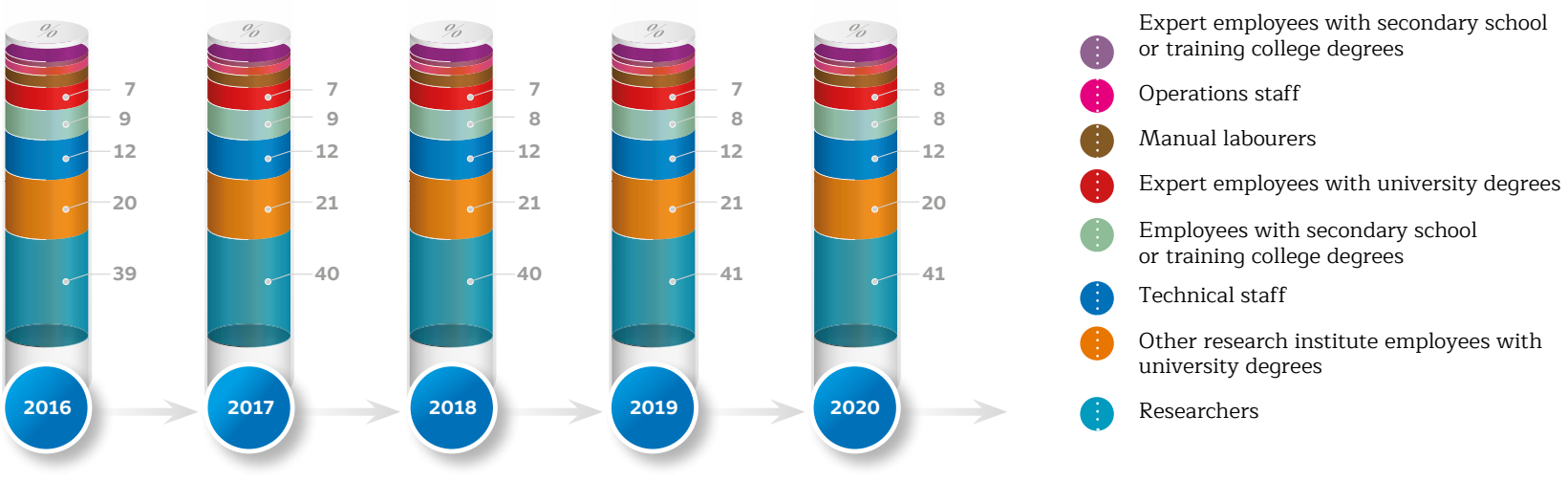
The total spent across all CAS Institutes (public research institutions) in 2020 for 9,893 CAS employees was CZK 5,469,560,000 for salaries and CZK 181,228,000 for other work performed. The average monthly salary equalled CZK 46,073 with year-on-year growth of 4.25% from 2019.

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

Table No. 4: Number of employees and average monthly salary per category for 2020

Category	Average recalculated number of employees	Average monthly salary in CZK
Researchers	4,046	58,446
Other research institute employees with university degrees	2,026	36,144
Expert employees with university degrees	798	44,626
Expert employees with secondary school or training college degrees	762	33,346
Expert R&D employees with secondary school or training college degrees	213	35,507
Technical staff	1,203	45,698
Manual labourers	501	27,342
Operations staff	344	25,646
Total	**9,893**	**46,073**

Chart No. 2: CAS research institute employee categories

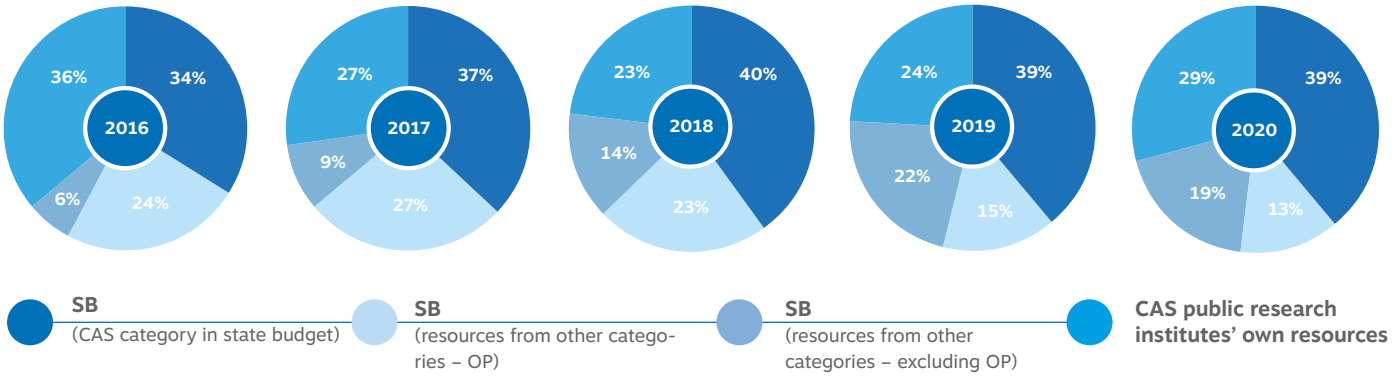


Financial resources

and their use

In 2020, the Czech Academy of Sciences managed a total of CZK 17,116.08 million, of which CZK 6,668.61 million came from the CAS category in the state budget (SB). This state budget funding equalled 39% of the CAS' total financial resources in 2020. The share of CAS public research institutes' own resources changed year-on-year due to an increase in income from licenses of the Institute of Organic Chemistry and Biochemistry and a decrease in resources from other budget categories (excluding operational programmes).

Chart No. 3: CAS Financial resources (in %)



Financial resources (for the entire CAS) originating from the CAS budget category, subsidies from other budget categories and the CAS' own resources are summarised in the following table.

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

Financial resource	Non-investment resources	Investment resources	TOTAL
Resources from the CAS budget category	**5,301.54**	**1,367.07**	**6,668.61**
Subsidies from other budget categories	**4,596.45**	**951.85**	**5,548.30**
GA CR grants	1,790.38	34.98	
TA CR projects	455.59	0,00	
Projects of other ministries, including operational programmes	2,350.49	916.87	
Public research institutes' own resources	**4,899.17**		**4,899.17**
Commissions relating to main activity	258.61		
Publication sales	83.47		
Rent	89.97		
Licenses	2,908.21		
Sale of goods and services	168.76		
Conference fees	2.13		
Interest, exchange rate profit	200.59		
Sale of material and securities	425.24		
Foreign grants and gifts	364.92		
Resources from own funds	162.79		
Other	234.48		
Total resources	**14,797.16**	**2,318.92**	**17,116.08**

CAS Institutes used CZK 13,352.30 million of the total non-investment resources of CZK 14,797.16 million to cover their own expenses.

> In comparison to 2019, the total expenditures of CAS Institutes (public research institutions) increased by CZK 1,618.06 million.

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.

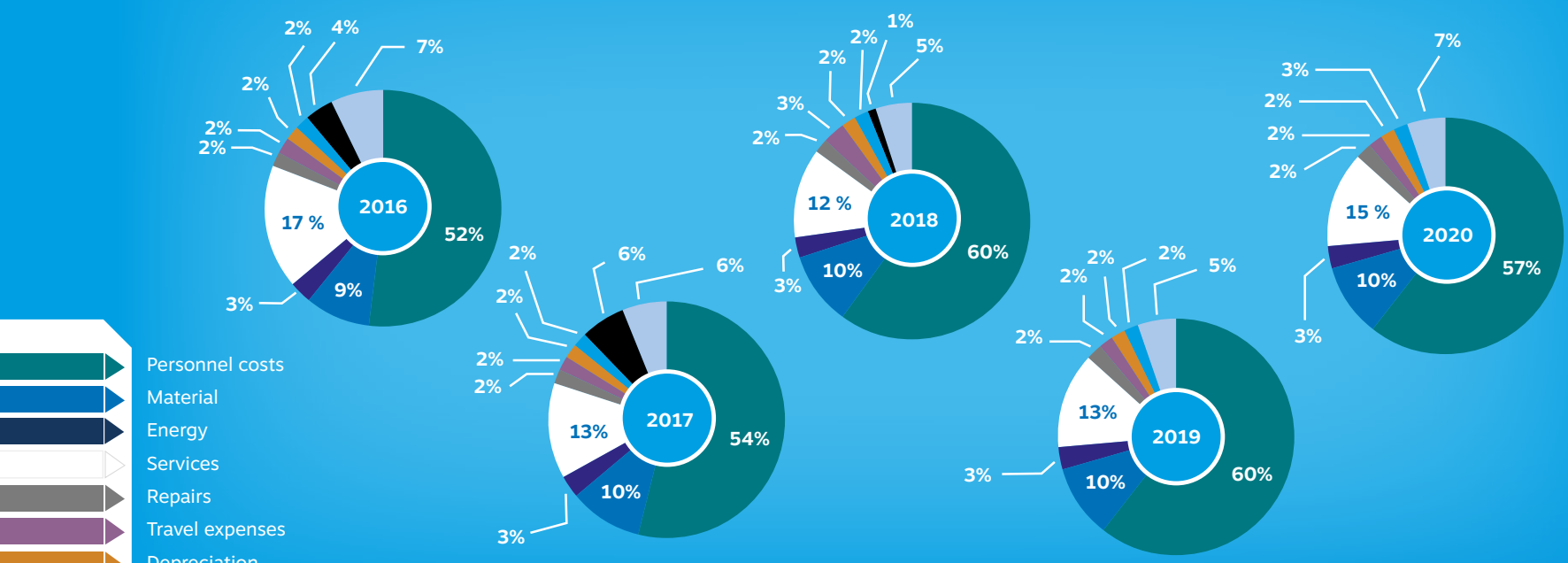
In comparison to 2019, the total expenditures of CAS Institutes (public research institutions) increased by CZK 1,618.06 million. A detailed breakdown of the expenditures of CAS Institutes is provided in the following table.

Table No. 6: Structure of non-investment expenditures of CAS Institutes (in mil. CZK)

Type of expenditure	2019	2020	Difference
Personnel costs (wages, mandatory insurance paid by the employer, sickness insurance benefit reimbursements)	7,057.15	7,554.50	497.35
Materials (e.g. books, journals, small tangible assets, consumable supplies, protective gear)	1,203.96	1,323.97	120.01
Energy, water, fuel	333.24	340.48	7.24
Services (postal services, small tangible assets, rent, conference fees, other services)	1,526.29	2,002.50	476.21
Repairs and maintenance	287.31	237.99	-49.31
Travel expenses	292.43	65.93	-226.50
Creation of targeted funds in total	182.95	261.50	78.54
Transfer to social funds and other social expenses	246.67	261.27	14.60
Taxes and fees	307.99	300.15	-7.84
Depreciation of fixed assets	209.47	216.01	6.54
Exchange rate losses	47.83	299.96	252.13
Securities and shares (sale of)	0.00	412.82	412.82
Other expenses (accident insurance, fines, damages)	132,02	151.56	19.55
Inventory change - own performance	-12.14	0.14	12.28
Activation of material, goods, services and property	-80.93	-76.48	4.45
CAS Institutes expended a total of	11,734.25	13,352.30	1,618.06

A significant cost item consists of depreciation of assets acquired with subsidies amounting to CZK 1,763.42 million, which is not included in this table.

Chart No. 4: Use of non-investment resources (in %)



A comparison of non-investment resources expended by CAS Institutes during the monitored period of 2016 to 2020 shows that there have been only slight changes to the ratios of the main categories.

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

Table No. 7: Investment resources of CAS Institutes (in mil. CZK)

Financial resource	2019	2020	Difference
Resources from the CAS category of the state budget	1,289.2	1,366.3	77.1
Resources from other ministries, including operational programmes	1,089.1	951.9	-137.2
Depreciation	218.0	213.0	-5.0
Transfer of additional profits	48.5	43.4	-5.1
Foreign grants and gifts	55.5	27.7	-27.8
Revenue from sale of fixed assets	63.8	33.2	-30.6
Aggregation of funds to acquire fixed assets	13.2	4.1	-9.1
Total	**2,777.3**	**2,639.6**	**-137.7**

Table No. 8: Use of investment resources by CAS Institutes (in mil. CZK)

Type of expenditure	2019	2020	Difference
Financing of buildings	460.1	1,040.0	579.9
Acquisition of instruments and equipment	1,754.5	1,639.3	-115.2
Maintenance and repairs	61.6	31.5	-30.1
Other	232.8	246.7	13.9
Total	**2,509.0**	**2,957.6**	**448.6**

Resource generation in 2020 equalled CZK 2,639.6 million and CAS Institutes used a total of CZK 2,957.6 million in 2020. The asset reproduction fund decreased by CZK 318 million.

Controlling

The CAS controlling system is based on requirements associated with the decision-making and management processes of CAS bodies and fulfils the purpose and intent of public administrative controlling. The Division of Public Administration Control of the CAS Head Office (hereinafter the OVK or "Division of Public Administration Control"), which reports directly to the President of the CAS, 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.

Controls are conducted pursuant to the approved annual plan in alignment with the thematic focus of specific controlling events. Division of Public Administration Control controlling ensures that requirements stemming from the financial control act and other public administration controlling regulations are met. This provides for the content and practical implementation of the requirement to verify management of state budget funding disbursed by the CAS as the administrator for the science and research budget category.

As in previous years, auditing of controlled entities focused mainly on examination of relations to state budgets, fulfilment of legal conditions during utilisation of budget funding, due record-keeping and reporting. In 2020, the Division of Public Administration Control focused once again on labour relations, particularly fulfilment of conditions stipulated by the labour code including employee liability for loss events at work, conducted standard auditing of the functionality and efficiency of internal controlling systems at CAS Institutes, and verified controlled entities' management of intangible assets acquired with state funding.

The Division of Public Administration Control paid particular attention to controlled entities' contractual relations in regard to exercising property rights for intangible assets and optimising use of tangible assets and to supplier-customer relations with respect to fulfilling conditions of both economic and non-economic activity pursuant to the EU directive.

The Division of Public Administration Control also examined compliance with procedures for the preparation, implementation and financing of capital investments as stipulated by valid legal regulations and internal rules and with legal tendering regulations, including due diligence in property management. Throughout 2020, the Division of Public Administration Control examined, in particular, whether: conditions set forth by budgeting rules were adhered to, all transactions were properly reported in accounting, asset records were properly maintained and the principles of economy, effectiveness and efficiency were followed during use of the controlled entities' financial resources and assets.

Heightened attention was also paid to verifying compliance with essential requirements stipulated by the CAS Statutes, decisions made by CAS bodies and the internal regulations of the CAS and CAS Institutes regarding financial management and use of institutes' assets. Cases of non-compliance with legal regulations that were identified during controls were described in control reports and the findings were always discussed at length with the management and responsible employees of the controlled entities. The identified problems were subsequently analysed in greater detail to create, after appropriate generalisation and processing, a basis for methodological work in regard to the financial management departments of CAS Institutes. The Division of Public Administration Control uses the conclusions and analyses of control findings in its methodological work to prevent reoccurrence of identified irregularities. In all cases, control reports and conclusions were

submitted to the President of the CAS and other members of the Academy Council Presidium to inform their discussion of public administration controlling results at CAS Academy Council sessions.

Despite the very adverse situation caused by the covid-19 epidemic and subsequent government regulations that fundamentally restricted people's mobility and social contacts, the Division of Public Administration Control fulfilled the approved 2020 controlling plan. The Division of Public Administration Control conducted controls at eight institutes; the results of the financial management controls which took place at the following institutes:

- Institute for the Czech Language
- Institute of Archaeology, Prague
- Institute of Atmospheric Physics
- Institute of Physiology

were discussed with the management of the given institutes. The directors of the controlled institutes subsequently adopted relevant measures to remedy the identified irregularities. The Division of Public Administration Control will continue to monitor implementation of these measures.

In 2020, the Division of Public Administration Control also completed controls at the following institutes:

- Institute of Inorganic Chemistry
- Nuclear Physics Institute
- Institute of Geonics
- Institute of Mathematics

Discussions with the management and responsible staff of each institute regarding the financial management control findings at these institutes were postponed until January 2021 for the aforementioned objective reasons.

The Division of Public Administration Control also controlled 11 scientific societies associated in the Council of Scientific Societies of the Czech Republic, with detailed audits of use of 23 project grants. This was 14.5% of the total volume of funding provided to the given entities in 2020 through the CAS state budget category.

Controls were conducted at the following societies:

- Czech Archive Society
- Czech Society of Experimental Plant Biology
- Czech Geological Society
- Czech Zoological Society
- Czech and Slovak Crystallographic Association
- Czech Association for the Study of Religions
- Czechoslovak Microscopy Society
- Czech Association of Art Historians
- Association of Historians of the Czech Republic (History Club 1872)
- Czech Society for Ecology
- Czechoslovak Microscopy Society

The Division of Public Administration Control's standard tasks also include processing complaints and suggestions sent to the Academy bodies and the CAS Head Office. In addition to cases sent directly to the Division of Public Administration Control, the Division maintains records of other complaints, intermittently monitors settlement of complaints and in some cases takes part in finding solutions. In 2020, the Division of Public Administration Control addressed or recorded six complaints. Four of these were deemed unsubstantiated and one justified; in the last case the party stopped communicating with the Division despite reminders.

Audits of accounting in EU framework programme projects were also conducted. The volume of audited funding in 2020 equalled CZK 25,307,000.

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 all scientific fields. Another means of support is the Otto Wichterle Award for prospective 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 Czech Academy of Sciences also offers targeted support for early career scientists through three further programmes: the Programme to Support Prospective Human Resources – Post Ph.D. candidates, the Programme for Research and Mobility Support of Starting Researchers and the Josef Dobrovský Fellowship Programme. Each year, the prestigious Czech Academy of Sciences Prizes reward successful scientists for their outstanding scientific results.

PRAEMIUM ACADEMIAE – ACADEMIC PREMIUM

The Academic Premium is the most significant means of support of 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 financial support awarded.

THE 2020 ACADEMIC PREMIUM AWARD-WINNERS INCLUDE:

RNDr. Petr Šittner, CSc.
Institute of Physics

Dr. Šittner is a leading global expert in research of martensitic phase transformations and the thermomechanical behaviour of shape memory alloys (SMAs). These functional metallic materials demonstrate thermomechanical properties that are wholly atypical in metals, such as extreme reversible deformability – super elasticity, shape memory ability i.e. the capacity to return to a pre-set shape when heated after deformation, and the ability to work in the thermal cycle, i.e. thermal actuation. Shape memory alloys have been used in practical applications for some time, primarily in the medical, aerospace, automotive and consumer product industries.

After his dissertation defence at the Institute of Physics, Petr Šittner worked for several years as an assistant at the Faculty of Engineering of Mie University in Japan, where as part of Professor Tokuda's group he introduced a new direction in theoretical and experimental research into the thermomechanical behaviour of SMAs under general stress, which was subsequently advanced by a number of leading teams in the USA, France and China.

After returning to the Czech Republic, he worked on use of neutron diffraction to study deformational processes in metallic materials demonstrating martensitic transformation. He and his team received the 2016 Siemens Award for the most important basic research outcome for the research results they published in the journal *Science*. Petr Šittner is also involved in developing new neutron diffraction and imaging methods as part of the Czech team for the construction of the European Spallation Source in Lund, Sweden.

During the past twenty years, he has been a visiting professor at Mie University in Japan, Western Australian University in Perth and Université Franche-Comté in Besançon, France and Université Joseph Fourrier in Grenoble, France.

The research which earned Petr Šittner an Academy Premium – Praemium Academiae concerns deformational mechanisms in metallic alloys related to SMAs, which, however, unlike SMAs do not exhibit martensitic phase transformations during temperature changes, but whose structure can be continuously and reversibly modified to a large extent under mechanical strain (supercritical elasticity). The aim of the research is to find the chemical composition and parameters of thermomechanical processing of multi-element metallic alloys manifesting supercritical elasticity.

prof. RNDr. Pavel Zemánek, Ph.D.
Institute of Scientific Instruments

Dr. Zemánek is an outstanding expert in photonics, a field that lies at the intersection of the physical and engineering sciences, and addresses the unconventional use of laser beams in the microworld.

He earned a degree in physical electronics at the Faculty of Science of Masaryk University in Brno, and completed fellowships in laboratories at Oxford University and the University of St. Andrews.

He has worked at the Institute of Scientific Instruments since 1991. He and his team address forces coming from the interaction of photons with matter that provide, e.g. manipulation of miniature objects by means of a light tractor beam or optical tweezers, self-assembly of microobjects by light into optically bound matter and characterisation of living microorganisms (e.g. algae, yeast, bacteria) using Raman tweezers. The latter can be used to identify the type of bacterium contactlessly and non-destructively or detect the bacteriophage infestation of an individual cell within minutes.

With the Academic Premium support, Pavel Zemánek will lead his research group in studying the classical and quantum behaviour of complex nanoobjects levitating in a vacuum in a light beam, and will employ laser cooling of their motion to the lowest energy states to reach a "macroscopic" mechanical quantum system. These experiments aim to contribute to the development of quantum technologies, which include, for example, more sensitive sensors, quantum simulators and testing of future noise-driven nanomotors at the quantum energy level.

Dr. rer. nat. Leoš Valášek, DSc.
Institute of Microbiology

Dr. Valášek graduated from the Faculty of Science of Charles University in genetics and molecular biology. He received his doctorate in biochemistry from the University of Vienna. He worked as a postdoctoral student at the Laboratory of Gene Regulation and Molecular, Cellular, and Developmental Biology of the US National Institutes of Health (NIH).

After returning to the Czech Republic in 2006, Dr. Valášek founded the Laboratory of Gene Expression Regulation at the Institute of Microbiology, which he leads. The laboratory investigates the principles of one of the fundamental molecular processes in the cell; i.e. protein synthesis (translation), which takes place through the ribosome and a number of translation factors.

His team of researchers is particularly interested in studying translation regulation at both general and gene-specific levels. The team also examines how cells respond to constantly changing environmental conditions by regulating protein synthesis changes and what deregulated changes occur in various pathologies. The evidence demonstrating the significance of proper translation regulation is astounding. Even a small disruption to the timing, spatial distribution, and/or accuracy of synthesis in key protein cell life causes or accompanies many human diseases. It is therefore unsurprising that even the expression of the very genes that encode translation factors is often deregulated, e.g. during oncogenesis. The research group intends to use the Academic Premium to clarify the roles of all translation control factors, specifically on the decision-making processes between each translation step, which can either terminate, extend, or enable the generation of other proteins.

To pursue this aim, the group intends to use its recently developed breakthrough technology Sel-TCP-Seq, which was described in the prominent journal Molecular Cell in August 2020. In addition to several other secondary objectives, the group plans to use this technology to investigate the molecular mechanisms and consequences of selected translation factors' roles in the malignancy process at the whole genome level.

prof. RNDr. Jitka Klimešová, CSc.
Institute of Botany

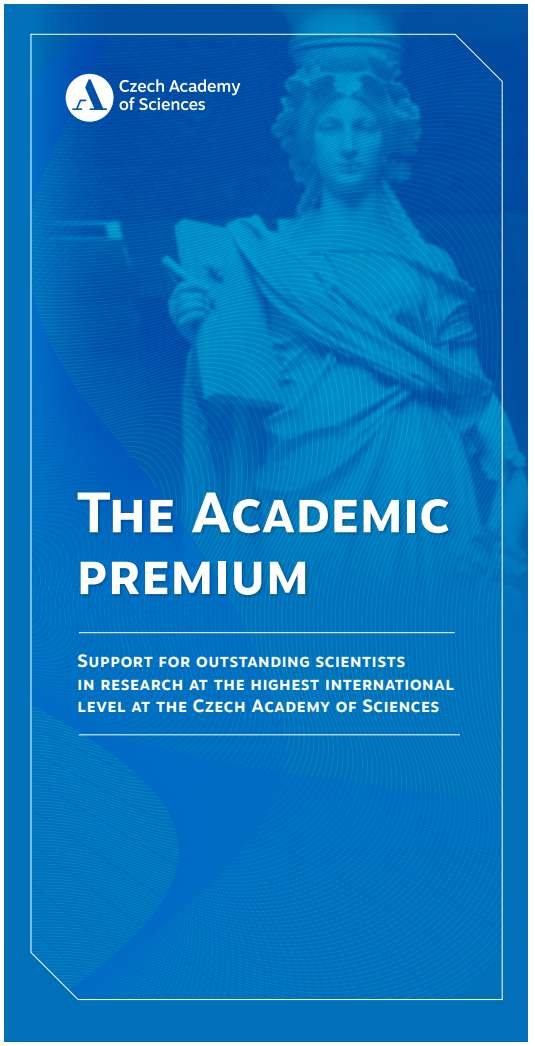
Dr. Klimešová focuses on ecology and plant functional morphology, a field that investigates how plant traits affect plant functions.

She studied systematic biology and ecology at the Faculty of Science at Charles University. She focuses on population biology, functional morphology and plant ecology. She has had several research fellowships abroad, including a one-year fellowship at the Smithsonian Environmental Research Center in Edgewater, MD, USA. She has participated in numerous scientific expeditions to the Svalbard archipelago in the Arctic Ocean, the Inner Mongolian steppe and the prairies of North America.

She has a longstanding interest in the traits and functions of underground plant organs, an area of study that was commonly neglected in the past. For more than 25 years her research team has specialised in, inter alia, clonal growth (plant reproduction using rhizomes, tendrils and tubers), plant regeneration after disturbances and carbon storage.

Dr. Klimešová's team has developed a standard methodology and a unique database of clonal and regenerative traits describing Central European flora.

The aim of the research supported by the Academic Premium is to describe the functional parameters of the economic spectrum of underground plant organs and to find out how they affect the function of aboveground organs and fine roots, plant reproduction, regeneration and competition. The results may be used to refine climate models (carbon sequestration in herbal communities), to study the evolution of storage organs, which are an important food source, or to predict vegetative evolution due to global change, especially the disturbance regime. The results will also be very useful for agricultural practices.



LUMINA QUAERUNTUR **FELLOWSHIP**

The Lumina Quaeruntur Fellowship provides financial aid to prospective 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 foreign grant agency during the fellowship, and the length of the fellow's scientific practice since receiving a doctorate must be a maximum of 10 years. Both Czech and foreign researchers are eligible for the fellowship.

IN 2020, SEVEN SCIENTISTS FROM DIVERSE CAS INSTITUTES BECAME LUMINA QUAERUNTUR FELLOWS:

Georgios Loukes-
-Gerakopoulos, Ph.D.
of the Astronomical Institute

The fellowship will enable his scientific group to focus on investigation of gravitational radiation from extreme mass ratio systems. The group aims to study the effect of resonances and chaos in these systems on gravitational waves.

PhDr. Jan Zápal, Ph.D.
of the Economics Institute

Dr. Zápal is initiating a research programme titled Challenges of democracy. The project will examine three phenomena which directly threaten democracy: the social activity of robots programmed to intervene in democratic elections, detailed targeting of voters with the goal of changing their behaviour during political campaigns and the lack of policies to prevent social problems. The team will e.g. design a web platform to monitor social robots on-line and describe in detail the groups most vulnerable to robots' activity, thus interweaving expertise in economics, political science, computer science and artificial intelligence.

Dr. Ippocratis Saltas, Ph.D.
of the Institute of Physics

His research group's programme is ambitiously called "New paths in the search for dark energy". Dr. Saltas seeks to formulate solar pulsation theory inter alia, and use it to search for new forces in the universe, investigate the basic character of general dark energy theory and theoretically describe its quantum origin. Prediction of recently discovered gravitational waves is another area of interest.

Ing. Vladimíra Petráková, Ph.D.
of the J. Heyrovský Institute of Physical Chemistry

Dr. Petráková wants to develop a method to help improve super-resolution microscopy. Her research group will use e.g. DNA origami to precisely locate molecules and nano particles.

Doc. Mgr. Slavomíra Ferenčuhová, Ph.D.
of the Institute of Sociology

The fellowship will enable Doc. Ferenčuhová to establish a new research team called the Center for Study of Social Change and Material Environment (CESCAME). The team will investigate innovative practices that respond to environmental changes related to e.g. energy and resource consumption, historical housing and urban planning changes, e.g. related to urban housing quality and affordability. The research team will also explore the question of who creates innovation in the urban context and how, and how formal expert innovation, e.g. new construction technologies, and informal innovative practices of urban dwellers influence one another.

MUDr. Miloslav Kverka, Ph.D.
of the Institute of Microbiology

His research team will focus on the influence of the microbiome on inflammatory and tumour processes. The project will concentrate on analysing the mechanisms by which the microbiome reacts with the immune system. The researchers will look for ways to favourably affect this interaction, such as through the therapeutic potential of dietary changes, probiotics, prebiotics and similar products. The possibility of influencing the development of pathological processes could lead to important practical applications of pan-societal significance.

Ansten Mørch Klev, Ph.D.
of the Institute of Philosophy

Dr. Klev focuses primarily on constructive type theory, which will be the key focus area for his new research team as well. The goal will be – in simplified terms – to understand what mathematics is about and how we understand it and examine how to best understand mathematical objects such as numbers and functions. The researcher's novel thesis is that these objects are constituted at the linguistic level. The project lies at the intersection of philosophy and mathematics, which is reflected in the interdisciplinary composition of the research team.

J. E. PURKYNĚ **FELLOWSHIP**

The aim of this fellowship was 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 creative teams in their respective institutes. In 2020, the CAS funded 20 J. E. Purkyně fellows with total funding of CZK 18,400,000. New proposals have not been accepted since 2018. Funding for projects that have already been approved will continue until 2023.

OTTO WICHTERLE **AWARD**

This award is intended for extraordinarily talented, prospective CAS scientists up to 35 years of age. The award bears the name of Professor Otto Wichterle, an outstanding Czech chemist on a global scale, who became President of the Czechoslovak Academy of Sciences after the events of November 1989. The aim of the Otto Wichterle Award is to encourage young CAS scientists whose excellent results contribute to the development of their relevant scientific disciplines. In 2020, CAS President Eva Zažímalová bestowed the Otto Wichterle Award to the following 22 young scientists:

I. MATHEMATICS, PHYSICS AND EARTH SCIENCES

Ing. Václav Eigner, Ph.D.
Institute of Physics
RNDr. Jiří Kaštil, Ph.D.
Institute of Physics
RNDr. Jiří Kroll, Ph.D.
Institute of Physics
RNDr. Michal Hrbek, Ph.D.
Institute of Mathematics
Mgr. Aleš Urban, Ph.D.
Institute of Atmospheric Physics

II. LIFE AND CHEMICAL SCIENCES

Ing. Jiří Henych, Ph.D.
Institute of Inorganic Chemistry
RNDr. Alan Liška, Ph.D.
J. Heyrovský Institute of Physical Chemistry
Ing. Kinga Mlekodaj, Ph.D.
J. Heyrovský Institute of Physical Chemistry
RNDr. Gabriela Ambrožová, Ph.D.
Institute of Biophysics
Mgr. Petr Stadlbauer, Ph.D.
Institute of Biophysics
Mgr. Petr Kohout, Ph.D.
Institute of Microbiology
Mgr. Anna Herrmannová, Ph.D.
Institute of Microbiology
Mgr. Tomáš Korytář, Ph.D.
Biology Centre
RNDr. Jan Klečka, Ph.D.
Biology Centre
RNDr. Andrea Bednářová, Ph.D.
Biology Centre
Mgr. Jiří Malíček, Ph.D.
Institute of Botany
MSc. Marta Alicja Kolanowska, Ph.D.
Global Change Research Institute

III. HUMANITIES AND SOCIAL SCIENCES

PhDr. Kamila Fialová, Ph.D.
Institute of Sociology
Mgr. Vojtěch Kessler, Ph.D.
Institute of History
Mgr. Filip Herza, Ph.D.
Institute of Ethnology
Mgr. Petr Pavlas, Ph.D.
Institute of Philosophy
Mgr. Matouš Jaluška, Ph.D.
Institute of Czech Literature

PROGRAMME TO SUPPORT PROSPECTIVE HUMAN RESOURCES – POST PH.D. CANDIDATES AT CAS INSTITUTES

This programme is intended for starting post-graduate students (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). In 2020, through programme calls, 40 candidates were supported in the 14th call and 27 candidates in the 15th call (with funding commencing on 1 January 2020 or 1 July 2020, as the case may be).

PROGRAMME FOR RESEARCH AND MOBILITY SUPPORT OF STARTING RESEARCHERS

This programme, initiated in 2016, was created to support the development of cooperation between CAS Institutes with prominent international scientific research institutions and enable starting researchers to independently take part in active international cooperation. In 2020, support totalling CZK 5,964,000 was awarded to 27 projects.

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 2020, total funding of CZK 232,000 was provided for five study visits at four CAS Institutes. The following researchers received support:

Mgr. Aurora Panzica
Institute of Philosophy
Mgr. Zuzana Kudzbelová
Masaryk Institute and Archives
Kristin Watterott, M.A.
Institute of Czech Literature
Olga Kalashnikova, M.A.
Institute of Philosophy
Martin Rohde, M.A.
Institute of Slavonic Studies

ERC-CZ/AV PROGRAMME

This is a programme to support projects of researchers who have received an A in the second round of the European Research Council expert panel evaluation (meaning not supported due to a lack of funding) or a B. Projects in the A group are five years in duration, and B projects are two years in length. In 2020, the CAS supported three projects with total funding of CZK 22,135,000. The project investigators are:

Mgr. Iva Mozgová, Ph.D.
Biology Centre
RNDr. Karel Žídek, Ph.D.
Institute of Plasma Physics
Doc. PhDr. Michal Bauer, Ph.D.
Economics Institute

CZECH ACADEMY OF SCIENCES AWARDS

Each year, the Czech Academy of Sciences bestows these awards to outstanding researchers for exceptional research results focused on social priorities which have strengthened the competitiveness of Czech science on an international scale, and which were first published or implemented within the last five years. In 2020, the **Academy of Sciences Award for outstanding results of great scientific significance was bestowed by CAS President Eva Zažímalová** on the following researchers:

Prof. RNDR. Julius Lukeš, CSc.
of the Biology Centre

for the scientific work *Dark matter of the ocean: from the discovery of diplonemid protists to their transformation into model organisms*.

INSTITUTE OF HISTORY TEAM OF AUTHORS

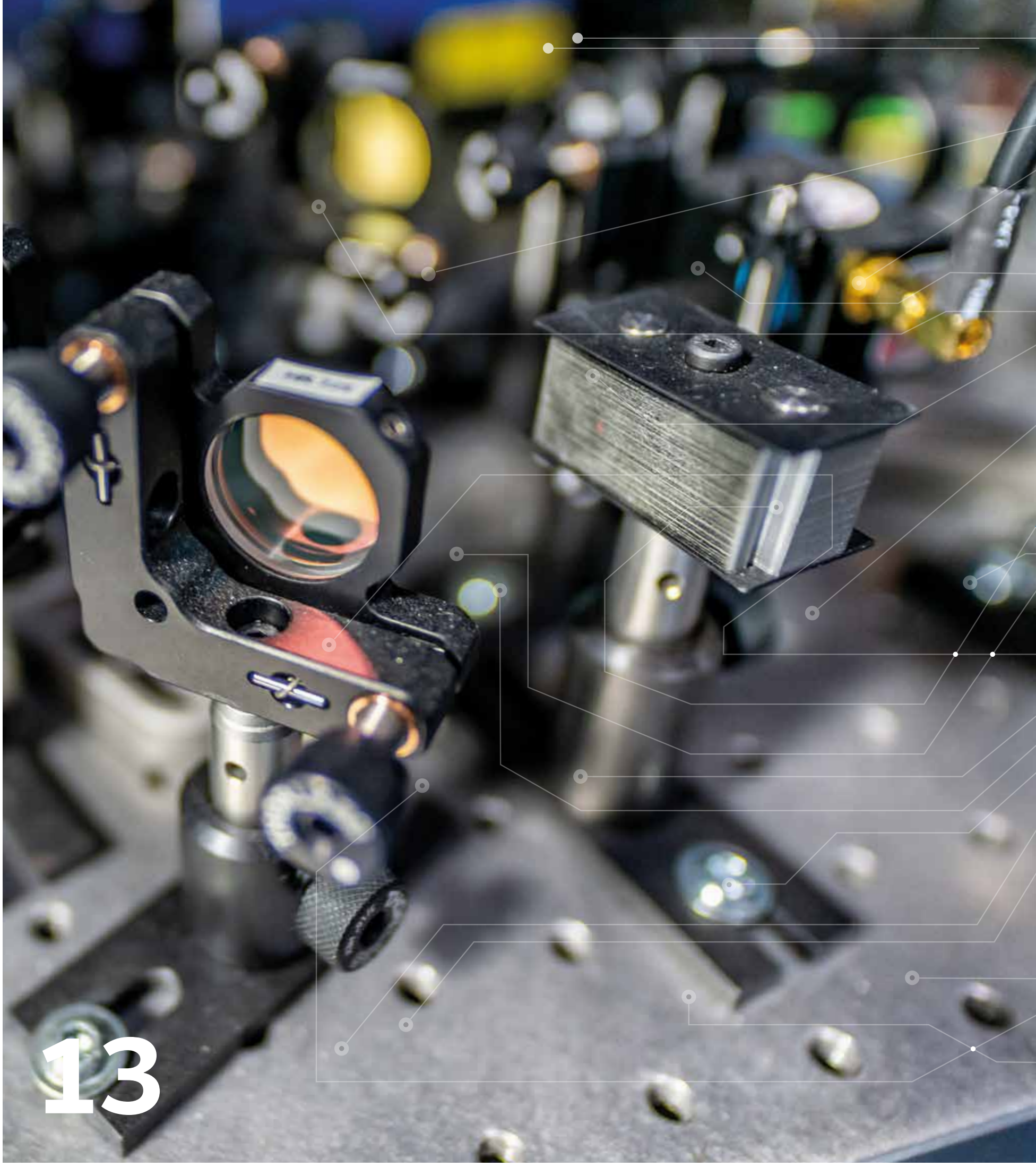
Doc. PhDr. RNDr. Jan D. Bláha, Ph.D.,
Bc. Richard Boukal,
RNDr. Tomáš Burda, Ph.D.,
Doc. Ing. Jiří Cajthaml, Ph.D.,
Bc. Vojtěch Cehák,
Bc. Marek Fáber,
RNDr. Mgr. Dana Fialová, Ph.D.,
Ing. Jakub Havlíček, Ph.D.,
Ing. Tomáš Janata, Ph.D.,
Mgr. Petra Jílková,
RNDr. Zdeněk Kučera, Ph.D.,
RNDr. Silvie Rita Kučerová, Ph.D.,
Bc. Kristýna Ledecká,
RNDr. Jiří Martínek, Ph.D.,
Mgr. Jitka Močičková,
Doc. PhDr. Jan Němeček, DrSc.,
JUDr. Daniela Králíková, Ph.D.,
Bc. Jiří Padevět,
Bc. Daniel Paluba,
Ing. Pavel Seemann, Ph.D.,
Prof. PhDr. Eva Semotanová, DrSc.,
Ing. Petr Soukup, Ph.D.,
Bc. Lucie Stará,
RNDr. PhDr. Markéta Šantrůčková, Ph.D.,
Doc. RNDr. Přemysl Štych, Ph.D.,
Bc. Zuzana Vaňková,
Doc. PhDr. Tomáš Vilímek, Ph.D.,
Ing. Růžena Zimová, Ph.D.,
Doc. PhDr. Zlatica Zudová-Lešková, CSc.,

for the scientific work *Czech Historical Atlas. Chapters on the History of the 20th Century.*

TEAM OF AUTHORS NOMINATED BY THE MASARYK INSTITUTE AND ARCHIVES

Doc. PhDr. Martin Franc, Ph.D.,
PhDr. Věra Dvořáčková, Ph.D.,
Mgr. Jan Boháček,
PhDr. Daniela Brádlerová, Ph.D.,
PhDr. Tomáš Gecko, Ph.D.,
PhDr. Tomáš Hermann, Ph.D.,
PhDr. Adam Hudek, Ph.D.,
PhDr. Milena Josefovičová, Ph.D.,
PhDr. Adéla Jůnová Macková, Ph.D.,
PhDr. Hana Kábová, Ph.D.,
Prom. hist. Nataša Kmochová,
PhDr. Miroslav Kunštát, Ph.D.,
PhDr. Jan Mervart, Ph.D.,
PhDr. Vítězslav Sommer, Ph.D.,
Mgr. Jiří Šoukal,
PhDr. Emilie Těšínská, Ph.D.,

for the scientific work *Martin Franc — Věra Dvořáčková et al., History of the Czechoslovak Academy of Sciences I. (1952–1962)*.



International cooperation

The CAS continued to further international relations in 2020 in alignment with the CAS Concept of Support of International Cooperation. It engaged in research organisation networks on the European and global levels, presented and increased the visibility of the CAS abroad and supported its institutes' systematic development in involvement in international research efforts. Over the long-term the CAS supports its institutes in taking an international view, developing new international partnerships and increasing participation in international research efforts, not only through bilateral or multilateral collaboration programmes, but also, for example, through Strategy AV21 programmes.

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

The covid-19 pandemic affected most areas of our lives in 2020 and international scientific collaboration was no exception. The vast majority of planned international activities could not be implemented and only a fraction of them could be held in an on-line environment, while some were postponed and others had to be cancelled entirely. We had to cancel events such as the traditional meeting of V4 country academy of sciences representatives, a meeting of CAS and Slovak Academy of Sciences management, Czech-Taiwanese Days of Technology, and participation of CAS representatives in delegations abroad, e.g. to Brazil, Brussels and other destinations. Measures introduced by the governments of most countries around the world presented a formidable challenge to international scientific collaboration, but they also gave rise to new solutions and partnerships. Thanks to the CAS' immediate response to the needs of society and rapid adaptation to studying current issues related to the covid-19 pandemic, the CAS helped Czech society while also developing important, productive partnerships which will be beneficial far into the future.

Research institutions in Taiwan became important partner organisations for the CAS, not only in relation to combatting the covid-19 pandemic. They initiated contact with the CAS management at the very outset of the epidemic and the two parties began working on joint activities. A natural culmination of the productive collaboration with Taiwanese research institutions in 2020 and other years was the participation of the CAS Vice President Zdeňek Havlas and Academy Council member Hana Sychrová in the Senate delegation to Taiwan at the turn of August and September. It was a very successful mission which reinforced cooperative ties with CAS' existing partners such as the Academia Sinica, and led to initiation of several new partnerships with Taiwanese universities and research organisations.

Several visits by foreign parties to the CAS did take place prior to the introduction of anti-pandemic measures. Representatives of the Japanese research organisation RIKEN (Institute of Physical and Chemical Research) visited the CAS management in February, and representatives of Kanazawa University, Japan followed suit in March. In August, the CAS President met with the Saxon State Minister for Science Sebastian Gemkow. The meeting followed on earlier meetings with the Leibniz Institute for the History and Culture of Eastern Europe (GWZO) and Leipzig University. The Academy Council supported the establishment of a GWZO branch office in Prague in order to create a platform for interdisciplinary Czech-German collaboration in the humanities and social sciences between the GWZO and relevant CAS Institutes.

Likewise, in 2020 CAS Institutes received considerably fewer foreign delegations at the request of state administration offices (e.g. the Office of the Government and ministries), or offices of foreign representatives located in Prague compared to previous years; there were only 14 such visits. All other planned foreign visits were cancelled or postponed indefinitely.

As the largest research organisation in the Czech Republic, the CAS plays a very active role in international non-governmental organisations, both by fully supporting and co-creating their activities and representing their mission – primarily seeking common approaches to scientific and social challenges – both domestically and abroad. In 2020, this appeal to seek solutions to global crises across institutions and on an international scale was more pronounced than ever due to the SARS-CoV-19 virus pandemic. The CAS actively engaged in all initiatives and challenges related to the pandemic. The CAS is an active member of prominent international organisations including the European Academies Science Advisory Council – EASAC, All European Academies – ALLEA, International Science Council – ISC, InterAcademy Partnership – IAP and others.

In cooperation with the International Human Rights Network of Academies and Scholarly Societies (IHRNASS), of which the CAS is a member, the CAS supported a declaration by the central committee of this organisation calling for governments to render protection of human rights part of the fight against the covid-19 pandemic. In collaboration with this international organisation, the CAS also sent supporting letters calling for political representatives of China, Iran and Vietnam to release 11 detained scientists.

The CAS also joined the IYBSSD 2022 (International Year of Basic Sciences for Sustainable Development 2022) project under the auspices of UNESCO. This joint initiative of several international organisations aims to strengthen the role of basic research to achieve the sustainable development goals.

ERA Cooperation

The CAS makes a concerted effort to engage in activities in the European Research Area (ERA). CAS Institutes consistently express a high level of interest in EU framework programmes. By taking part in international projects, CAS Institutes have

the opportunity to participate in research with far-reaching social impacts and to gain access to unique research infrastructures, instruments and scientific data. In 2020, CAS Institutes participated in research in 127 Horizon 2020 programme projects with funding totalling EUR 9.54 million. There were also two continuing projects funded by the EU Framework Programme 7 for Research and Technological Development with a total budget of EUR 185,400. CAS researchers focus their attention on applying for prestigious ERC grants, which support outstanding scholarly research directed beyond the bounds of knowledge in a given field. Three CAS research projects received ERC support in 2020: two ERC Starting Grants (each of approx. EUR 1.3 million) and one Consolidator Grant (approx. EUR 2 million).

Aside from direct involvement in research, CAS researchers also provide expert advisory services to European institutions. Increasing their presence in EU-level advisory groups and expert panels enables the CAS to play a role in creating European policy priorities and be an active and dynamic player in science and research in Europe.

The greatest 2020 milestone in this area was the appointment of CAS President Prof. Eva Zažímalová to the board of the seven-member Group of Chief Scientific Advisors, which provides independent scientifically based recommendations to the College of Euro-commissioners. She will assume office in May 2021.

The CAS also contributed to development of European policy through its opinion statements. In 2020, the CAS published position papers about the future of the ERA and support of basic research through the EU Horizon Europe framework programme.

Bilateral and Multilateral Cooperation

The CAS also developed multilateral cooperation with European and non-European countries through joint research programmes. In 2020, the CAS continued to participate in the ERA-NET Cofunds co-financed by the European Commission. The CAS provided funding of CZK 1.6 mil. for the DAISIE project implemented by the Institute of Sociology within the NORFACE partnership. In 2020, the CAS provided funding of CZK 987,000 for the VICTOR-E project, part of the HERA partnership and researched by the Institute of Contemporary History. In 2020, the CAS also joined CHANSE, the joint HERA – NORFACE partnership programme. 2020 also saw the launch of three projects that include CAS Institute teams which had been accepted into the SEA-Europe JFS programme (cooperation between countries of Southeast Asia and Europe) and subsequently awarded grants totalling CZK 1.07 million. In parallel, the CAS took part in another call in June 2020 for SEA-Europe JFS joint multilateral projects.

In 2020, the CAS continued to update contractual documents with existing partner organisations and entered into several new contractual partnerships, with e.g. the Institut National des Sciences Appliquées Lyon (INSA Lyon), France and Kanazawa University, Japan. Updated agreements on cooperation were approved with the Scientific and Technological Research Council of Turkey (TÜBITAK), the Slovak Academy of Sciences (SAV), the Hungarian Academy of Sciences (MTA) and the Argentine National Scientific and Technical Research Council (CONICET).

In most cases, international bilateral cooperation projects could not be implemented as planned in 2020 due to the epidemiological situation. Therefore, upon agreement with foreign partner organisations, the CAS supported the granting of one-year extensions to international collaboration projects due to conclude in 2020. These extensions apply to 31 mobility projects, five Mobility Plus projects and the DAISIE multilateral project.

Tenders for international collaboration projects starting in 2021 were announced in the standard manner, with 11 partner organisations. Out of 92 submitted project proposals, a total of 35 were awarded funding, including 29 Mobility Plus projects and six mobility projects.

CEFRES platform cooperation

Early 2020 saw the conclusion of the first, very successful French-Czech TANDEM project within the CEFRES platform, which secured a prestigious ERC grant for follow-up research focusing on the relationship between hunters, wild pigs and biological safety (researchers Luďek Brož of the CAS and Virginia Vaté of the CNRS in France). Researchers Michèle Baussant (CNRS) and Johanna Wyss (CAS) initiated a new project focused on the anthropological aspects of memory and memories in post-imperial minorities in Europe and the Near East.

The CEFRES French-Czech platform rests on the long-term partnership between the CAS, Charles University in Prague and the French Research Center in Humanities and Social Sciences (CEFRES), which is under the tutelage of two French institutions – the Ministry of European and Foreign Affairs and CNRS. The history of CEFRES, an institution promoting development of international collaboration in social sciences and excellence in these sciences, reaches much further back – to 1991. After the fall of Communism, CEFRES aimed first and foremost to restart scientific exchanges between France and Central Europe, while building a network of researchers from France, the Czech Republic, Slovakia, Hungary and Poland became its mission. In 2021, CEFRES will celebrate 30 years of operation, during which it has organised many seminars for Czech and French students, post-doctoral students, researchers and others.

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. This work is rooted in agreements concluded successively with the Association of the 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) and the Moravian-Silesian Region (2020). In 2020, these agreements were implemented through 16 joint projects which were financed according to agreements between CAS Institutes and their regional partners.

> CAS Institutes help Czech regions and microregions improve their quality of life through jointly funded regional cooperation projects.

In 2020, CAS Institutes from the sections of Earth Sciences, Chemical Sciences, Biological and Medical Sciences, Biological-Ecological Sciences, Historical Sciences and Humanities and Philology were engaged in regional cooperation. Projects focused on the following topics: research into landscape history and its educational and economic use (Skalná Museum of Geophysics, underground mines as water reservoirs), environmental protection (agricultural use of biochar), research into regional cultural monuments (protection and presentation of archaeological, artistic and musicological heritage) as well as contemporary philosophical issues.

The planned regular meetings of representatives of Czech regions and the CAS did not take place last year due to the epidemic. However, in spring 2020 the results of the following selected projects were published at the website http://www.avcr.cz/cs/veda-a-vyzkum/spoluprace/regionalni-spoluprace/:

1. **Impact of plant species on the efficiency of small constructed wetland wastewater treatment plants**, Institute of Experimental Botany, Upper Secondary School of Chemistry Pardubice and Upper Secondary School of Electrical Engineering Pardubice
2. **Study of ionospheric plasma using sudden ionospheric disturbance monitors (SID)**, J. Heyrovský Institute of Physical Chemistry, Observatory and Radioclub of Spa City of Carlsbad
3. **Reduction of the biomass of unsuitable fish species to reduce the negative effects of eutrophication in the Jordan Reservoir**, Biology Centre, City of Tábor
4. **Current philosophy: Humans and the environment**, Institute of Philosophy, Vysočina Region and JUPITER Club
5. **Research into medieval sculpture and painting in the Pardubice region. Architect František Schmoranz Sr. and re-gothicification of buildings and their interior furnishings in the region**, Institute of Art History, Chrudim Regional Museum.

Section of Earth Sciences

- Museum of Geophysics at the Skalná Elementary School (Skalná)
- Analysis of spatio-temporal changes and complex positioning of Hraničná Mine using 3D laser scanning in order to ensure security for making the mine accessible to the lay and professional public, Phase III – Overall scanning of mines and UAV area mapping (Vojtovice)
- 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 purposes of the municipality of Horní Město (Horní Město)

Section of Chemical Sciences

- Radio spectrum observation of ionospheric disturbances (Karlovy Vary)
- SeLOS – Joint Observational Spectroscopy Laboratory (Valašské Meziříčí)

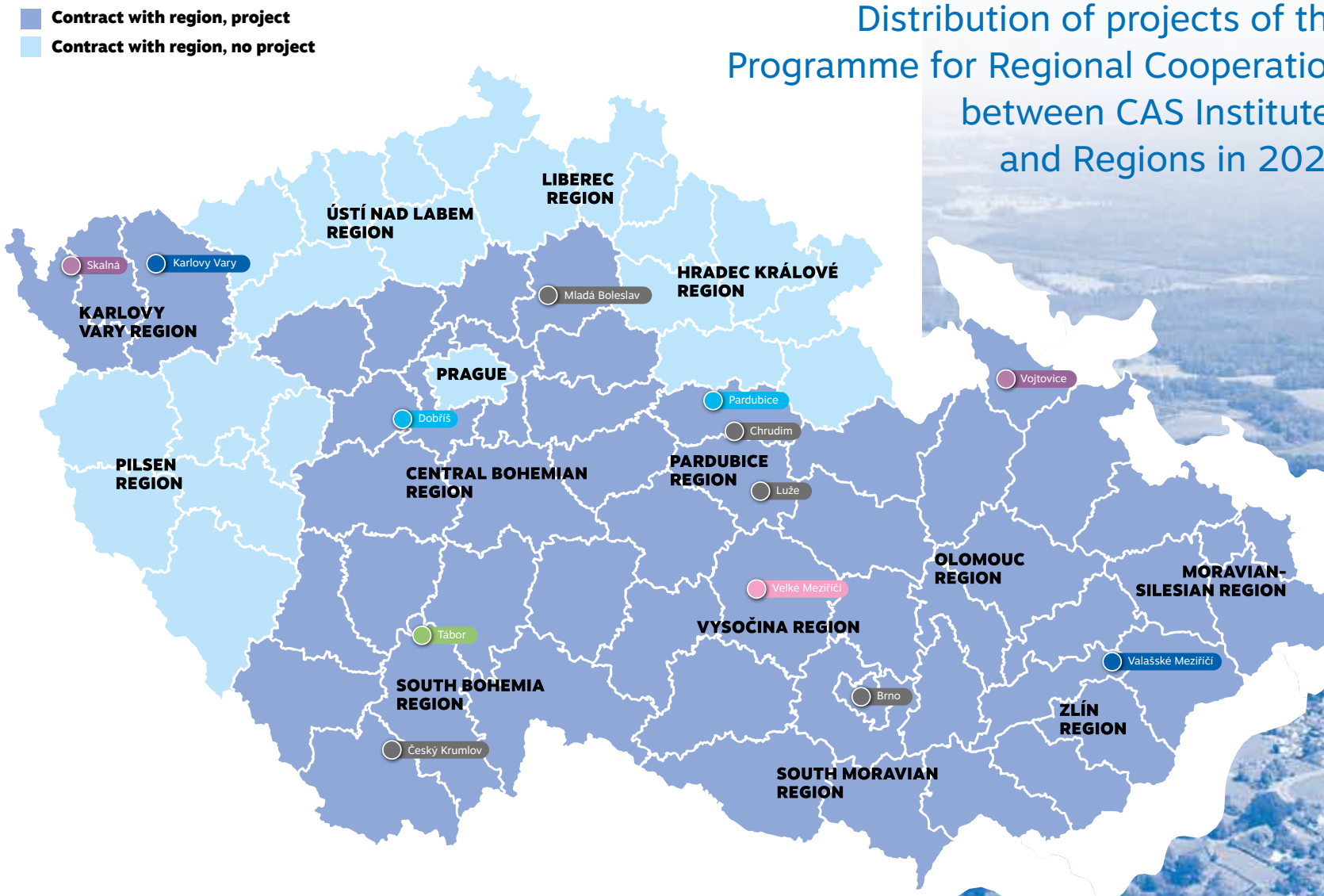
Section of Biological and Medical Sciences

- Impact of plant species on the efficiency of small constructed wetland wastewater treatment plants – vertical system (Pardubice)
- Study of use of compost to raise the organic matter in soil and improve soil absorption as a measure to fight drought in the Central Bohemian Region (Dobříš)

Section of Bio-Ecological Sciences

- Reduction of the biomass of unsuitable fish species to reduce the negative effects of eutrophication in the Jordán Reservoir (Tábor)

Distribution of projects of the Programme for Regional Cooperation between CAS Institutes and Regions in 2020



Section of Historical Sciences

- Pasticcio and original works in 18th century musical theatre arts (Český Krumlov)
- Making the archaeological collections at the Košumberk Castle in the Chrudim region accessible. Part IV. (Luže)
- Faith in art – art in faith. Chrudim medieval artistic culture (Chrudim)
- Josef Dürich, forgotten victor (Mladá Boleslav)
- Hradisko near Kroměříž – a Bronze Age fortress (Kroměříž)
- Implementation of citizen participation in preservation and learning about the archaeological heritage of the South Moravian region (Brno)

Section of Humanities and Philology

- Otokar Březina exhibition in Nová Říše (Nová Říše)
- Current philosophy: Threats and opportunities (Velké Meziříčí)

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Environment and sustainable operations

in scientific research and research infrastructure

The Czech Academy of Sciences dedicates itself to sustainability and environmental protection above and beyond the scope of its legal obligations, in various ways: through several Strategy AV21 programmes (e.g. *Landscape Preservation and Revitalisation, Food for the Future, Efficient Energy Conversion and Storage, Natural Hazards*), by establishing expert committees (Environmental Committee, CAS Energy Research Committee) and through the research conducted by CAS Institutes. Additionally, the CAS is currently preparing to collect data which will inform the development of a concept for sustainable building operation in differing scientific research conditions.

A pilot recycling facility for separating composite packaging materials built by the Institute of Chemical Process Fundamentals

is an example of application of research results. Recycling these materials, such as widely used Tetrapak, is problematic due to the bonded layers of paper, plastic and aluminium. The unique, patented method developed by the Institute of Chemical Process Fundamentals leaches mixtures of reagents to divide the composite packaging into separate layers. The patent is licensed and a pilot unit with an annual capacity of 10,000 tons is currently under construction.

In 2020, the CAS developed a pilot project to monitor the energy performance of buildings of three selected CAS Institutes. The scheduled project launch is spring 2021. Insights from the pilot project may be used to gradually assess the operational performance of institutes to determine priorities for the sustainable building operation concept. The CAS Academy Council currently takes into account responsible operations in its decisions on institutes' construction requests. The monitoring results – along with experience from other institutes, such as the Czech University of Life Sciences Prague – could provide concrete data on the carbon footprint of buildings operated by CAS Institutes in the near future.

The CAS supported investment into new community energy systems as part of the commenting process on a draft general programme document for the Modernization Fund that was elaborated by the Ministry of the Environment. Its development could enable decentralisation of energy production and transfer of resources to points of consumption, while engaging local entities such as municipalities, cooperatives, registered associations, public institutions, universities and public research institutions. A concrete step towards engagement in community energy systems may be implementation of the plan to build solar power plants on the roofs of CAS buildings.

> Environmental issues are not only the realm of the Global Change Research Institute - they concern each and every CAS Institute.

Illustration of proposed residential CAS buildings in Prague-Lysolaje with roof vegetation and a photovoltaic power plant

Educational activities

Helping to educate young scientists and improve 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 to 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

> In 2020, employees of CAS Institutes trained 2,161 doctoral students and also participated in the supervision of bachelor and master programme students.

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 a cooperation agreement between the Czech Academy of Sciences and the relevant university in regard to implementation of doctoral programmes. 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 and listing affiliations on papers published by students. Agreements have already been signed with 16 universities and negotiations with others are continuing in an atmosphere of mutual trust and due procedure. In 2020, an agreement on cooperation between the CAS and the Silesian University in Opava was approved by both entities, although its official signing has been hindered by governmental anti-pandemic restrictions to date. Preparation of an agreement between the CAS and INSA Lyon university in France was delayed for the same reason. A planned CAS delegation trip to France to follow on the INSA Lyon management's visit to Prague in November 2019 had to be cancelled and instead a video conference was held in June 2020, during which both parties confirmed their continuing interest in intensifying their collaboration as soon as the epidemiological situation allows. It was possible, however, to organise the official signing of a long-prepared agreement on the training of doctoral students between the Institute of Philosophy of the CAS and three Leipzig University institutes in August 2020. In addition, CAS Institutes continue to gradually conclude specific agreements with university faculties which are applying for accreditation of a study programme.

Relations between the CAS and universities are monitored and coordinated by the CAS Council for Higher Education and Researcher's Training Cooperation, which is an advisory body to the CAS management. The Council met for its annual session on 16 November 2020. The session was also attended by the external member, Prof. Tatiana Molková of the Praesidium of the Council of Higher Education Institutions. Long-standing good relations between the Council of Higher Education Institutions and the Council for Higher Education and Researcher's Training Cooperation is also demonstrated by the fact that, conversely, the Chair of the Council for Higher Education and Researcher's Training Cooperation Pavel Krejčí is a regularly invited guest at meetings of both the Praesidium and the Assembly of the Council of Higher Education Institutions.

CAS Institutes and employees participate extensively in student education at both public and private universities. Last year, despite the problems caused by the pandemic, CAS employees provided more than 6,479 semestral series of lectures, practicals or seminars with a total scope of more than 70,000 hours. CAS Institutes contribute significantly to student education and supervision of students' qualification work. In 2020, employees of CAS Institutes trained 2,161 doctoral students and also participated in the supervision of bachelor and master programme students. 181 doctoral students trained at CAS Institutes successfully completed their studies in 2020.

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 fields and aims to cultivate the skills students need to succeed in the fiercely competitive international environment. Courses are held regularly in Prague and in Brno; in 2020, 116 students in Prague and 166 students in Brno took part. The lecturers are renowned and experienced experts, mainly CAS employees, and lecture topics are chosen so as to be useful to doctoral students across all disciplines. In 2020, the main subjects included scientific methodology, ethical principles in scientific work and bioethics, evaluation of scientific work, scientific communication and its written genres, presentation of research results, editorial aspects of publishing in journals, scientific writing techniques, rhetoric and the culture of the spoken word, lecturing skills, information resources for science, research and education, research funding, targeted funding, project development, intellectual property and its commercialisation, technology and knowledge transfer, writing in English, and more. Most of the lectures were conducted remotely due to the current anti-pandemic measures. The import and significance of these courses is evidenced by student feedback received by the CAS.

Table no. 9: Overview of the most significant forms of cooperation with universities

	2014	2015	2016	2017	2018	2019	2020
Doctoral students trained at CAS institutes	2,030	2,091	2,019	2,175	1,995	2,046	2,161
Newly accepted doctoral students	315	376	348	323	376	384	427
Number of doctoral dissertations completed	268	264	263	260	264	242	181
Number of semestral series of lectures, seminars and practicals	4,046	4,246	5,547	4,949	5,247	6,909	6,479
Number of hours lectured	75,342	76,348	75,978	76,423	71,335	73,086	69,518

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 a CAS Institute 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 in length, with a minimum of eight hours per month. Travel costs are also covered for students who commute. In 2020, 74 students who had completed CAS internships met for an on-line Student Science Conference on 26 November 2020. They presented their project results, categorised into three scientific research areas, to a jury and the public. The jury presented awards for the top three results in each discipline and also gave a special award for outstanding creative work. For 2021, another 112 topics have been announced which cover a wide range of scientific fields and disciplines in all three of the Czech Academy of Sciences' research areas.

ENGAGEMENT AT SECONDARY AND PRIMARY SCHOOLS

Summer Science Camp in Jindřiš

CAS' engagement in secondary and primary school education centres around teaching and a broad array of lectures. The CAS also offers summer science camps for secondary and primary school science teachers and science promotion courses through the Open Science project.

Thirty-five secondary and primary school teachers from across the Czech Republic took part in the **Summer Science Camp**, which was held in Jindřiš near Jindřichův Hradec from 10 to 22 August 2020. The camp was divided into three separate three-day sections: chemistry and biology, mathematics and physics, and science for primary school teachers. The goals of the course were to enhance teaching methods with immediate practical illustration of content through experiments and to develop an understanding of how to use these methods in practice. Lecturers included scientists from CAS Institutes, university education experts and teachers who shared their own classroom experiences.

Media communication

and promotion

The Czech Academy of Sciences has always dedicated great effort to communicating with the public, particularly through the media. Distinctive CAS scientific results have the potential to leave an indelible imprint on the Czech media landscape and beyond. A fundamental part of the Academy's media communication efforts is continuous, regular and systematic popularisation of scientific and research results. CAS researchers and PR specialists strive to spark the broad public's interest in scientific work. They endeavour to bring science closer to non-scientists, capture their interest in research findings across disciplines and present research institutes and staff at work on specific research projects.

On 29 September 2020 the Academy Council approved a new CAS Communication Strategy Concept which will further enhance the CAS' positive image, prestige and reputation in the public sphere.

THE CZECH ACADEMY OF SCIENCES AS A MEDIA PARTNER

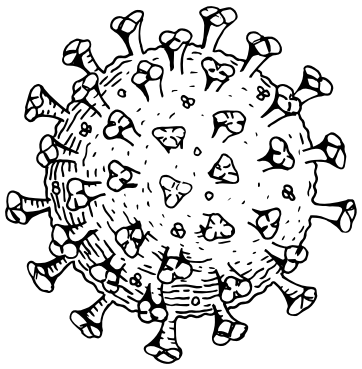
The Czech Academy of Sciences has always dedicated great effort to communicating with the public through the media. In 2020, there were 21,598 media outputs about the CAS in monitored media.

Working with public service media – Czech Television (CT), Czech Radio (CR) and the Czech Press Agency – is an essential part of the CAS media communication strategy. The time-tested, well-developed and roundly appreciated cooperative ties between the CAS and these public service media proved to be vital during the past year. In March 2020, a pandemic caused by a new type of coronavirus struck the world and profoundly changed everything, including the media relations, promotional and educational work of the CAS.

Up until March 2020, communication with the media, promotion of science and CAS educational activities were implemented as planned. Starting on 12 March, when a state of emergency was declared in the Czech Republic, economic life was sharply restricted, and schools, stores, restaurants and subsequently the Czech borders were closed, all CAS media activity focused on a single topic: explaining issues related to the current crisis-level spreading of the new disease called covid-19. During this roughly six-week period the media had no interest in any other scientific topics. Starting in May 2020, when it seemed that the epidemic had been brought under control in the Czech Republic and the government began easing restrictions, the media radar once again broadened to a wider spectrum of scientific topics. The coronavirus, however, remained a constant part of the media agenda. In September, the number of covid-19 cases began to rise steeply once again and in October the government had to declare another state of emergency and institute strict anti-pandemic restrictions due to the alarming number of hospitalisations. The pandemic's development, the consequences of government measures, testing and later the development of vaccines and vaccination became permanent parts of the news and scientists such as biochemist Jan Konvalinka, immunologist Václav Hořejší, virologist Libor Grubhoffer, biochemist Zdeněk Hostomský, molecular geneticist Jan Pačes, economist Daniel Münich and others became the most visible figures personifying the CAS' efforts to combat the SARS-CoV-2 pandemic.

In 2020, there were 21,598 media outputs mentioning the CAS and variations of its name, 63% of which were on the internet, 28% in printed media, 4% in Czech Press Agency news agencies which other media use as a source, 3% in television news and 2% in radio. According to Newton Media, the keyword Academy of Sciences appeared in the monitored media an average of 2,000 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 and not only in relation to the covid-19 pandemic, figured prominently in the media in 2020; consequently only a few brief examples of the unmistakable impact of CAS media communication can be shared below.



Before the pandemic outbreak

Research results that received significant media attention before the pandemic outbreak included a report on the first genetically modified chicken developed by scientists from the **Institute of Molecular Genetics** and Biopharm using the CRISPR/Cas9 molecular tool. Other news that made headlines included the **Institute of Physics'** development of a new material for 5th generation mobile networks; verification of the essential role of the enzyme acrosin in fertilisation, to which a scientist from the **Institute of Experimental Medicine** contributed; and the first critical edition of songs from the Jistebnický cancional, on which experts from the **Masaryk Institute and Archive, Institute of Philosophy, Institute for the Czech Language and Institute of Czech Literature** collaborated.

The mainstream magazine Týden helped promote the Academy's good reputation through its series Czech Science Up Close (Česká věda zblízka) featuring CAS Institutes. The opening of a new microscopy centre at the **Institute of Molecular Genetics** at the end of February also attracted extensive attention from diverse media.

Covid-19 pandemic news stories in the Czech media also reported on another Czech contribution to the fight against the disease: the substance remdesivir, which Tomáš Cihlář helped develop. This scientist also worked at the **Institute of Organic Chemistry and Biochemistry**.

FIRST CORONAVIRUS WAVE

From mid-February – and particularly in March and April 2020 – the media directed a wide variety of questions about the new type of coronavirus to experts in an array of CAS Institutes. CAS experts from various institutes – the **Institute of Organic Chemistry and Biochemistry, Institute of Molecular Genetics, Institute of Microbiology**, as well as the **Institute of Vertebrate Biology, Institute of Physics, Institute of Chemical Process Fundamentals, Institute of Psychology, Economics Institute**, etc. appeared increasingly in national audiovisual, printed and internet media. Journalists sought them out in relation to the process by which the virus spreads, the search for effective antibodies, and to a large extent due to CAS laboratories' involvement in testing samples for the virus. Later they also asked about testing of face mask materials, development of a coronavirus detection biosensor, work on development and serial production of protective masks for health care and laboratory workers, involvement in universal covid-19 testing, as well as the impacts of the lockdown on mental health, economics cycles, vocabulary and mathematical models and the history of epidemics. Scientists gave interviews for Czech Television, Czech Radio, internet servers such as Novinky.cz, Aktuálně.cz, DVTV and Seznam Zprávy TV. They were also afforded significant space in printed editions of newspapers including *MF DNES*, *Hospodářské noviny*, *Lidové noviny*, *Deník N* and other media.

Media interest naturally also turned to the CAS President. In this period, Eva Zažímalová gave extensive interviews to the iDNES server, CNN Prima News, Czech Television, Czech Radio and the Seznam Zprávy server.

In that period of breaking news and changes, having a covid-19 coordinator for CAS Institutes proved very effective. The role was assumed by Jan Konvalinka, who persistently explained what the CAS and other academic institutions could offer in terms of testing samples as well as a wide spectrum of aspects related to the SARS-CoV-2 virus.

Alongside responding to media questions, CAS scientists introduced their own topics into the public sphere. The pro-active Media Communication Department of the CAS Head Office, which was later integrated (except for crisis communication) into the press department of the Division of External Relations of the Centre of Administration and Operations of the CAS, also contributed to this effort. This period also saw the publication of information about testing of face mask materials, which scientists from the **Institute of Chemical Process Fundamentals** had initiated, a translation of an expert article about the origin of the new coronavirus in *Nature Medicine*, which scientists from the **Institute of Vertebrate Biology** prepared two days after publication of the original, and information about a biosensor developed by the **Institute of Physics** intended to detect the coronavirus on surfaces or in water.

A press release about development of RP95-M masks providing the highest level of protection, originally developed at the Czech Technical University and prepared for serial production through a collaborative effort involving Czech companies and subsidiaries of the **Institute of Physics** in just a few weeks, elicited notable media attention. The media also reported on the **Nuclear Physics Institute's** offer of free sterilisation in its Microtron MT25 cyclic electron accelerator, primarily for health care workers.

Despite the pandemic, the media shared the **Astronomical Institute's** report on the "super full moon" as well as its confirmation of the existence of impact craters on Greenland later in the year. Media attention also turned to a study by the **Institute of Botany** and **Biology Centre** that is concerned with the decrease in plant species in European forests in relation to increasing quantities of nitrogen.

Media refocus on science

From the end of April and during the summer months, scientific topics unrelated to covid-19 were gradually afforded more space in the media. CAS experts, for example scientists from the **Institute of History** or the **Institute for Contemporary History**, spoke about current events and commemorated anniversaries. Scientists from the **Global Change Research Institute – Czech Globe** were called on to comment on drought (and later floods) during this period.

A discovery made by Pavel Jungwirth's team at the **Institute of Organic Chemistry and Biochemistry**, which was published on the cover of Science, drew broad media attention. The research, conducted in collaboration with scientists from the USA and Germany, described and mapped the molecular level of the birth of a metallic solution of alkali metals in ammonia from the original electrolyte.

CAS Vice President Zdeněk Havlas reminisced about his former colleague at the Institute of Organic Chemistry and Biochemistry, Prof. Antonín Holý, in a Seznam.cz television programme in May. The programme was exceptionally well received and had roughly a million views.

Both the Prague and the Brno **Archaeological Institutes** of the CAS were mentioned in the press in relation to the opening of the Gateway to the Roman Empire visitors' centre in Mušov, the Archaeological Summer 2020 project and the CAS Archaeological Information System.

The research results of **Biology Centre** scientists who successfully tested a new Lyme's disease vaccine also elicited attention in various media.

A patented design by Czech Technical University and **Institute of Physics** scientists extending the lifespan of fuel cells in nuclear reactors under emergency and standard conditions also attract-

FIRST CORONAVIRUS WAVE

ed broad media attention. The Czech patent was accepted by the European Patent Office in May.

Research by the **Institute of Vertebrate Biology** also attracted notable media attention. A team led by Martin Šálek published a study demonstrating that field manure heaps plays an important role in the survival and nesting of birds, including endangered species.

Biomedicine and the medicinal potential of research are always popular topics in the media. During this period, a study by the **Institute of Biotechnology** and **Institute of Experimental Medicine** that analysed and described post-ischemic alterations in mice also resonated in the media.

The **Global Change Research Institute – Czech Globe**, with Masaryk University and the Czech Hydrometeorological Institute, reported on a study in *Nature* about changes in flooding frequency and magnitude in Europe during the past 500 years.

A new type of solar cell that resulted from international research involving scientists from the **Institute of Physics** also drew considerable media attention.

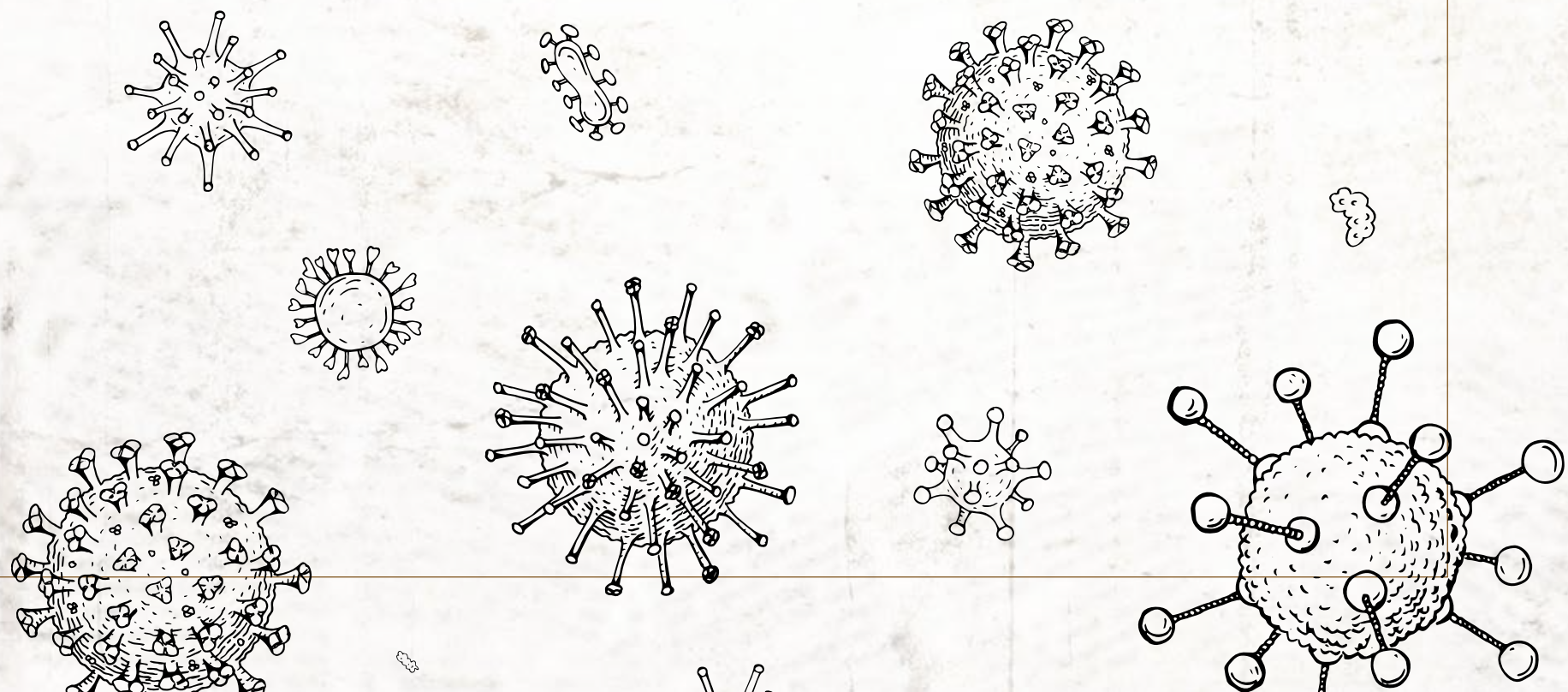
However, during the summer the media continued to report on the numbers of covid-19 patients, which once again began to rise gradually. CAS experts diligently explained various aspects of the new type of coronavirus infection. A description of the new coronavirus protein structure by Evžen Bouřa's research group at the **Institute of Organic Chemistry and Biochemistry** published in the journal *Nature Communications* thus resonated in the media.

An event celebrating the Prague City Hall's gift of filter tester parts to the **Institute of Chemical Process Fundamentals**, in which the CAS President took part, was also widely reported in the Czech media. The City Hall gave the Institute the parts as a token of gratitude for assistance during the coronavirus crisis.

In early September, the Academy of Sciences was mentioned in the media in relation to current political events when two members of the Academy Council took part in the Czech Senate's delegation to Taiwan. The CAS also drew media attention when Prime Minister Andrej Babiš and then government commissioner Roman Prymula visited the BIOCEV Centre (15 September). Their visit marked the successful completion of the first phase of clinic testing of the medicinal substance MitoTam, developed by Jiří Neužil of the **Institute of Biotechnology**.

Researchers from CERGE-EI, a joint institute of Charles University and the **Economics Institute**, were frequently mentioned in the Czech media in relation to current events (annullment of the super-gross wage, a one-off payment for the elderly and potential reintroduction of universal measures in response to the growing number of covid-19 positive cases in the Czech Republic).

ERC Starting Grants were awarded to only two Czech scientists, both CAS Institute employees, in 2020. Not surprisingly then, the Czech media reported widely on the awarding of grants to Ota Pavlíček of the **Institute of Philosophy** and Christian Sippl of the **Institute of Geophysics**. The media described their scientific specialisations and also reported on the awarding of a prestigious ERC Consolidator Grant to economist Filip Matějka of CERGE-EI.

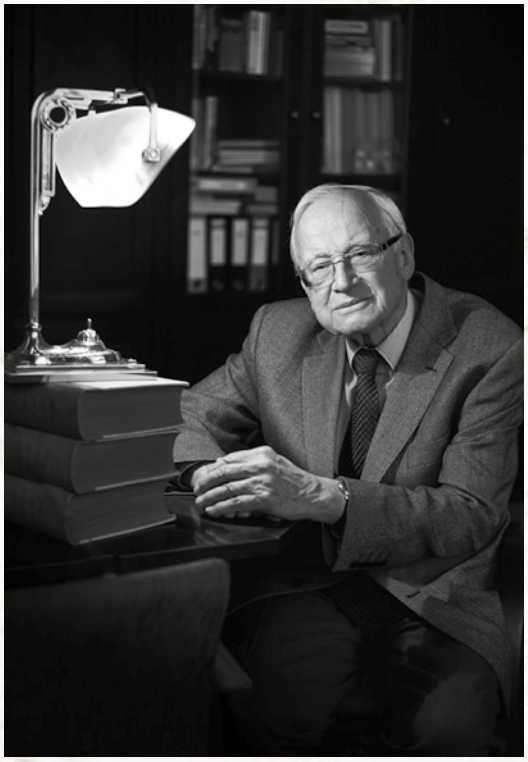


SECOND CORONAVIRUS WAVE

Due to the alarming statistics evidencing the number of covid-19 infections, the increasingly strict government restrictions and general concern in society, CAS President Eva Zažímalová and other former CAS presidents published an appeal to Czech citizens. The letter was published on 12 October and the media shared it immediately.

During this period, R&D&I Council Deputy Chairman Pavel Baran announced at a press conference that the 2020 Czech Head award would be presented to immunologist Václav Hořejší of the Institute of Molecular Genetics.

In relation to a R&D&I Council session, the media also began to circulate the proposal to establish a new virology institute spearheaded by the CAS as a conceptual response to the covid-19 pandemic. CAS President Eva Zažímalová explained the idea to the media and CAS Vice President Zdeněk Havlas also expounded on the idea in an extensive page-long interview in *Hospodářské noviny*.



Passing of Rudolf Zahradník

On Saturday, 31 October, the first president of the CAS, Rudolf Zahradník, passed away. In the ensuing days all of the national Czech media, both printed and audiovisual, shared information about the life and scientific contributions of this exceptional person and scientist as well as his work to develop the Academy of Sciences. The 20th annual, jubilee CAS Week of Science and Technology was dedicated to the memory of Rudolf Zahradník and began on-line just two days after his passing.

Other media activities: Strategy AV21 and AVex expert opinions

Strategy AV21 remains the flagship of CAS communication. In 2020, Strategy AV21 was comprised of 20 complex research programmes which focused on fundamental social issues in the spirit of the motto "Top research in the public interest". This mission was and is essential to gradually changing politicians' and the broad public's view of the most important Czech research organisation.

AV*ex* expert opinions, which were conceived based on a request from the Parliament of the Czech Republic, were published for the second year in a row. They provide lawmakers, selected ambassadors and Members of the European Parliament independent and apolitical expert information about concrete, current social problems and potential solutions. AVex opinions strengthen the image of the CAS as an apolitical expert institution and synergistically contribute to the practical implementation of Strategy AV21's main motto. Applicable CAS Institutes act as guarantors for the elaboration of content of expert opinions. In 2020, a total of six opinions were prepared: antibiotics resistance (published in January, the Institute of Microbiology was the guarantor), planetary greenhouse gases (published in August, the Institute of Thermomechanics was the guarantor), soil degradation (published in September, the Biology Centre was the guarantor), climate change (published in October, the Global Change Research Institute – Czech Globe was the guarantor) and harm to public health in the Ústí nad Labem region (published in November, the Institute of Experimental Medicine was the guarantor). Additionally, in mid-December, a special issue about viruses was prepared (the guarantor was the Institute of Organic Chemistry and Biochemistry). This special AV*ex* issue was double the usual size (8 pages) and introduced various types of viruses which are critical human pathogens and could threaten contemporary society, outlined ways of effectively dealing with them and reflected the possible use of viruses as biological weapons.

SCIENCE PROMOTION

through the CAS Centre of Administration and Operations

The CAS service office, the Centre of Administration and Operations, has always played an important role in systematic promotion of CAS research results. It manages a wide spectrum of promotional activities through the Division of External Relations. In 2020, however, they were dramatically affected by the paralysis of social life stemming from government anti-pandemic measures.

The last major event at which representatives of scientific institutions, the state administration and government, universities, partner organisations, sponsors and prominent figures from artistic and social circles were able to meet was a gala New Year's performance at the National Theatre on 29 January. Puccini's opera *Turandot* was a magnificent event – its finality unbeknownst to all at the time – which was followed by unprecedented suspension of planned promotional CAS activities. The CAS managed to at least shift some of the events to an on-line environment.

The first event to be cancelled in mid-March was **Brain Week**, a festival about the latest discoveries and trends in brain research and neuroscience that is traditionally held under the auspices of the Czech Academy of Sciences. A **gala lecture at the Žofín Palace** in Prague titled *New approaches to cancer treatment: Focus on mitochondria* by Jiří Neužil of the Institute of Biotechnology was initially postponed and later cancelled.

The cancellation of the 6th annual **Science Fair** planned for June was the most visible loss in terms of CAS promotion and communication with the public.

Ceremonies presenting medals in different disciplines and generous grant awards to promising scientists, the *Academy Premium* and *Lumina Quaeruntur Fellowship*, were postponed for more favourable times. The only events that took place outside of lockdowns were the presentation of the *Otto Wichterle Award* to 22 emerging scientists in late June and the presentation of *Research Professor degrees* to researchers from the CAS and universities in late September.

> The Czech Academy of Sciences considers popularisation of research results and dissemination of scientific knowledge to the broad public as integral parts of its mission.

The 20th annual, jubilee **CAS Week of Science and Technology**, held in November and dedicated to the memory of Rudolf Zahradník, was shifted to an on-line environment, as was the **Night of Scientists** event.

The seventh annual **Photogenic Science** competition went on as planned without any major changes because both the registration process and voting take place on-line. A record 362 photos by 106 employees from 34 CAS Institutes were sent in. The only pandemic impacts on the competition were the cancellation of the traditional show opening and announcement of winners and restricted access to the **Gallery of Science and Art**, where the winning photos were displayed. A guided video tour of the exhibition was posted at www.vedafotogenicka.cz.

The CAS has also traditionally promoted its work by holding exhibitions featuring scientific projects and achievements. The Gallery of Science and Art, the main venue for CAS exhibitions, hosted three in 2020. The exhibition season was kicked off with the exhibition *Water* about the cycle of water in nature and humans' role in it, prepared by the Centre of Administration and Operations in collaboration with the Institute of Hydrodynamics (7 February – 22 March).

An exhibition titled *TGM as a networker* examined how civically engaged intellectual Tomáš G. Masaryk used various forms of communication. This exhibition was developed in collaboration with the Masaryk Institute and Archives (1 June – 31 July). The exhibition was made possible by targeted funding from the Ministry of Culture of the Czech Republic through the NAKI II project "The international correspondence networks of T. G. Masaryk and the establishment of Czechoslovakia in 1918".

On the occasion of the 350th commemoration of the death of Jan Amos Comenius, the Institute of Philosophy prepared an exhibition titled *J. A. C.: Comenius in remembrance cultures* (4 September – 16 October). The exhibition featured text, images, theatre and film elements, as well as an anchoring of Comenius in period exhibitions and events.

In 2020, four issues of the magazine *A / Science and Research* were published. The main theme of the March issue was the brain (*A 1/2020*), the June issue addressed soil (*A 2/2020*), the September issue focused on waste disposal (*A 3/2020*) and the December issue explored painting and imagery (*A 4/2020*). There were two issues of the popular science magazine *AΩ / Science for Everyone*, with the spring issue focusing on disease and epidemics and the autumn issue featuring invasions. Both magazines won awards in the prominent 18th annual *Zlaty Středník* communications competition. The magazine *A / Science and Research* received second place in the public sector category and the magazine *AΩ / Science for Everyone* took third place in the External printed magazines and newsletters category. In 2020, there were also 10 issues of the internal electronic newsletter *AB / Academic Bulletin*.

Currents events at the CAS and its institutes were promoted through the main CAS websites and social networks. Facebook remained the most frequented social network with 42,000 fans, followed by Instagram (13,500) and Twitter (7,100). CAS official profiles also featured in the *Zlaty Středník* communications competition, with the CAS Instagram taking third place in the Use of social networks category.

The huge increase in the number of fans, primarily on Facebook, was in large part based on the successful on-line project *Science at home*. CAS staff streamed and broadcast "homemade" videos on CAS social networks and spontaneously created science promotion images and text. The Institute of Geophysics, for example, offered an on-line lecture about Mars for children and instructions for building a 3D model of a volcano, while the Institute of Experimental Botany published tips for simple biological-chemical experiments. At home experiments, streamed lectures, recordings of older lectures and tips for interesting on-line articles were collected on the new website **www.vedanadoma.cz** and CAS social networks under the hashtag #Vedanadoma. The project targeted a broad group of fans (parents, children, students and science fans) as well as teachers who could use the material in remote lessons. The videos received more than 750,000 views and the project website with e-resources was visited by more than 80,000 users during the pandemic and school closures. *Science at home* was one of the first on-line e-learning resources in the guide published by the Czech Ministry of Education, Youth and Sports.

In 2020, the CAS prepared two **podcast** series of unusual audio-conversations about science. In the spring, the podcasts were part of the *Science at home* project and in autumn 2020 the series became an independent unit called *Science within reach*. CAS podcasts are available on Anchor, Spotify, Google Podcasts, Apple Podcasts, Soundcloud, etc.

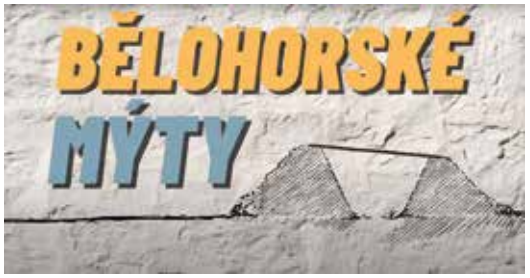
The Czech Academy of Sciences also continuously popularises science through its **audiovisual works**. In 2020, amidst restricted conditions due to the pandemic lockdown, new episodes of the YouTube show called *Scout* were created. Scout translates current topics in contemporary science for young audiences. Czech Television had previously expressed interest in Scout and thus a collaborative effort was initiated in autumn 2020 to produce five episodes of *Scout for children*. The episodes are scheduled to air in autumn 2021 on Czech Television :D. Czech Television broadcast CAS documentary films created through Strategy AV21 programmes several times (*Magion*, *Motions* and four episodes of *Silent Threats*). They are available for viewing at the Czech Television on-line broadcasting website. There were over one million views of CAS documentaries in all. In 2020, the fifth episode of *Silent Threats* titled *Disappearing Soil* was completed. Czech Television has also expressed interest in this film and plans to air it in 2021. A documentary about research into the social, cultural and natural consequences of landslides that occurred in the village of Maršov in the 1960s was also publicly presented, and work began on a new documentary series on water in the Czech Republic.

The studio OAT contributed to production of videos for the *Science at home* (which originated to meet remote learning needs stemming from the pandemic). CAS also created videos presenting Czech science and research projects and institutes, videos presenting prominent Czech scientists and important anniversaries (e.g. the 400th anniversary of the Battle of White Mountain).

OTEVŘENÁ VĚDA
AKADEMIE VĚD ČR

The project **Open Science** afforded another year of science internships for high school students from across the entire country in 2020. The range of possible internship topics covered all three research areas and students were able to choose one of 105 topics. A total of 1,028 applications from 449 students were submitted. Instructors chose one to three students for each internship. Altogether 161 interns took part in Open Science in 2020, with 97 internships under the guidance of 86 instructors from 32 CAS Institutes.

The **Undistorted Science** promotional-educational video series had more than 6.5 million views in 2020 and added a sixth edition. Seven new series based on Strategy AV21 research programmes will be released over the course of 2021. Topics include e.g. particle accelerators, supercomputers, black holes, ecosystems, climate change and contemporary Czech history. Scientists from the Czech Academy of Sciences serve as content guarantors.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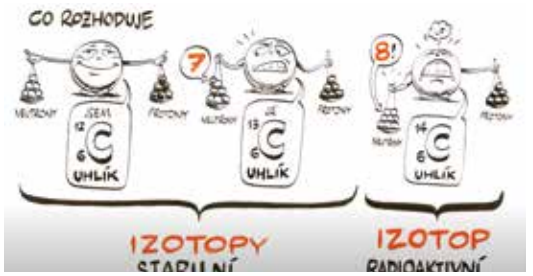
CO ROZHODUJE
UHLÍK
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IZOTOP


PŘI SRÁŽKÁCH
JÁDER VZNIKAJÍ
NOVÉ ČÁSTICE


STRATEGIE AV21
Podcasty


včelaření
s
václavem
břistíkem


Sluneční soustava
Planety obíhají okolo Slunce.


TICHÉ HROZBY
SÍLA PŘÍRODY POHLEDEM ČESKÝCH VĚDCŮ


Z
VĚD


MAGION


VĚDA
NA DOSAH
Proč a jak útoč
Věda na dosah
Sledovat
15

INSIGNIA ET SYMBOLVM GEORGII
MIELNICZKY á GREYFNFELSO,
CAPITANEI IN KOPORCZE.

GRYPHS volucris quatrupes, ROSA cui pede SAXA
Purpurat, est generis stēma decúsq; mei. (premēti
Emeruit virtus, REX contulit: Ecquis honorem
Eripiat, cui REX et pia vita fauent?

SYMBOLVM.

GRAVIA MONSTRANT AD GAVDIA.

DVlcia qui speras post tristes gaudia casus,
Ne tibi displiceat, qui præit illa, labor.
Quæ citó, quæ facilé obveniunt bona, non bene durant,
Nec sunt grata nimis, nec satis apta regi.
Tu tiús á gravibus venies ad gaudia curis,
Et mage grata quies, post grave fiet onus.

M. Geor. Carolides á Carls-
perga Poëta Laureatus Cæsarius
14. Octobr. faciebat.

PRAGÆ, Typis M. Danielis Adami, Anno M. D. XCVI.

Publications

The Czech Academy of Sciences supports the publication of original scientific monographs and popular science literature from all scientific disciplines, both through the Academia Publishing House, which is part of the Centre of Administration and Operation, and CAS Institutes. Books by Czech Academy of Sciences authors are also published by other Czech publishers and prestigious international publishing houses. In 2020, CAS scientists authored or co-authored a total of 51 books published abroad.

The Czech Academy of Sciences supports the publication of high-quality publicly accessible scientific and popular science publications. It thus contributes to the dissemination of the results of scientific research and the development of further knowledge.

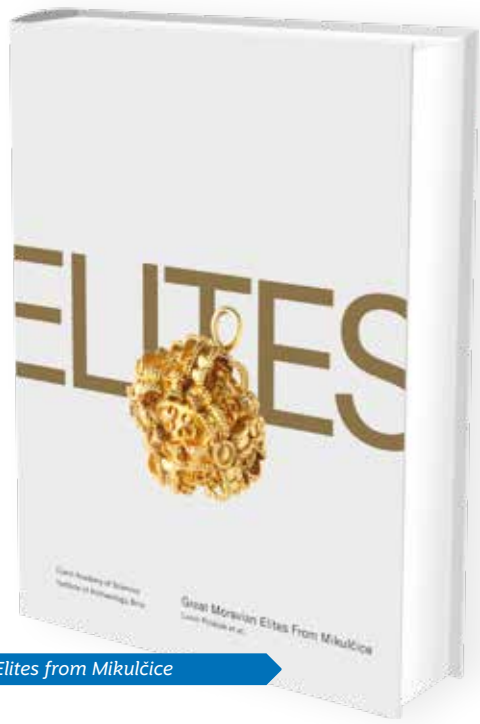
In compliance with Directive No. 13/2018 on Support of Publishing Activity, the CAS supports proposals for publication of original scientific work, critical editions of important sources and significant monuments, translations of important scientific or popular science works, and popular science works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

In 2020, through the Publishing Support Programme, the Czech Academy of Sciences supported, based on recommendations from the CAS Editorial Board, publications by the following 11 CAS Institutes: the Institute of Archaeology, Brno, Institute of Archaeology, Prague, Institute of Philosophy (Filosofia Publishing House and Oikoymenh Publishing House), Institute of History, Masaryk Institute and Archives, 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 almost CZK 18 million enabled publication of 99 books, 40 of which were published by the Academia Publishing House and 59 were published by CAS Institutes. Support also extends to another forthcoming 70 books.

The number of published books was slightly lower than in past years in regard to the impacts of the spread of the SARS-CoV-2 coronavirus.

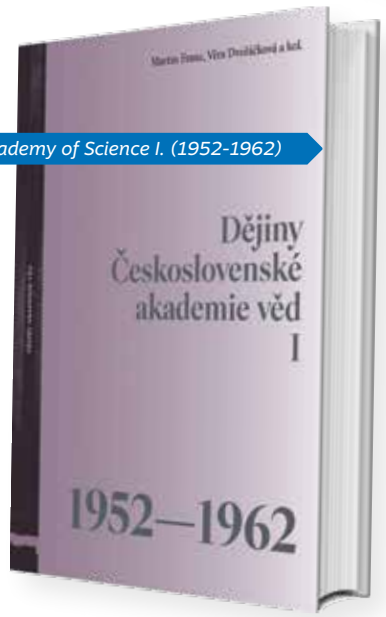
Some of the noteworthy works that were published with Publishing Support Programme funding in 2020 include the following original scientific works: the first volume of the four-volume collective work dedicated to the history of the Czechoslovak Academy of Science by M. France, V. Dvořáčková et al. *History of the Czechoslovak Academy of Science I.* (Academia), a monumental two-volume opus by K. Kubínová and K. Benešovská (editors): *Imago, imagines*, The Artwork and the Metamorphoses of its Functions in the Czech Lands from the 10th Century to the First Third of the 16th Century (Academia), an extensive publication by L. Poláček and 30 other authors: *Great Moravian Elites from Mikulčice* (Institute of Archaeology, Brno), a remarkable mon-

K. Kubínová and K. Benešovská (eds.): Imago, imagines



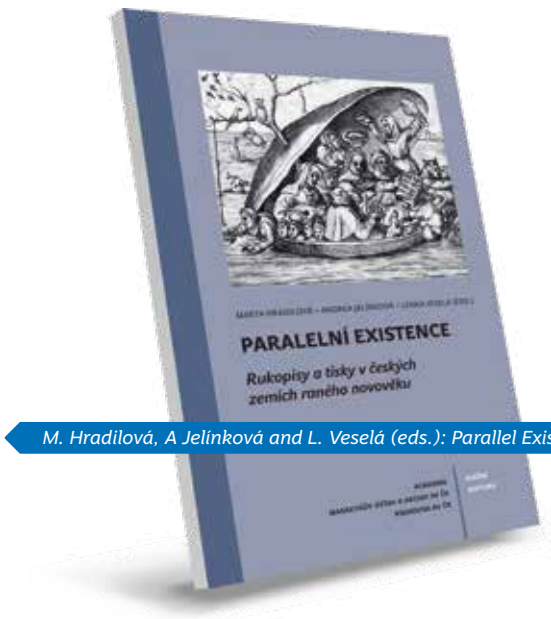
L. Poláček et al: Great Moravian Elites from Mikulčice

M. Franc, V. Dvořáčková et al: History of the Czechoslovak Academy of Science I. (1952-1962)



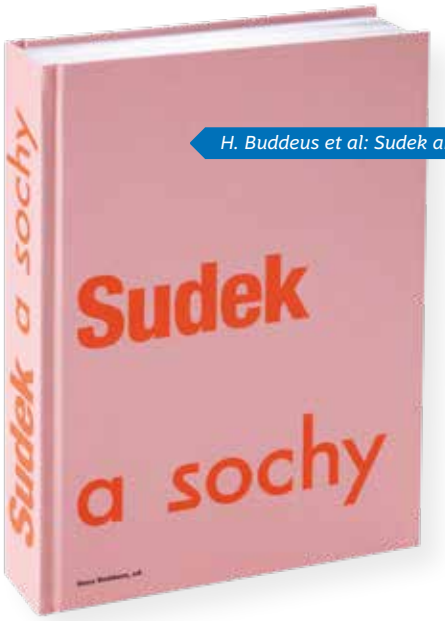
ograph by J. Trnka titled *The Philosopher Erazim Kohák* (Filosofia Publishing House) and a richly illustrated publication by Hana Buddeus et al. titled *Sudek and Sculpture*, which was published both in Czech and English language mutations (Artefactum Publishing House).

J. Trnka: Philosopher Erazim Kohák



M. Hradilová, A Jelínková and L. Veselá (eds.): Parallel Existences

The largest CAS publishing house is the Academia Publishing House, which is a leader among Czech publishers and publishes work from all scientific disciplines. The Academia Publishing House publishes 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.



H. Buddeus et al: Sudek and Sculptures

In 2020, the Academia Publishing House published a total of 98 books, 8 new Science Around Us brochures and five new brochures in the *Strategy AV21* series. Three monographs were published under the Strategy AV21 research programmes: M. Bednář (ed.) *Patočka's Thinking and the Contemporary World*, P. Hlaváček and M. Romancov (eds.) *Displaced Europe. Contexts and perspectives of the European "Eastern question"* and M. Hradilová, A. Jelínková and L. Veselá (eds.) *Parallel Existences.*

M. Bednář (ed.): Patočka's Thinking and the Contemporary World

P. Hlaváček and M. Romancov (eds.): Displaced Europe. Contexts and perspectives of the European "Eastern question"

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. Furthermore, they are an important link between the professional public and international scientific organisations: through their members, scientific societies associated in the Council of Scientific Societies of the Czech Republic are involved in 174 international scientific organisations.

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.

The CAS provides systematic, long-term support to scientific societies associated in the **Council of Scientific Societies of the Czech Republic**. 2020 was the Council's second year of operation as an independently registered association, affiliated with the Academy Council of the CAS through the Committee for Cooperation with Scientific Societies. The Council of Scientific Societies of Czech Republic currently associates 85 scientific societies with more than 25,000 members. Many scientific societies are interdisciplinary in nature and some are not represented in academic or other scientific institutions.

The number of societies did not change in 2020. The situation ensuing from the mass spread of the SARS-CoV-2 coronavirus, however, dramatically changed the character and quantity of societies' activities. Many meetings, particularly international gatherings, were cancelled or postponed although some were transformed into remote or hybrid formats. Important international conferences included the *9th European Conference of Constitutive Models for Rubber* (Czech Society for Biomechanics), *Visual, Material, and Sensory Cultures of Science* (Society for the History of Sciences and Technology, 580 participants on-line) and the *16th Conference on Polysaccharides-Glycoscience* (Czech Chemical Society). Czechoslovak and national events took place in almost the same scope as previous years, albeit some with fewer participants. Many events were also held in English and were well attended by international participants, such as the *20th Conference of Czech and Slovak Physicists* (Union of Czech Mathematicians and Physicists, hybrid format, ca. 600 participants), *72nd Conference of Chemists* (Czech Chemical Society, 300 participants), *XVI. Congress of Czech and Slovak Immunologists* (Czech Immunological Society, 300 participants on-line), *52nd Conference on Variable Stars Research* (Czech Astronomical Society), *Diversity to support students' engagement in learning in theory and research* (Czech Educational Research Association) and *2020 Zoological Days* (Czech Zoological Society, 465 participants).

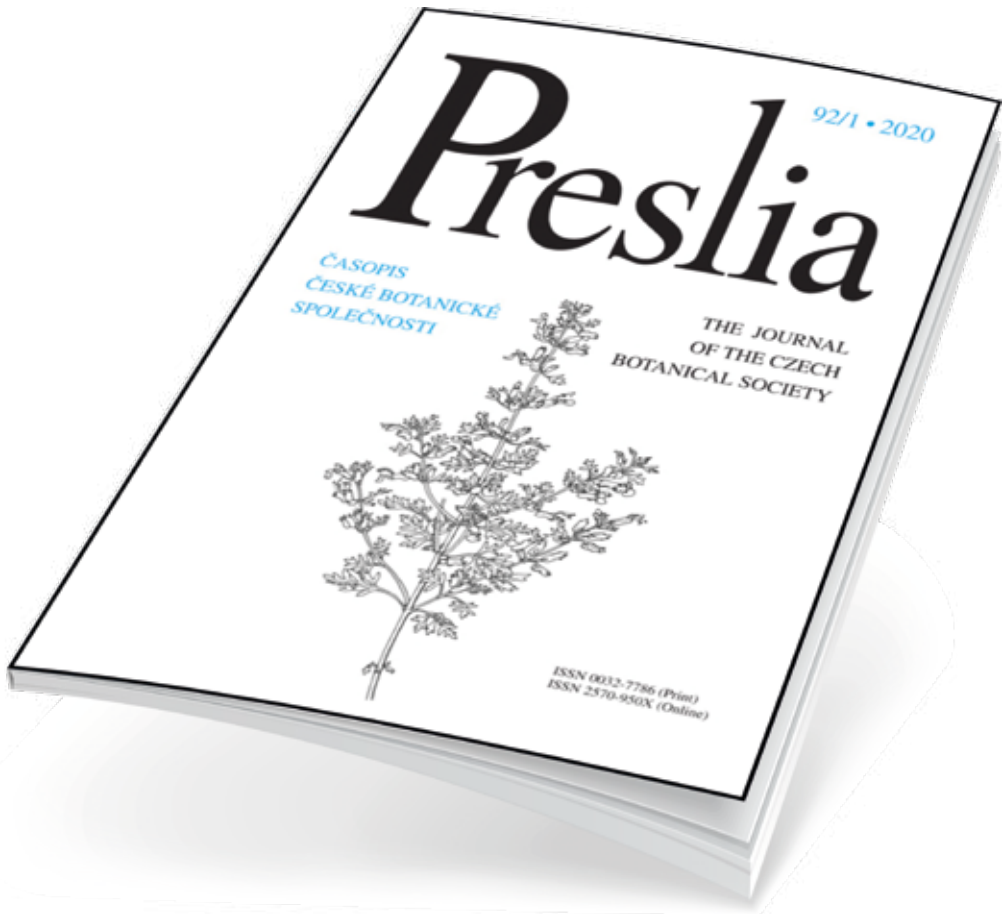
Scientific societies' publishing work was not affected: altogether the societies published 32 internationally noted journals, of which seven had an impact factor, e.g. *Preslia* (Czech Botanical Society – IF 4.36), *Fottea* (Czech Phycological Society – IF 2.46), *Journal of Geosciences* (Czech Geological Society – IF 1.28) and *Plant Protection Science* (Czech Society for Plant Pathology – IF 1.13), and 37 national professional journals, 15 Internet journals and 42 newsletters. Books and anthologies were also important publication platforms for scientific societies; in 2020, they published a total of 35 books and 54 anthologies.

Scientific societies actively supported elementary, secondary and university education by holding 184 events such as mathematics, chemistry, natural science or astronomy knowledge competitions, specialised field courses for secondary school and university students and teachers, summer schools (when the pandemic restrictions eased up), often including members of the public. Along with traditional events such as *Geography Days* (Czech Geological Society) and the *55th Floristic Botany Course* (Czech Botanical Society), there were also new formats such as the event *Experts for Schools 2020* (Czech Economic Society), which offered lectures on current economic issues for secondary school students (mostly on-line) and two *Winter Quantitative Methods Schools* (Czech Sociological Association) that took place before the pandemic outbreak.

Most scientific societies also usually offer lectures, popularisation and other social activities. Through adaptation to the on-line environment, there was only a slight decrease in the number of lectures and summer excursions (355) and media outputs actually increased slightly (235); exhibition and other public activities were of course diminished.

Two unusual events were noteworthy: the *Major Exhibition of Invertebrates* (Czech Entomological Society), presenting living organisms and their communities, which was transformed overnight to a much more demanding on-line format and made accessible on the Facebook page of the Faculty of Science of Charles University. A second notable activity was the *Declaration of professional societies and academic institutions* on the initiation of preparations for the Danube-Oder-Elbe canal (Czech Society for Ecology), which emphasised the ecological and economical absurdity of the proposed project; the declaration was signed by 80 chairs of societies, deans and heads of faculty institutes and CAS Institute directors.

The **Learned Society of the Czech Republic** (Society) connects prominent scientists from all disciplines. Its goals are to encourage the free 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 and support educational quality improvements and the development of a creative, rational and humanly responsible social environment in the Czech Republic. The Society had 95 regular fellows, 49 foreign fellows and 16 emeritus fellows at the end of 2020.



The Society organised a number of lectures on current scientific and educational issues, including seven lectures and discussions at plenary sessions open to the public, two public lectures and four lectures at the XXVI. General Assembly. In light of epidemic measures instituted to prevent the spread of covid-19, the Society organised meetings and lectures on-line, which helped maintain continuity in the Society's operations and tasks during this difficult time, including active collaboration with international experts.

The Society organised a competition for secondary school students and awarded 10 students; it also presented an award to an exceptional young researcher. The Society also recognized two educators for supporting students' interest in science and research at secondary schools, enabling students to work independently and for 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. RNDr. Martin Loebl, CSc. The most significant prizes that the Society awarded in 2020 were two medals of the Learned Society of the Czech Republic, Societas Scientarium Bohemica, Ad Laudem et Honorem, for merit in the development of science.

The Society held seven working meetings as well as an on-line gathering of members during the advent period. The Society and the United Nations Information Centre in Prague jointly awarded a prize for communication about climate change, which was presented during a debate titled *Climate Change During the Coronavirus Era* (as an extraordinary lecture of the Society).

The Learned Society of the Czech Republic published several declarations about current public affairs. It expressed its support for continuing funding for the large ungulate project in the former Milovice-Mladá military area. It joined an initiative organised by the International Human Rights Network of Academies and Scholarly Societies calling for the release of several academicians imprisoned in the Islamic Republic of Iran. It sent an open letter to the Minister of Health Adam Vojtěch criticising the decision to invest several tens of millions of Czech crowns into the development of a Czech SARS-CoV-2 coronavirus vaccine. Representatives of the Learned Society scientific technology committee met with Adam Vojtěch to discuss issues relate to covid-19. The Board of the Learned Society of the Czech Republic also published a declaration on the current covid-19 strategy.

The Society's website at www.learned.cz and its Facebook and Twitter accounts provide information about the Society's activities and its members. Lectures or presentations from lectures are also published on the website. The Society collaborated with the UN Information Centre Prague, the Faculty of Science of Masaryk University, the Bohuslav Jan Horáček Foundation for Česky ráj and other organisations. Memorandums on cooperation were concluded with the Faculty of Mathematics and Physics of Charles University, Faculty of Science of Charles University and Charles University.


BER
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Awards granted

by the CAS

Each year the Czech Academy of Sciences recognises leading scientists for excellent research results that focus on social priorities, have strengthened the international prestige of Czech science and were first published or implemented during the past five years. In 2020, 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 national and foreign 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 awards in 2020:

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

Prof. RNDr. Julius Lukeš, CSc.,
of the Biology Centre, for the scientific work *Dark matter of the ocean: from the discovery of diplonemid protists to their transformation into model organisms*

Institute of History team of authors
composed of**:**
Doc. PhDr. RNDr. Jan D. Bláha, Ph.D.,
Bc. Richard Boukal,
RNDr. Tomáš Burda, Ph.D.,
Doc. Ing. Jiří Cajthaml, Ph.D.,
Bc. Vojtěch Cehák,
Bc. Marek Fáber,
RNDr. Mgr. Dana Fialová, Ph.D.,
Ing. Jakub Havlíček, Ph.D.,
Ing. Tomáš Janata, Ph.D.,
Mgr. Petra Jílková,
RNDr. Zdeněk Kučera, Ph.D.,
RNDr. Silvie Rita Kučerová, Ph.D.,
Bc. Kristýna Ledecká,
RNDr. Jiří Martínek, Ph.D.,
Mgr. Jitka Močičková,
Doc. PhDr. Jan Němeček, DrSc.,
JUDr. Daniela Králíková,
Bc. Jiří Padevět,
Bc. Daniel Paluba,
Ing. Pavel Seemann, Ph.D.,
Prof. PhDr. Eva Semotanová, DrSc.,
Ing. Petr Soukup, Ph.D.,
Bc. Lucie Stará,
RNDr. PhDr. Markéta Šantrůčková, Ph.D.,
Doc. RNDr. Přemysl Štych, Ph.D.,
Bc. Zuzana Vaňková,
Doc. PhDr. Tomáš Vilímek, Ph.D.,
Ing. Růžena Zimová, Ph.D.,
Doc. PhDr. Zlatica Zudová-Lešková, CSc.,

for the scientific work *Czech Historical Atlas. Chapters on the History of the 20th Century.*

Team of authors nominated by the Masaryk Institute and Archives of the CAS, consisting of**:**
Doc. PhDr. Martin Franc, Ph.D.,
PhDr. Věra Dvořáčková, Ph.D.,
Mgr. Jan Boháček,
PhDr. Daniela Brádlerová, Ph.D.,
PhDr. Tomáš Gecko, Ph.D.,
PhDr. Tomáš Hermann, Ph.D.,
PhDr. Adam Hudek, Ph.D.,
PhDr. Milena Josefovičová, Ph.D.,
PhDr. Adéla Jůnová Macková, Ph.D.,
PhDr. Hana Kábová, Ph.D.,
Prom. hist. Nataša Kmochová,
PhDr. Miroslav Kunštát, Ph.D.,
PhDr. Jan Mervart, Ph.D.,
PhDr. Vítězslav Sommer, Ph.D.,
Mgr. Jiří Šoukal,
PhDr. Emilie Těšínská, Ph.D.,

for the scientific work *Martin Franc — Věra Dvořáčková et al., History of the Czechoslovak Academy of Sciences I. (1952–1962).*

The Award of the Czech Academy of Sciences for Young Researchers for Outstanding Results of Research, Experimental Development and Innovations, achieved in CAS-supported research projects before reaching the age of 35, was presented to:

- **Mgr. Jana Brejchová, Ph.D.,** Institute of Physiology, for the following scientific outcome:
  - Determination of δ-opioid receptor molecules mobility in living cell plasma membrane using a novel FRAP analysis method ("Restoration of fluorescence after illumination")
  - Plasma membrane cholesterol level and agonist--induced internalisation of δ-opioid receptors; colocalisation study with intracellular membrane markers of the Rab family
- **RNDr. Petr Zouhar, Ph.D.,** Institute of Physiology, for the following scientific outcome:
  Systemic role of metabolic and secretory functions of adipose tissue
- **Martin Bouda, Ph.D.,** from the Institute of Botany, for the following scientific outcome:
  Calibrated 3D models of water transport in plants

The 2020 Award of the President of the Czech Academy of Sciences for Promotion or Popularisation of R&D&I was presented to:

- **RNDr. Vladimír Wagner, CSc.,**
  nominated by the Nuclear Physics Institute
- **Prof. RNDr. Petr Pyšek, CSc.,**
  nominated by the Institute of Botany
- **Mgr. Milan Dufek,**
  nominated by the Institute of Philosophy

Honorary medals awarded to Czech and foreign researchers in 2020

The Honorary Medal of the CAS "De Scientia et Humanitate Optime Meritis" (in memoriam)

- **Prof. Ing. Karel Ulbrich, DrSc.,**
  Institute of Macromolecular Chemistry

The Bernardo Bolzano Honorary Medal for Merit in the Mathematical Sciences

- **RNDr. Martin Markl, DrSc.,**
  Institute of Mathematics

The Ernst Mach Honorary Medal for Merit in the Physical Sciences

- **Prof. Ing. Pavel Lejček, DrSc.,**
  Institute of Physics
- **Prof. RNDr. Mojmír Šob, DrSc.,**
  Institute of Physics of Materials

The Jaroslav Heyrovský Honorary Medal for Merit in the Chemical Sciences

- **Prof. David Smith, Ph.D., DSc., DSc. h. c., FInstP, FRS**, Great Britain

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

- **RNDr. Jaromír Lukavský, CSc.,**
  Institute of Botany

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

- **MUDr. Josef Zicha, DrSc.,**
  Institute of Physiology

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

- **Prof. PhDr. Jana Hoffmannová, DrSc.,** Institute for the Czech Language
- **Prof. PhDr. Jiří Kraus, DrSc.,** Institute for the Czech Language
- **PhDr. Ludmila Uhlířová, CSc., dr. h. c.,** Institute for the Czech Language
- **Prof. PhDr. Petr Koťátko, CSc.,** Institute of Philosophy

The František Palacký Honorary Medal for Merit in the Historical Sciences

- **Prof. PhDr. Eva Semotanová, DrSc.,** Institute of History
- **Dr. Peter Urbanitsch,** Österreichische Akademie der Wissenschaften, IHB, Vienna, Austria

The Honorary Medal for Merit for the Czech Academy of Sciences

- **Prof. RNDr. Jana Musilová, CSc.,** Masaryk University
- **Ing. Jan Rosa, CSc.,** Institute of Physics

The Jan Patočka Memorial Medal

- **Doc. Dr. phil. Hans Rainer Sepp,** Faculty of Humanities of Charles University – Department of German and French Philosophy

Major awards presented to CAS researchers by other institutions

The Award of the Chairman of the Research, Development and Innovation Council for the popularisation of research and development in the Czech mass media was bestowed upon:
RNDr. Václav Cílek, CSc.,
of the Institute of Geology

The František Běhounek Award of the Ministry of Education, Youth and Sports for promotion and popularisation of Czech science in the European research area was awarded to:
Prof. Tomáš Jungwirth, Ph.D.,
of the Institute of Physics

The Milada Paulová Award for lifelong achievement in science for women researchers bestowed by the Ministry of Education, Youth and Sports was awarded to:
Ing. Ilona Müllerová, DrSc.,
of the Institute of Scientific Instruments

The Golden Linden Medal of the Minister of Defence of the Czech Republic for an extraordinary contribution to the development of defence and security of the Czech Republic was awarded to:
Doc. PhDr. Jan Němeček, DrSc.,
of the Institute of History

The Charles University Gold Medal of Merit was bestowed upon:
Prof. Ing. Štěpán Jurajda, Ph.D.,
of the Economics Institute for the development of CERGE-EI

The Charles University Silver Memorial Medal was bestowed upon:
Prof. PhDr. Milan Hlavačka, CSc.,
of the Institute of History for his contribution to the university's development in science, the culture of learning and academic freedom

The Emil Votoček Medal for Merit in development of science and technology of the University of Chemistry and Technology, Prague was bestowed upon:
Prof. Ing. Jiří Hanika, DrSc.,
of the Institute of Chemical Process Fundamentals

The Josef Hlávka Medal for lifetime achievement in Czech science bestowed by the Josef, Marie, and Zdeňka Hlávka Foundation was awarded to:
Doc. RNDr. Jana Pěknicová, CSc.,
of the Institute of Biotechnology

The Gold Commemorative Medal of the Czech Medical Society of Jan Evangelista Purkyně was bestowed upon:
Prof. MUDr. Pavel Mareš, DrSc.,
of the Institute of Physiology for exceptional achievements in his scientific career and active participation in professional associations

The Magnesia Litera Award in the publishing category:
Mgr. Jana Mařík ová-Kubková, Ph.D.,
of the Institute of Archaeology, Prague

The Czech Astronomical Society presented **The František Nušl Award for achievements in Czech science Award** to
Doc. RNDr. Petr Hadrava, DrSc.,
of the Astronomical Institute

The President of the Czech Science Foundation's Award for exceptional grant project basic research outcomes was bestowed upon:
Judit Šponerová, Ph.D.,
of the Institute of Biophysics,
Dr. rer. nat. Leoš Shivaya Valášek, DSc.,
of the Institute of Microbiology

The Technology Agency of the Czech Republic's Award for the best project in the business category was won by:
Dr. Ing. Pavel Honzátko
of the Institute of Photonics and Electronics

The City of Prague Silver Medal was presented to:
MUDr. Radim Šrám, DrSc.,
of the Institute of Experimental Medicine for his lifetime achievements in research into the public health impacts of air pollution.

The Japanese Government bestowed **the Order of the Rising Sun** on:
Prof. Sergey Bulanov of the Institute of Physics for his international contribution to science and technology.

The Czech Head National Prize of the Government

The 2020 Czech Head National Prize of the Government of the Czech Republic was awarded to: **Prof. RNDr. Václav Hořejší, CSc.,**
of the Institute of Molecular Genetics

The Czech Head Project Prize in the Invention category was bestowed upon:
Mgr. Jiří Dědeček, CSc., DSc.'s team,
at the Institute of J. Heyrovský Institute of Physical Chemistry

The VEOLIA Award Doctorandus for Natural Science was bestowed upon:
Mgr. Matouš Vobořil, Ph.D.,
of the Institute of Molecular Genetics

Letters of thanks for long-standing service to the CAS

Due to the epidemic, the presentation of 2020 letters of thanks to CAS employees for long-standing service to the CAS was postponed until 2021.

Granted scientific degrees

“Research Professor”

The scientific degree “Research Professor” was established by Decision XXI. at a session of the 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 adopted the Rules for Awarding the Scientific Degree “Research Professor” at the Czech Academy of Sciences.

The Czech Academy of Sciences awards the scientific degree of Research Professor to scientists in recognition of outstanding 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 Science Council of the CAS established a Committee for the Research Professor Degree as an auxiliary and advisory body for matters related to the awarding of the scientific degree. The Science Council decides on the awarding of scientific degrees solely on the basis of proposals by the Committee for the Research Professor Degree and the results of scientific degree award proceedings.

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

In 2020, the Science Council awarded the scientific degree to the following 15 researchers from the CAS and universities:

RNDr. Lubomír Adamec, CSc., Res. Prof.,
Institute of Botany

Dissertation: *Ecophysiological characteristics of aquatic carnivorous plants*
Commission: Botany, Experimental and Ecological Biology
Degree granted: "Research Professor in Biological and Ecological Sciences"

Prof. RNDr. Tomáš Cajthaml, Ph.D., Res. Prof.,
Institute of Microbiology

Dissertation: *Mechanisms of biodegradation of organic pollutants and emerging micropollutants by ligninolytic fungi*
Commission: Microbiology, Virology and Mycology
Degree granted: "Research Professor in Molecular-Biological and Medical Sciences"

Doc. RNDr. Pavel Dráber, CSc., Res. Prof.,
Institute of Molecular Genetics

Dissertation: *Molecular Mechanisms of Microtubule Nucleation and Organisation*
Commission: Molecular Biology and Genetics
Degree granted: "Research Professor in Molecular-Biological and Medical Sciences"

Doc. JUDr. Jakub Handrlica, L.L.M., Ph.D., Res. Prof.,
Faculty of Law, Charles University

Dissertation: *Nuclear Law and Legal Futurism*
Commission: Law Sciences
Degree granted: "Research Professor in Social Sciences and Humanities"

PhDr. Martina Klicperová, CSc., Res. Prof.,
Institute of Psychology

Dissertation: *The Psychology of Democracy*
Commission: Psychology
Degree granted: "Research Professor in Social Sciences and Humanities"

Doc. Mgr. Alexandr Malijevský, Ph.D., Res. Prof.,
Institute of Chemical Process Fundamentals

Dissertation: *Geometry induced phase transitions at patterned surfaces*
Commission: Physics of Condensed Matter Systems
Degree granted: "Research Professor in Physical and Mathematical Sciences"

Doc. PhDr. Jiří Militký, Ph.D., Res. Prof.,
Institute of Archaeology, Prague

Dissertation: *Celtic coinage in Bohemia in the 3rd and 2nd centuries B.C.*
Committee: Archaeology
Degree granted: "Research Professor in Historical Sciences"

Doc. Mgr. Milan Pokorný, Ph.D., Res. Prof.,
Faculty of Mathematics and Physics, Charles University

Dissertation: *Steady compressible Navier-Stokes-Fourier system and related problems. Large data results*
Committee: Mathematical Analysis and Related Fields
Degree granted: "Research Professor in Physical and Mathematical Sciences"

Doc. Dr. Ing. Miroslav Rozložník, Res. Prof.,
Institute of Mathematics

Dissertation: *Gram-Schmidt orthogonalization in presence of rounding errors*
Commission: Mathematical Analysis and Related Fields
Degree granted: "Research Professor in Physical and Mathematical Sciences"

Photographs from the ceremony presenting Research Professor scientific degrees at the CAS Main Library in September 2020

Doc. PhDr. Filip Smolík, Ph.D., Res. Prof.,
Institute of Psychology

Dissertation: *Early Language Development: Measurement, Early Understanding, and Factors Affecting Development*
Commission: Psychology
Degree granted: "Research Professor in Social Sciences and Humanities"

Doc. RNDr. Artur Sergyeyev, Ph.D., Res. Prof.,
Institute of Mathematics at the Silesian University in Opava

Dissertation: *Selected Topics in Integrable Systems and Related Structures*
Commission: Mathematical Structures
Degree granted: "Research Professor in Physical and Mathematical Sciences"

Ing. Petr Škrdla, PhD., Res. Prof.,
Institute of Archaeology, Brno

Dissertation: *Moravia at the Onset of the Upper Palaeolithic*
Commission: Archaeology
Degree granted: "Research Professor in Historical Sciences"

Prof. Ing. David Vališ, Ph.D. et Ph.D., Res. Prof.,
Faculty of Military Technology, University of Defence in Brno

Dissertation: *Methods for modelling the degradation of the reliability of technical systems*
Commission: Applied and Theoretical Mechanics
Degree granted: "Research Professor in Technical Sciences"

Doc. RNDr. Radomíra Vaňková, CSc., Res. Prof.,
Institute of Experimental Biology

Dissertation: *The role of cytokinins in the response to abiotic and biotic stresses*
Commission: Botany, Experimental and Ecological Biology
Degree granted: "Research Professor in Biological and Ecological Sciences"

Prof. PhDr. PaedDr. Jindřich Vybíral, CSc., Res. Prof.,
Academy of Arts, Architecture and Design in Prague

Dissertation: *Leopold Bauer. Heretic of Modern Architecture*
Commission: History and Art Theory
Degree granted: "Research Professor in Historical Sciences"

Annexes

The Annual Report of the Czech Academy of Sciences for the provision of information pursuant to Act No. 106/1999 Coll., on Free Access to Information, as amended, for the period from 1 January to 31 December 2020

a)	Number of submitted requests for information	3
	Number of decisions rejecting a request	1
b)	Number of submitted appeals against a decision rejecting a request	0
c)	Number of court judgments examining the legality of a decision rejecting a request	0
d)	Number of exclusive licences granted	0
e)	Number of complaints submitted pursuant to Section 16a of the Act	0

List of Abbreviations Used

CAS	Czech Academy of Sciences
ERC	European Research Council
EU	European Union
R&D	Research and Development
R&D&I	Research, Development and Innovation
R&D&I Council	Research, Development and Innovation Council
TTO	Technology Transfer Office of the CAS

2020 Annual Report on the Activities of the Czech Academy of Sciences

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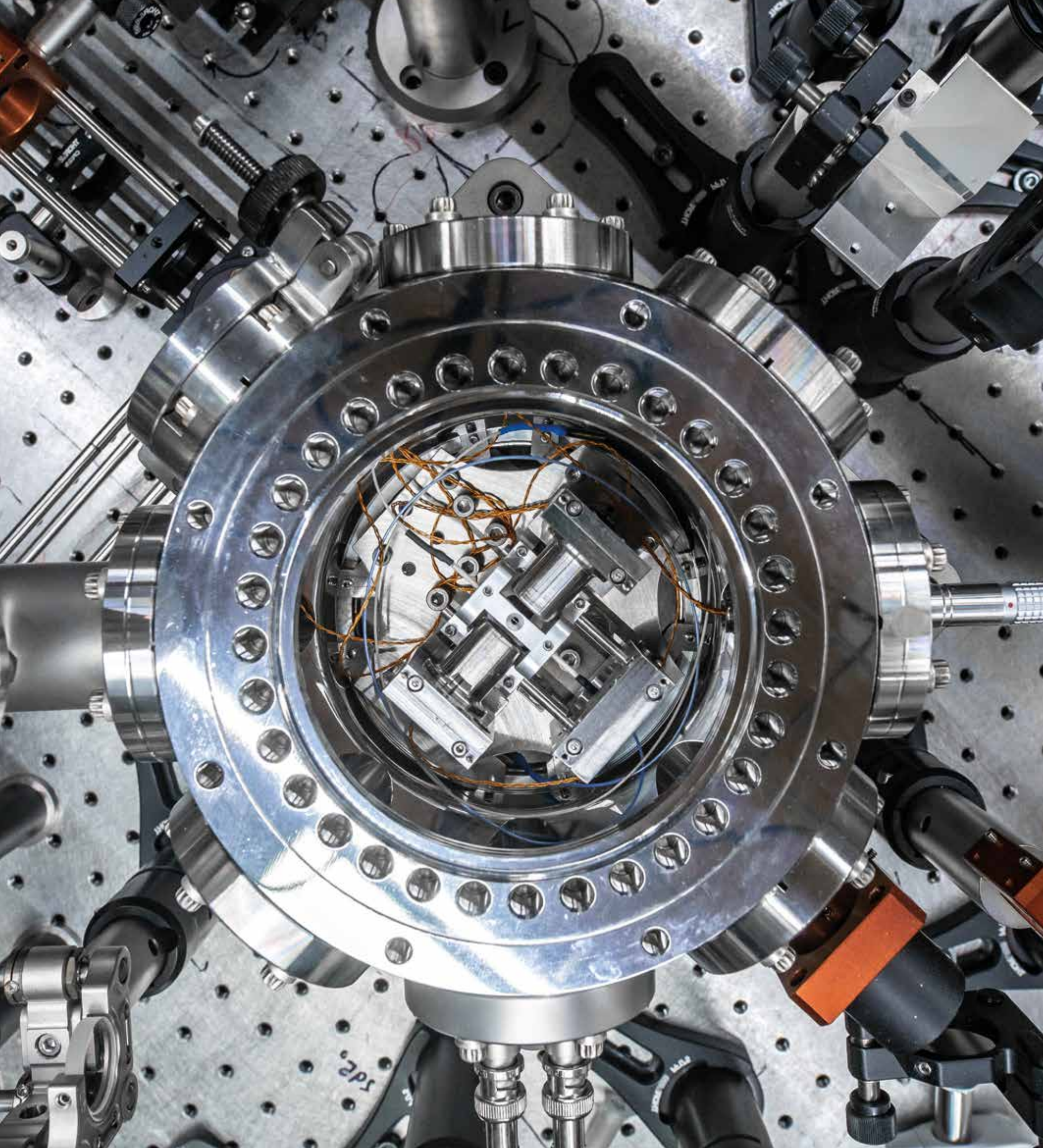

Czech Academy of Sciences

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

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

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

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

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

Czech Academy of Sciences

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