



**Charles  
University**

# **The University's Ninety-Nine Steps Towards the Future**

**PROJECTS CO-FINANCED FROM THE OPERATIONAL PROGRAMME RESEARCH, DEVELOPMENT, AND EDUCATION**

Implemented between 2014 and 2023 at Charles University

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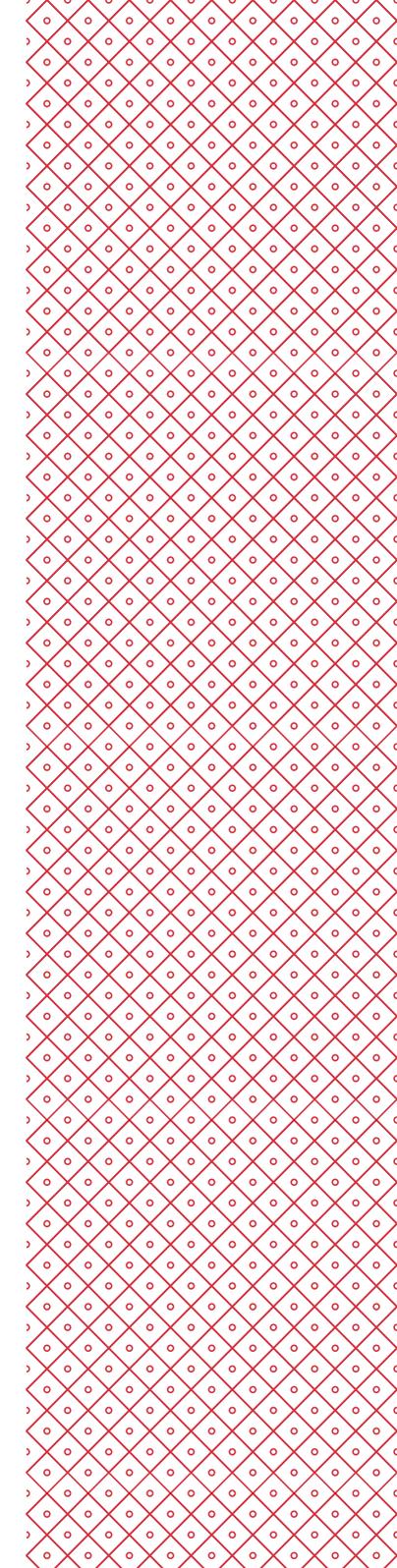
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# Introduction

This publication presents a wide range of projects supported by the operational programme Research, Development, and Education (OP VVV) at Charles University, which promoted and continues to promote the university's overall development. The respectable number of ninety-nine implemented projects with funds exceeding CZK 8 billion was indelibly incorporated into the life of the university. The goal of this publication is to describe this impact and, in fact, to brag a little bit about it. There is definitely something to brag about.

Over the last few years and programme periods, the implementation of projects financed from the cohesion policy has become a common part of the life of not only schools, universities, and other research organizations. It is sometimes easy to forget the very reason for the existence of these interventions, but the fact that such resources are available at all and used not only for the development of education and research in the Czech Republic is often overlooked. Thus, this publication has a more important role than just the usual formal publicity required by the terms of the projects or publicity aimed only at the simple promotion of the successes of individual projects. It should also resonate in our thinking about how development actually occurs in the fields of higher education and research and what conditions are created for it. In addition to the evidence of the ways to fulfil the original mission of these funds, i.e. to reduce the disparities between the individual regions of Europe, basically each of the following pages of our publication shows how the absence of these funds would be damaging for the Czech Republic and Charles University.

The structure of this publication is also testimony to the cross-sectional impact that the operational programme Research, Development, and Education has had and will continue to have on our entire university. In many cases, it would be difficult to find people at the university who have not benefited from the projects now or will not in the future, either in terms of improving the environment or facilities, or simply put, the conditions for excellent education and research





in their extraordinary diversity. On the following pages, you can easily identify the shift that the majority of our faculties have undergone thanks to the projects. You will see stories about specifically focused projects as well as “university-wide” projects, and thus in a positive sense “irreversibly” imprinted into our entire organization. You will read information about new buildings and the completion of campuses, the support of our exceptionally large research infrastructures, as well as the university’s contribution to solving global challenges. In the same way, you will see here examples of the excellent practice of connecting our teams in the form of partnerships with other important domestic and foreign institutions... In short, you can witness the positive impact on the university as a whole, in its broad disciplinary portfolio, as well as the structural impact, for all of its roles, and according to their needs. Charles University, as the oldest, largest, and most important university and research organization in the Czech Republic, must continuously and in considerable quantities invest in its development in all senses of the term in order to fulfil its role and maintain its competitiveness. And just as it has been necessary for the university to raise a large amount of funds, it is also its duty to ensure that these funds are effectively and wisely invested in the future.

Operational programmes are not only about resources, but also about collaboration, for example, gaining experience and contacts abroad or establishing new cooperation and opening other avenues for development. Project results are first and foremost a commitment. In terms of sustainability – often mentioned in the project’s terms – but also a commitment to acceleration and additional qualitative progress. Improving the quality and growth of capacities in the broadest sense must be a challenge for every institution if it is to fulfil its educational, research, or social roles.

In the case of Charles University, experience must be transformed into new demands for its own strategic management, planning, and long-term work with development projects. And this applies not only to the university itself. The results and experience must then contribute to a joint dialogue between the state administration and educational and research organizations about the future direction of the system as a whole and its various nuances, whether it be on a conceptual, financial, methodological or, last but not least,

legislative level. After all, many of the approaches and tools of the OP VVV documented here were and are designed to offer desired synergies and complementarities to other tools and national policies. Concepts that may seem somewhat distant from everyday university life will nevertheless be decisive for the future of the university and research environment in just a few years. However, let's also not forget that balancing the differences between regions and raising the level of those lagging behind not only depends on finances. So let's use the experiences gained – those that we perceive as acquired through positive stories, as well as those that are the result of less pleasant moments.

We should thank here the Czech Ministry of Education, Youth and Sports, which, from the position of the Managing Authority for implementing the project, made it all possible, from the initial conceptual setting of the programme and calls up to the final billing of the projects. Where else than here is it appropriate to appreciate that, as a university, we had a friendly partner willing to perceive the difficulties of the implementation phase of projects and a helper in overcoming them. Such an approach is far from being commonplace, and I believe that as universities we can be envied by the beneficiaries of other operational programmes. Thanks also goes to everyone who participated in implementing the projects at Charles University in all phases of their life cycle, and of course, both the academic staff and everyone else who participated in supporting the management and administration of the projects, because without them, implementation would not have been possible. For everyone, let this publication be a testimony that such work has meaning for the university.

So let's turn the page now and allow me to offer a little invitation on the next page. To fly through our joint successes. It won't be just for a short moment, so hold on tight.

## **Pavel Doleček**

*Vice-Rector for Strategic Cooperation  
and Development Charles University*



# Invitation

Sit back and take a look with us at an illustrative map of implemented projects throughout Charles University, which are not only beneficial to academia, but to society as a whole.

**Project Support Department**



EUROPEAN UNION  
European Structural and Investment Funds  
Operational Programme Research,  
Development and Education



MINISTRY OF EDUCATION,  
YOUTH AND SPORTS

# Better facilities for lawyers

The Faculty of Law participated in the university-wide project Improving the Quality of Education at Charles University and its Relevance for the Needs of the Labour Market. In order for this to fully develop in all its beauty and complexity, there needed to be investments in the modernization of equipment and premises. And this made it possible for us to **create, profile, and specialize the administrative and technical facilities in order to improve the quality of teaching and to facilitate professional meetings on the premises of the Faculty of Law**, the greatest achievement of which, in addition to the newly renovated premises, was the creation of a conference portal, through which you can register from anywhere in a second for conferences organized by this faculty.



## Faculty of Law, Charles University



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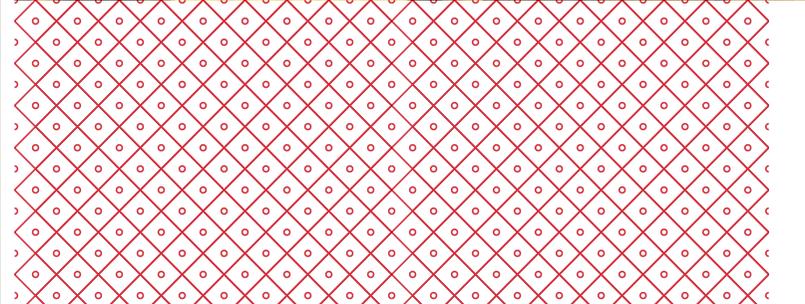
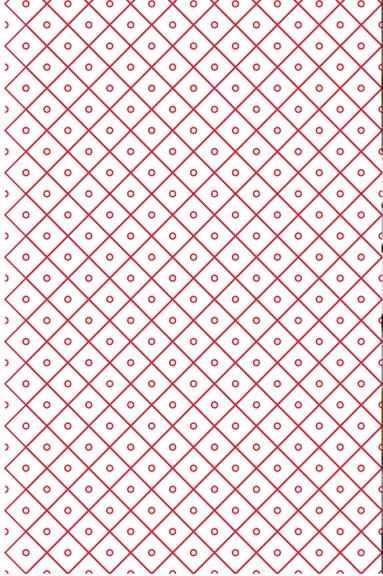
CZK 6,582,354



1 Jan. 2018 to 31 Dec. 2019



JUDr. Věra Honusková, PhD.



# How to conquer modern technology

Do you still remember the equipment of Czech hospitals in 1993? Most likely yes. Would you like to visit them again or would you prefer the hospitals of 2023? And would the fact change your mind that hospital equipment is currently just sitting in the corner and not being used because no one knows how to get it working, let alone use it? Equipment is one thing, but staff who can handle the equipment and fully use it, well, that's another matter – and most crucial. The project **Procurement of Equipment for the Innovation of Teaching Biophysics at the Medical Faculties of Charles University** was not only involved in the technical facilities, but also created a way to teach future physicians how to use these modern devices, for example from the fields of ultrasonography, endoscopy, radiometry, spectrometry, to fully use hyperbarium in practice, among other things, using e-learning courses. And because we have team spirit, we arranged these great things not only for the 1<sup>st</sup> Faculty of Medicine but also for all others medical faculties at Charles University.



## 1<sup>st</sup> Faculty of Medicine, Charles University



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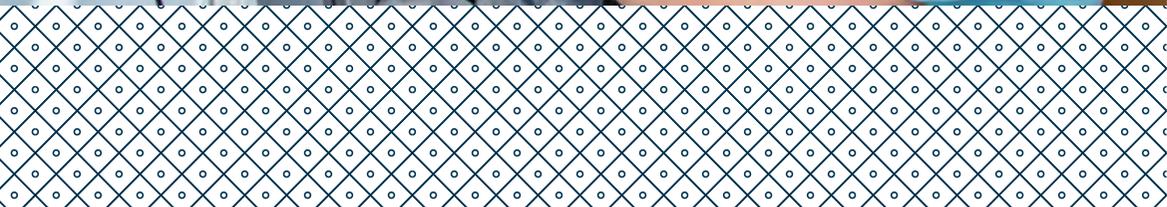
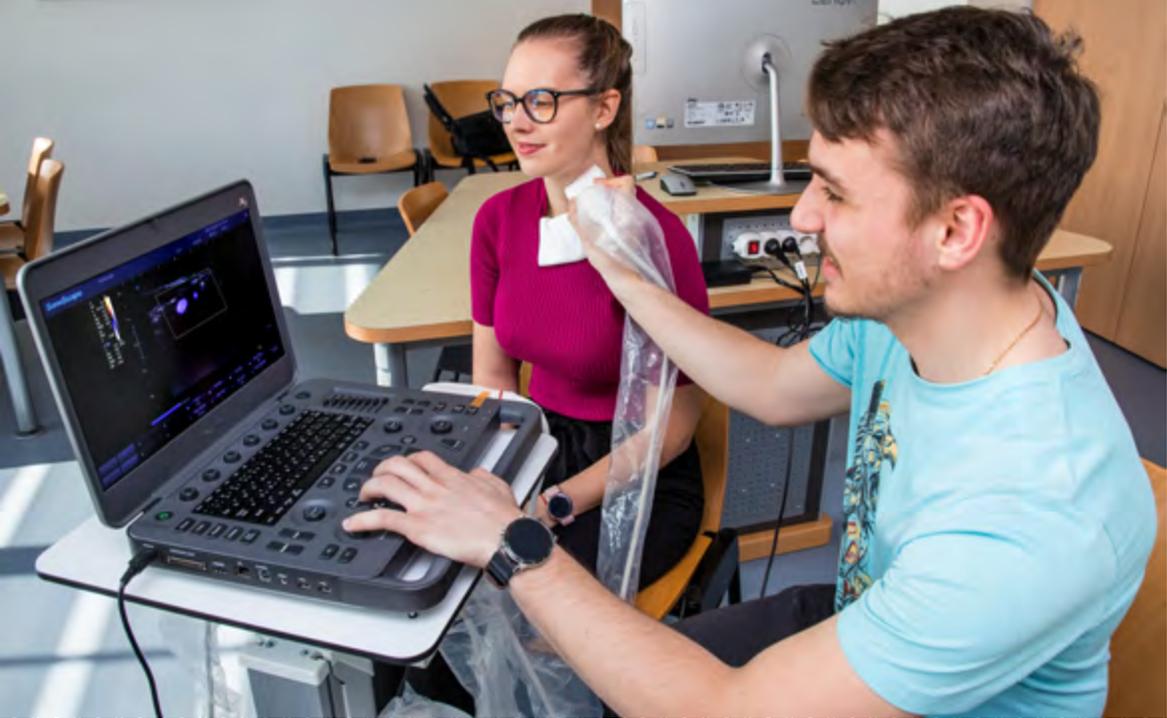
CZK 43,741,792



1 Jul. 2017 to 30 Nov. 2021



Ing. Jan Kašpar



# Where is the border, Where is the gap?

Imagine: We are sixteen years old. The whole world belongs to us. It starts at a ball with high heels and formal ties and continues with entertainment or a discotheque with dishevelled hair and a cool jacket, where we encounter once again alcohol, cigarettes, and other drugs, whether legal or illegal, it doesn't matter. After all, we are sixteen! When is it still "fun" and when does it start to be a problem? Modern tools such as *eHealth* and *mHealth* can help prolong the path to addictive behaviour or even prevent crossing the line between risky and addictive use and also ensure more effective and more affordable treatment. In the project **Modernization of the PhD Study Programme in Addictionology in the Areas of Research into the Prevention and Treatment of Addictive Behaviour**, we focused not only on these areas of electronic health, but also on research relating to the rehabilitation of cognitive skills, neuro-prevention, and electronic prevention. Among other things, we also arranged education for many researchers who will devote themselves to the issue in the long term and carry out competitive research projects on an international scale. We ensured this through English language activities and exchanges of good practice with capacities abroad in the field of addictionology.

## 1<sup>st</sup> Faculty of Medicine, Charles University



CZ.02.2.69/0.0/0.0/16\_018/0002489



CZK 8,251,017



1 Sep. 2017 to 30 Sep. 2022



Mgr. Roman Gabrhelik, Ph.D.



# A recipe for immortality (almost)

Mary Shelley – Frankenstein. Organs and body parts preserved in jars in a substance for creating new life? We're now going to talk about something else – that is, almost. So that we can understand the causes and occurrence of diseases and then be able to treat them, thus extending the quality of life, we need to research the disease. And for that, we also need to preserve the tissue attacked by the disease so that we can perform a wide range of tests on it. The project **BBMRI-CZ: Network of Biobanks – a Universal Platform for Research into the Etiopathogenesis of Diseases** focused on the preservation of these tissues as well as the provision of suitable tools and techniques for their examination. The results are of practical use, for example, in laboratory tests, and have a direct impact on the diagnosis and treatment of monitored cancerous and non-cancerous diseases from gastroenterology, cardiology, neurology, ophthalmology, and other areas of medicine.



## 1<sup>st</sup> Faculty of Medicine, Charles University



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CZK 35,456,060



1 Oct. 2017 to 31 Mar. 2020



Mgr. Kateřina Jirsová, Ph.D.



Masaryk Memorial Cancer Institute  
Palacký University Olomouc



Projekt  
**BBMRI-CZ: SÍŤ BIOBANK - UNIVERZÁLNÍ PLATFORMA  
K VÝZKUMU ETIOPATOGENEZE CHOROB**  
je spolufinancován Evropskou unií.

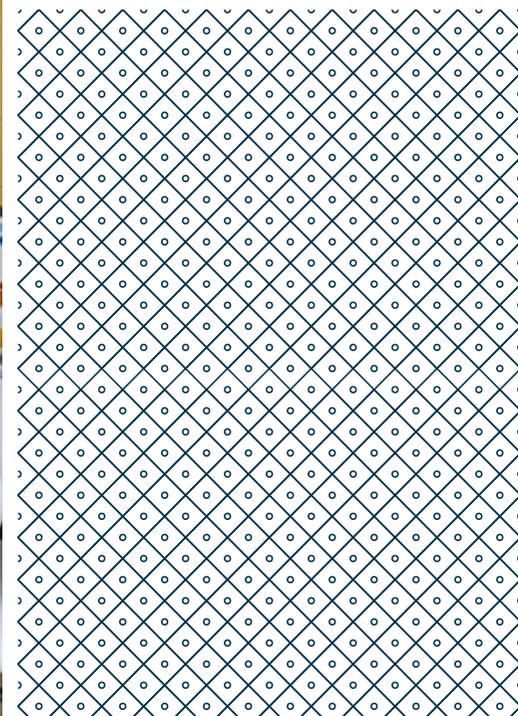
Cílem projektu BBMRI-CZ je rozšířit spektrum získávaného biomateriálu, optimalizovat a standardizovat postupy jeho primárního zpracování a dlouhodobého skladování. Dále se projekt zabývá výzkumem v oblasti etiopatogeneze nádorových a nenádorových chorob.



EVROPSKÁ UNIE  
Evropské strukturální a investiční fondy  
OP Výzkum, vývoj a vzdělávání



MINISTERSTVO ŠKOLSTVÍ,  
MLÁDEŽE A TĚLOVÝCHOVY



# Rare and dangerous diseases

The Genomics Centre has exceptional scientists who can detect rare diseases that others do not know how to deal with; without instrumentation equipment, however, this would not be possible. The project **National Medical Centre of Genomics – Infrastructure Modernization and Research into the Genetic Variability of the Population** provided the most modern instrumentation, thanks to which we can identify these diseases, and thus better target any subsequent treatment. Each sample collected and processed is then carefully preserved in the publicly accessible Czech gene pool library. Thanks to the project, we acquired the Illumina NovaSeq 6000 sequencer, unique at that time, which uses sequential methods of the new generation and enables the processing of large quantities of samples at a lower operational cost. Lest we forget – did you get tested for covid? It is highly likely that they processed them in this very laboratory.



## 1<sup>st</sup> Faculty of Medicine, Charles University



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CZK 57,731,437



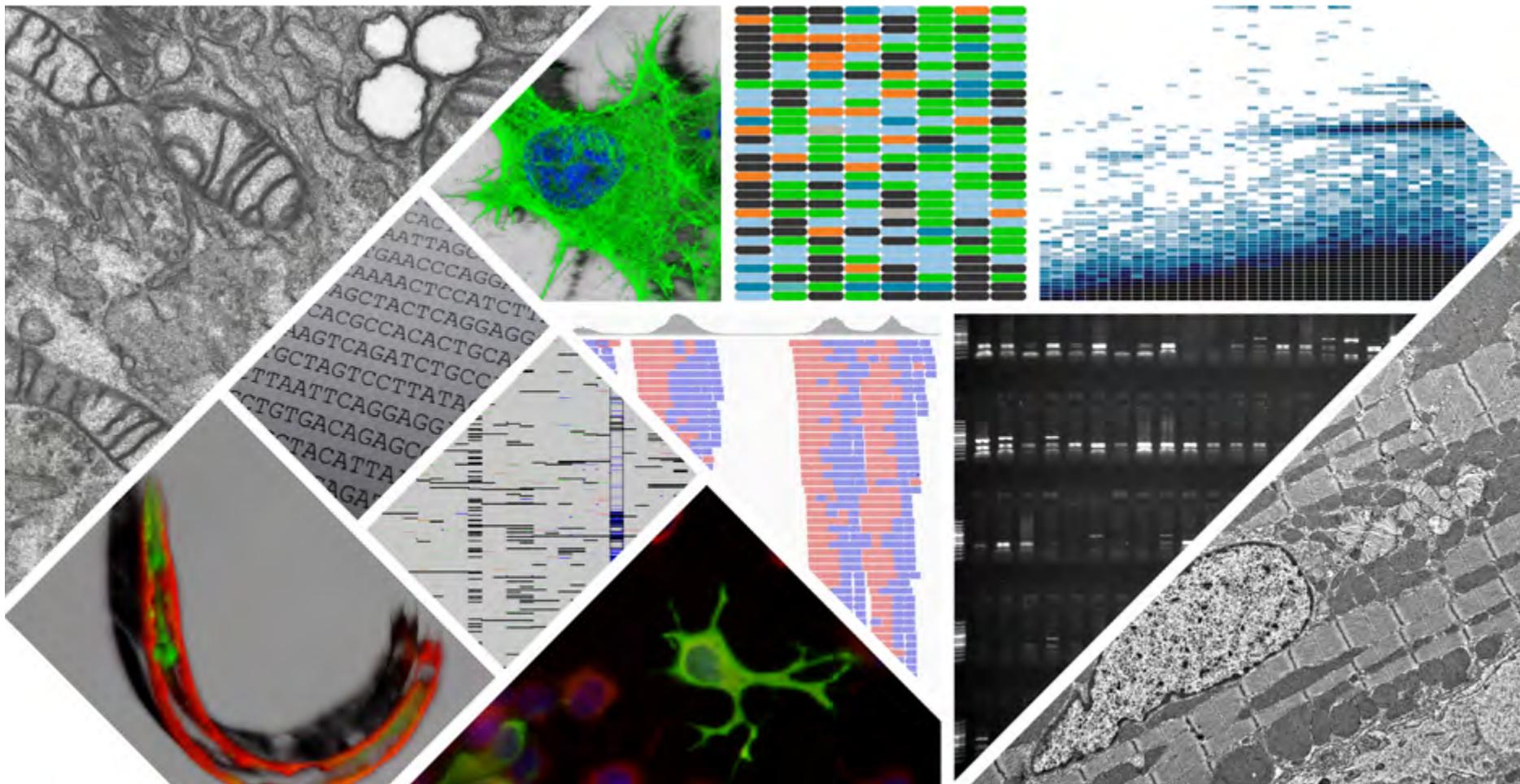
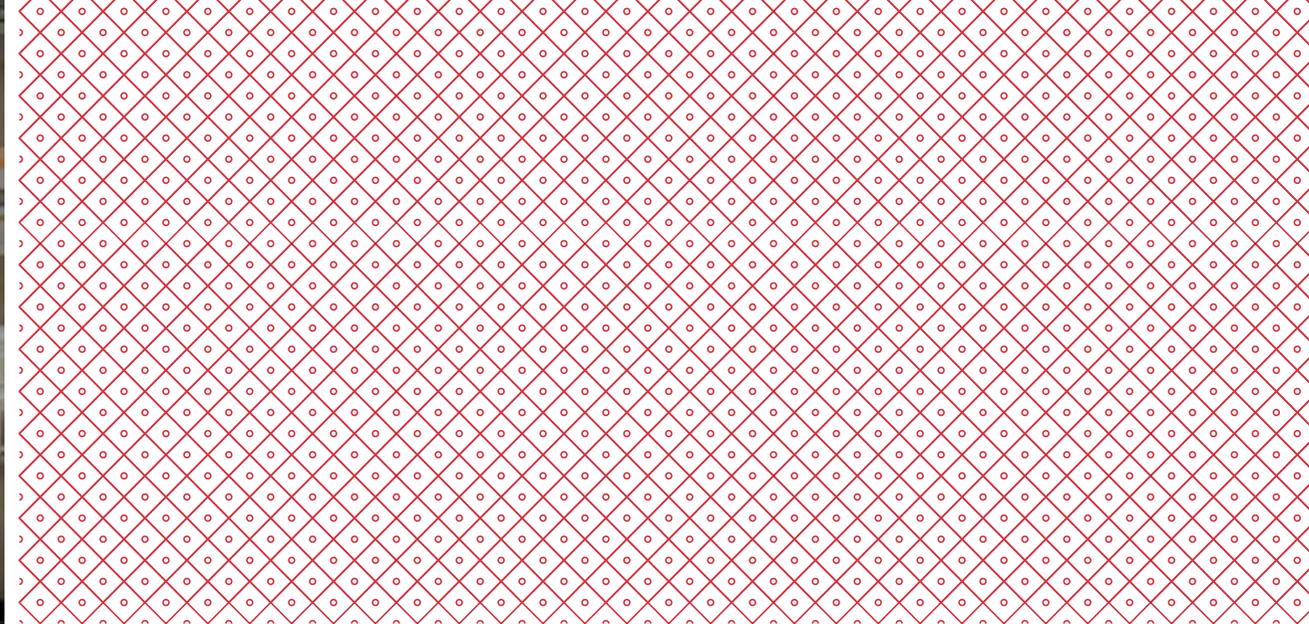
1 Apr. 2017 to 30 Sep. 2019



prof. Ing. Stanislav Kmoch, CSc.



Masaryk University  
Palacký University Olomouc  
University Hospital Brno



# Additional hi-tech instruments for genomics

But the instrumentation of the National Centre for Medical Genomics does not end there! As part of the **Modernization and Expansion of the Instrumentation for the National Centre for Medical Genomics**, we have acquired other unique technologies, such as a PCR thermal cycler, a cooled centrifuge with rotors, a capillary DNA sequencer, and a NGS system. In order to properly store all of the data about your genetic information and subsequently use it for scientific discoveries, a proper computer must be purchased – in this case, it is not a desktop computer, but a room full of servers. That's why we bought a computing server and data storage, a 2-socket server + storage server and a device for automated preparation of sequencing libraries. And this certainly wasn't free of charge.



## 1<sup>st</sup> Faculty of Medicine, Charles University



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CZK 17,819,127



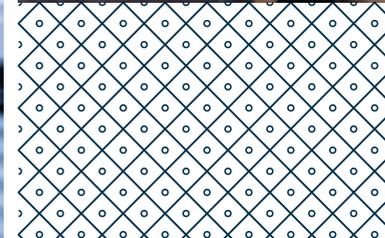
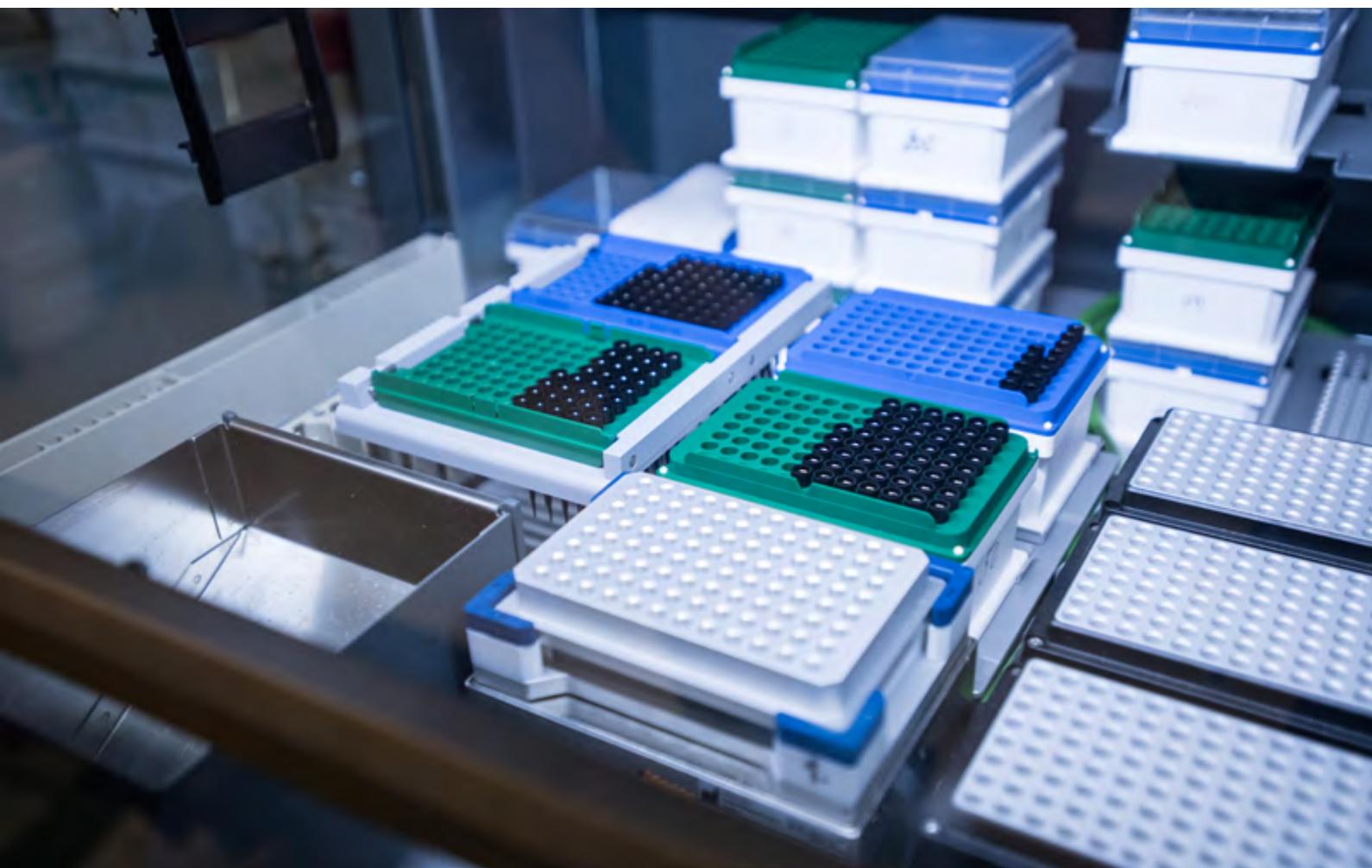
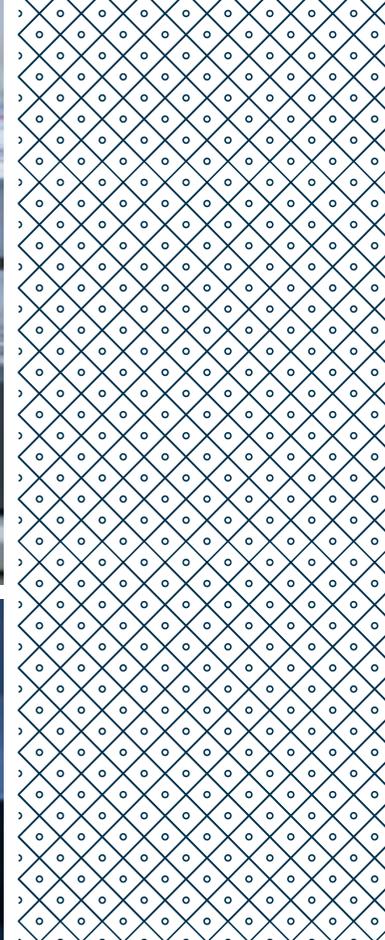
1 Jan. 2020 to 31 Dec. 2021



prof. Ing. Stanislav Knoch, CSc.

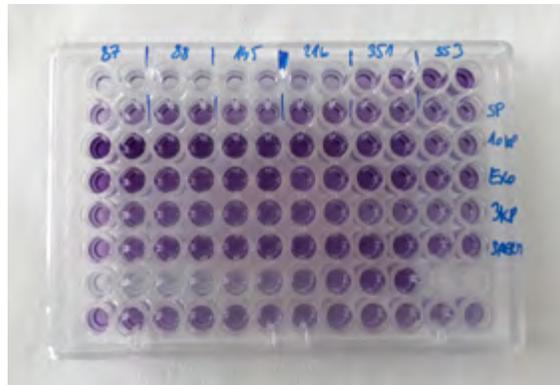
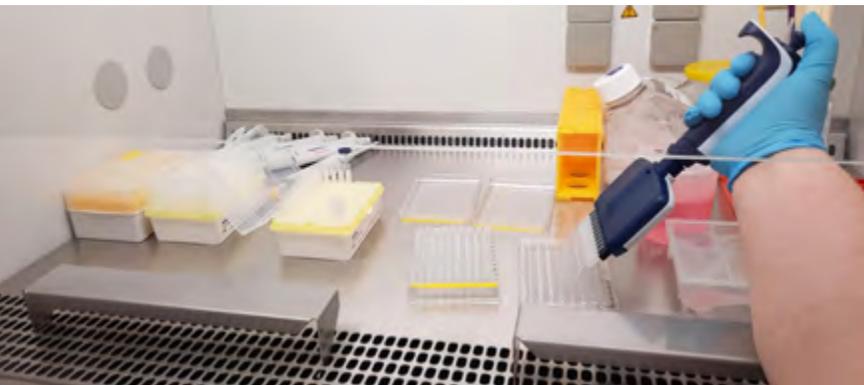


Palacký University Olomouc  
Masaryk University



# We were on TV and even won an award

Well, this is really amazing! The project **Centre for Cancer Ecology – Research of the Cancer Microenvironment Supporting Cancer Growth and Spread** has research teams that have over seventy patents registered, including international ones. It celebrated its first year with the most prestigious domestic scientific award Česká hlava! Memorandums of cooperation with Harvard School of Medicine, Dana-Farber Cancer Institute (USA), Universiteit Antwerpen (Belgium), Portland State University (USA), Ludwig Maximilians Universität, Munich (Germany), and Midwestern University, College of Pharmacy (USA) are a matter of course. Presentation of the Centre for Cancer Ecology on the radio and television in the Czech Republic and abroad was expected. The interest of the lay and professional public is growing dynamically. And our team of scientists was the first in the world to discover the possibility of taming the cytokine storm. In this way, they can help patients with acute respiratory distress syndrome and pneumonia, which are life-threatening conditions of patients with severe cases of Covid-19. This was all due to the fact that this project was ensured by a unique community of seven scientific groups from two faculties and three institutions, the first of its kind that has been successful in finding new cancer treatment options.



## 1<sup>st</sup> Faculty of Medicine, Charles University



CZ.02.1.01/0.0/0.0/16\_019/0000785



CZK 284,390,160



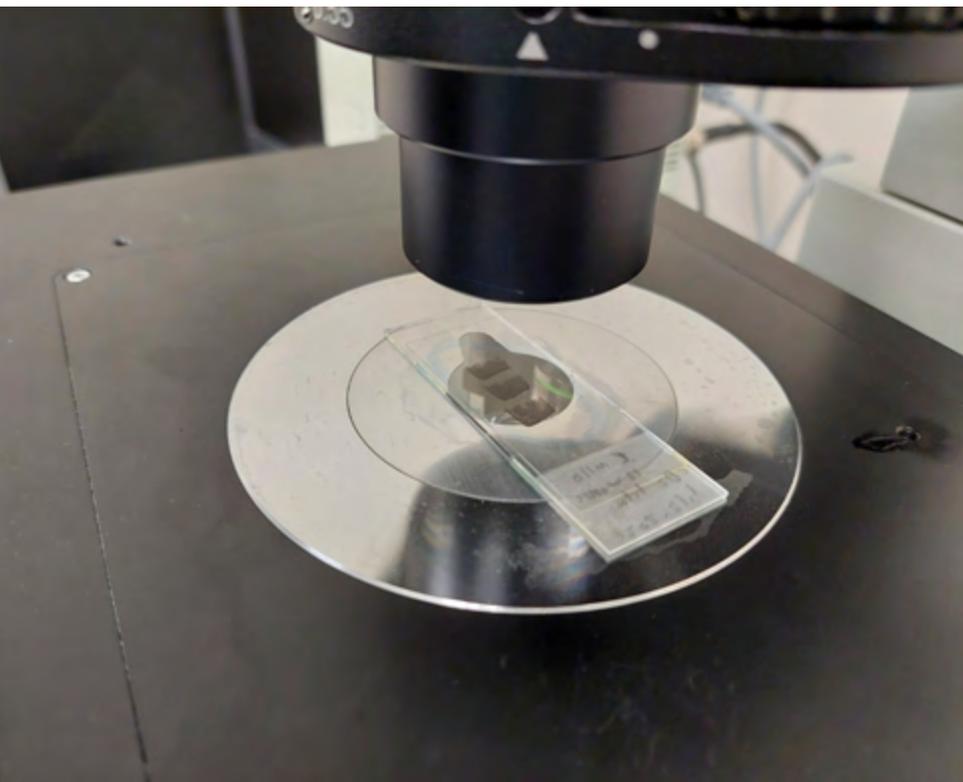
1 Sep. 2018 to 30 June 2023



prof. MUDr. Karel Smetana, DrSc.



Institute of Molecular Genetics  
of the Czech Academy of Sciences  
Institute of Animal Physiology and Genetics  
of the Czech Academy of Sciences



# From a small building to a five-generation villa

Time. Something that we lack in many ways. Specialized workplaces for students “scattered” throughout the Prague Motol campus? The transfers between them were demanding not only on time, but also energy. We can now use both of these valuable commodities more efficiently thanks to **Completion of the Teaching Premises in the Complex of the Theoretical Institutes of the 2<sup>nd</sup> Faculty of Medicine**. With the demolition of four inadequate buildings and the creation of one comprehensive workplace (including an auditorium, classrooms, a library with a study room, facilities for students and employees, and workplaces for seven institutes), we achieved not only time and energy savings, but also a more efficient transfer of information between workplaces. The new complex also includes an animal room, which provides a dignified warm and dry habitat for guinea pigs, rats, and mice.



**2<sup>nd</sup> Faculty of Medicine,  
Charles University**



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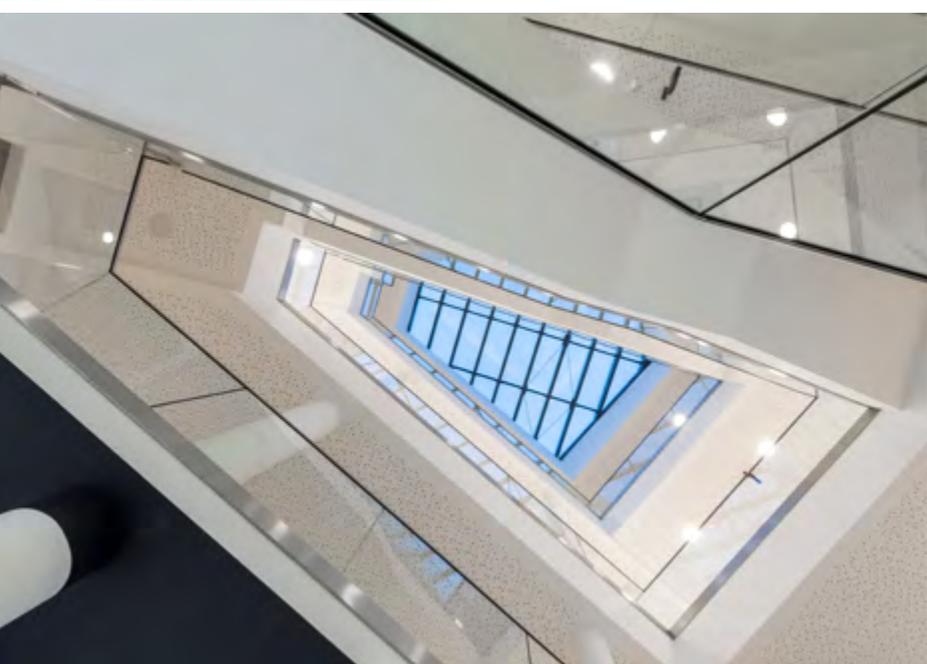
CZK 216,703,185



1 Mar. 2018 to 30 Apr. 2023



Bc. Jan Jirsa



# Two large meals with extra bacon, please!

Bacon, chocolate, lots of chocolate, sausages, M&Ms, cake, open-face sandwiches, sweet red lemonade, cola, and many other goodies. Well, who would not choose these and preferably all at once! Some people can't resist. They eat and eat, and suddenly can't fit into their pants anymore, and then they can't figure out what to do. Charles University, however, knows how to deal with this and is opening a new field of study, Nutritional Therapist, which cannot be completed without practical training in a kitchen. How to correctly choose suitable ingredients, prepare dishes according to recipes for individual diets, practicing the options for healthier diets, training in proper food preparation and hygiene during food preparation (including the processing and use of the HACCP system – one of the tools to help effectively prevent food safety risks). All of this is possible thanks to the project **Establishing an Experimental Dietary Kitchen**, and thus can help ill-informed eaters fit back into their pants and keep their heart and blood vessels healthy for many years to come.



## 3<sup>rd</sup> Faculty of Medicine, Charles University



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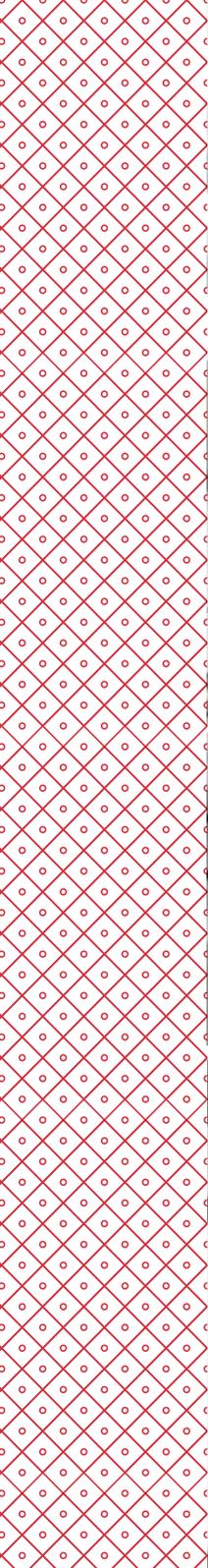
CZK 4,057,440



1 Jul. 2017 to 31 Dec. 2019



doc. MUDr. Pavel Dlouhý, Ph.D.



# Hard on the practice field, easy on the battlefield

Increasing the qualifications of instructors and the practical skills of students would not be possible without the most modern technical equipment and facilities. Thanks to the project **Building and Equipping the Centre for the Theory and Practice of Education in Medical and Non-Medical Fields**, several classrooms full of medical simulators are now available for students on which they practice how to handle real injuries for adults and children. The instruction also provides practice in solving problematic situations relating to pregnant patients. We also have available audio and video recording technologies so that we can replay everything important, because repetition is the mother of wisdom after all. In combination with the created classroom materials *Didactic Medicine for Educators*, this centre is a unique resource for future practice with live patients.

## 3<sup>rd</sup> Faculty of Medicine, Charles University



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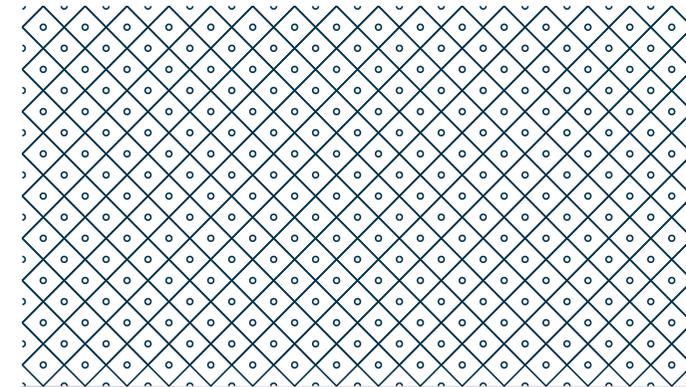
CZK 47,539,153

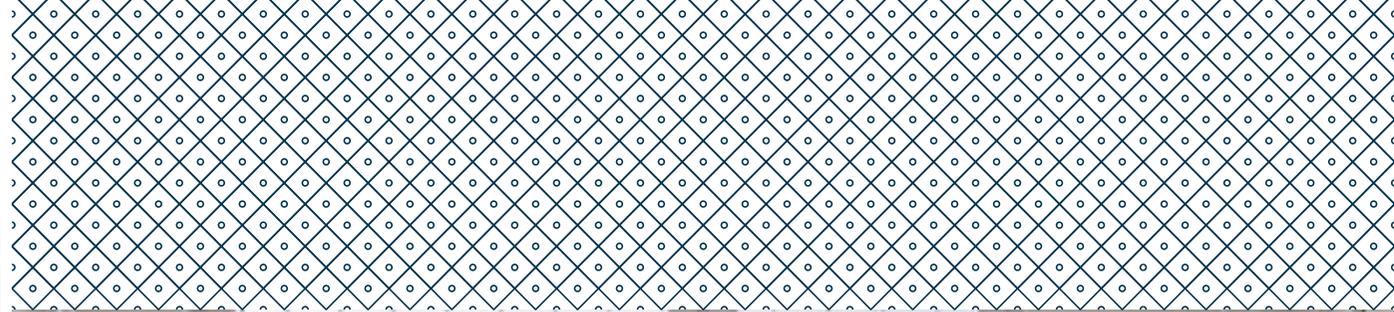


1 Jul. 2017 to 31 Mar. 2022



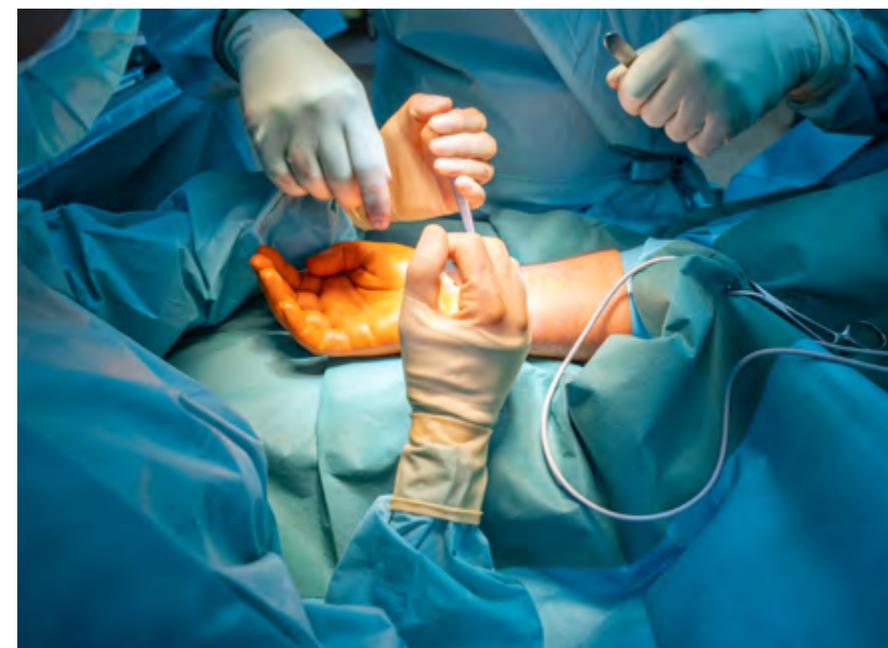
doc. MUDr. František Duška, Ph.D.





# “With surgical precision”. It should not be taken for granted.

Do you play the piano? The flute? PlayStation? Do you use a keyboard? If so, then you certainly appreciate the perfection and complexity of your hands, which we all take for granted. For a serious case when something spills on our hands, for example, hot oil, and a cat attacks us from the closet and at the same second a vase drops on your hand so unfortunately that it adds to the burn a laceration, a damaged nerve and a broken bone, there are doctors who, thanks to the project **Establishing a Laboratory for Practical Instruction and Education in Plastic Surgery and Burn Medicine**, had a chance to train with real technologies and material on anatomically accurate models that correspond as much as possible to the traits of real human tissues on state-of-the-art, world-class simulators. Thanks to this, we are assured of the best care – and our hands will be as good as new again in no time.



3<sup>rd</sup> Faculty of Medicine, Charles University



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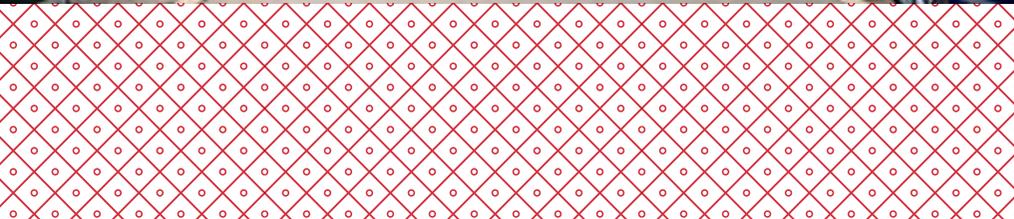
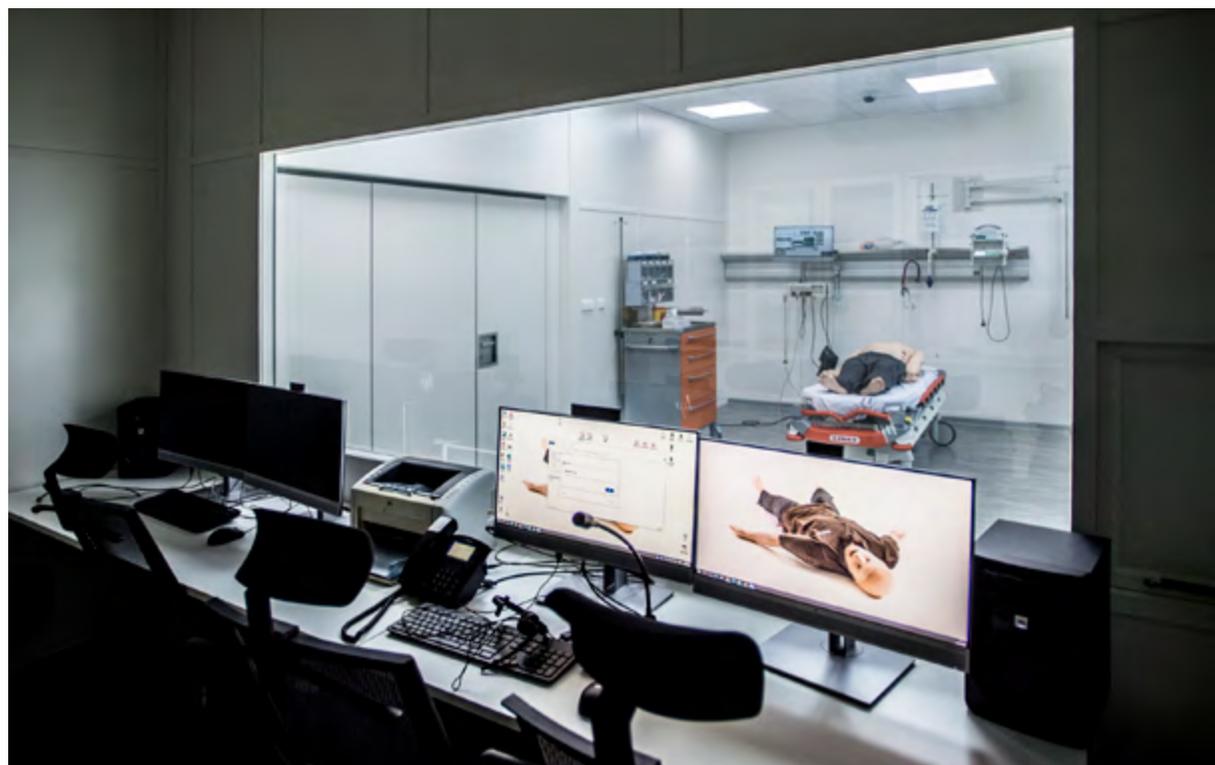
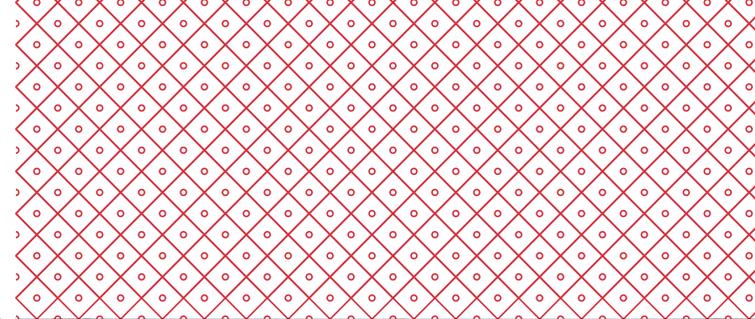
CZK 16,300,660



1 Jul. 2017 to 30 Jun. 2020



prof. MUDr. Andrej Sukop, Ph.D.



# Invaluable Medical Facilities

Molecular and cellular biology, biochemistry, pharmacology, physiology, histology and embryology, anthropology and morphology, pathological physiology, anatomy... Phew, the list is overwhelming. However, all of these disciplines are the subject of the project **Reconstruction and Equipment of the Premises for Teaching Preclinical Disciplines at the 3<sup>rd</sup> Faculty of Medicine**, which has modernized the existing instruction with very valuable equipment – for example, dissecting tables, including accessories, a tissue microscope, or an ultrasound diagnostic system.



## 3<sup>rd</sup> Faculty of Medicine, Charles University



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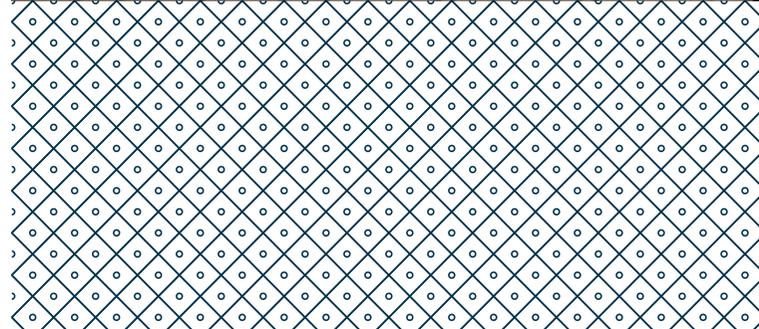
CZK 22,673,446



1 Jul. 2017 to 31 Mar. 2022



prof. MUDr. Romana Šlamberová, Ph.D.



# Everyone under one roof

The first stage of the construction of the University Medical Centre (UniMeC), already co-financed from the Operational Programme Research and Development for Innovation (OP VaVpl), was carried out between 2012 and 2015. Through the project **Building Educational Infrastructure – UniMeC, 2<sup>nd</sup> stage**, in 2022, the main building of the unique campus was completed, which houses eight theoretical institutes, the Simulation Centre, support operations (Scientific Information Centre, Information Technology Centre, Operations and Technical Department), and the dean's office. Thus, 77 years after the founding of the Faculty of Medicine in Plzeň, a long-held dream of many generations has come true – to concentrate the operations of the faculty in one place, on one campus, in the vicinity of the Plzeň University Hospital. The campus offers its users lecture halls, seminar rooms, practice rooms, teaching and research laboratories, a teaching kitchen and a gymnasium, teaching emergency rooms, and examination rooms. There are collective and individual study rooms in the library premises, and two of the study rooms are available to students "24/7". Students here have modern changing rooms, a bicycle room, and a relaxation room. In good weather, it is possible to go up to the utilitarian roof. A modern canteen with a café serves everyone to replenish their energy.

Faculty of Medicine in Plzeň,  
Charles University



CZ.02.2.67/0.0/0.0/16\_016/0002512



CZK 1,087,971,631



1 Jan. 2020 to 31 Mar. 2023



prof. MUDr. Dana Müllerová, Ph.D.





# An apocalypse?! Not for the time being

You remember Covid well, right? Have you seen the series or played the game *The Last of Us* or do you know the movie *Resident Evil*? The common denominator is an infectious disease and the destruction of humanity; well, or at least a major threat to human beings and humanity. Through the project **The Centre for Infectious Disease Research**, we are a step closer to a comprehensive approach to the issue of infectious diseases. How, you ask? We have studied, for example, the mechanisms of damage to vital organs during sepsis, the etiopathogenesis of this damage, the development of new (and improvements to existing) preventive, diagnostic, and therapeutic measures, bacterial resistance to antibiotics, or the role of the cardiovascular system in the etiopathogenesis of infectious diseases. And last but not least, research was conducted on damage to the central nervous system during sepsis, and we have developed new methods for the rapid detection of infectious agents.



**Faculty of Medicine in Plzeň,  
Charles University**



CZ.02.1.01/0.0/0.0/16\_019/0000787



CZK 184,105,509



1 Jan. 2018 to 30 Sep. 2022



prof. MUDr. Martin Matějovič, Ph.D.  
prof. MUDr. Milan Štengl, Ph.D.



# Experiments for better medicine

Medical biology and genetics, medical microbiology and experimental surgery – fields that we need to develop and firmly establish in the curriculum of Charles University. As part of the project **Further Development of Experimental Approaches in Resolving Current Medical Issues at the Faculty of Medicine in Plzeň – Accreditation of New Doctoral Areas of Study**, the training of experts was arranged in the field of antibiotic resistance and microbiological treatment of diseases associated with healthcare and, last but not least, in modern procedures for experimental surgery and tumour biology. We all agree that there is a need to educate experts who will work and be competitive in the mentioned areas in research and clinical practice.



Faculty of Medicine in Plzeň,  
Charles University



CZ.02.2.69/0.0/0.0/16\_018/0002455



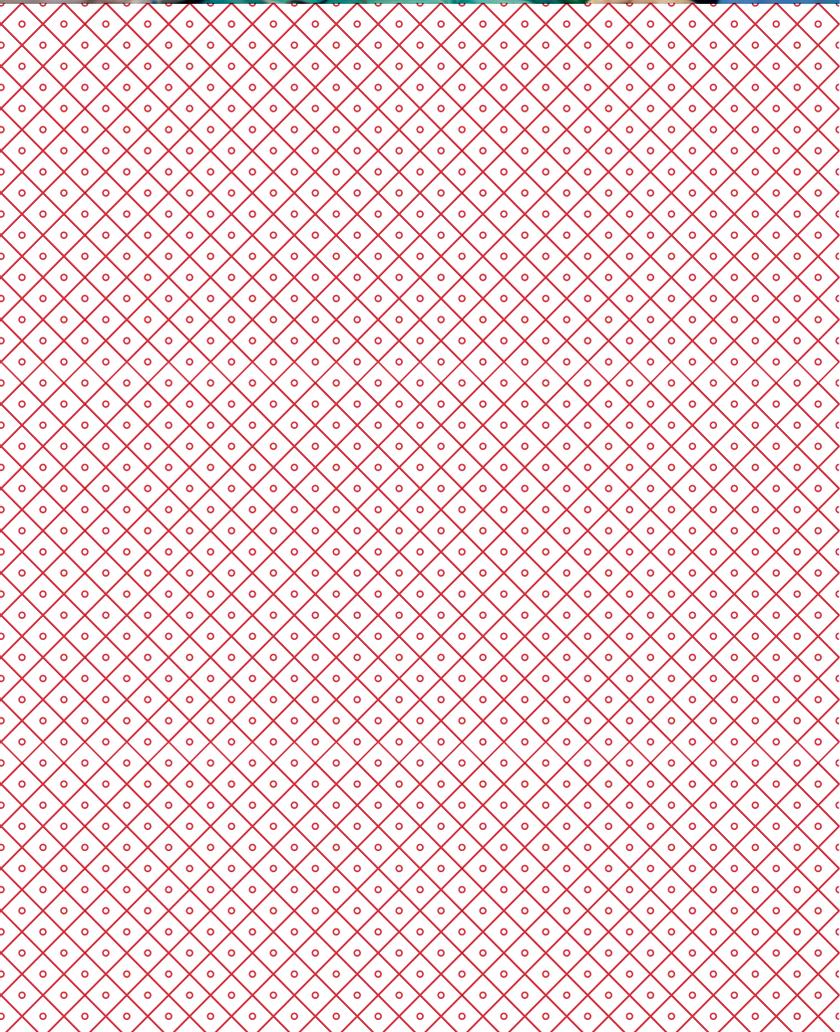
CZK 9,292,503



1 Jul. 2017 to 30 Sep. 2022



prof. MUDr. Vladislav Třeška, DrSc.



# Facilities for education in the future



## Faculty of Medicine in Plzeň, Charles University



CZ.02.1.01/0.0/0.0/16\_017/0002454



CZK 30,257,276



1 Jul. 2017 to 30 Jun. 2020



prof. MUDr. Vladislav Třeška, DrSc.

Were you interested in the previous page? It would not be here without the success of the project **Investment Support for Experimental Fields in Newly Accredited Doctoral Study Programmes at the Faculty of Medicine in Plzeň** for one simple reason, which we have already answered several times throughout this e-book. Without high-quality technical and physical facilities, you cannot even cook a good dinner, let alone conduct high-quality research and educate amazing scientists. So... the acquisition of equipment enabled the further development of doctoral study programmes at the Faculty of Medicine in Plzeň, with the aim of ensuring the education of top-notch professionals capable of holding their own in the international scientific sector. Full stop.

# Learning? Anytime and from anywhere

Did you miss something at the lecture? Would you like more information on the topic being discussed? Don't feel like running to the library for the course notes? Or did someone just take the last course notes? Don't despair! Online courses and e-learning materials are designed specifically for you. The project **Innovation of Instruction and the E-learning Environment at the Faculty of Medicine in Hradec Králové** focused on introducing a new electronic and interactive teaching method and on modernization of the equipment for the time when you will study in person at the faculty; for example, new audiovisual technology contributed to this.

Faculty of Medicine in Hradec Králové,  
Charles University



CZ.02.2.67/0.0/0.0/16\_016/0002518



CZK 14,962,961

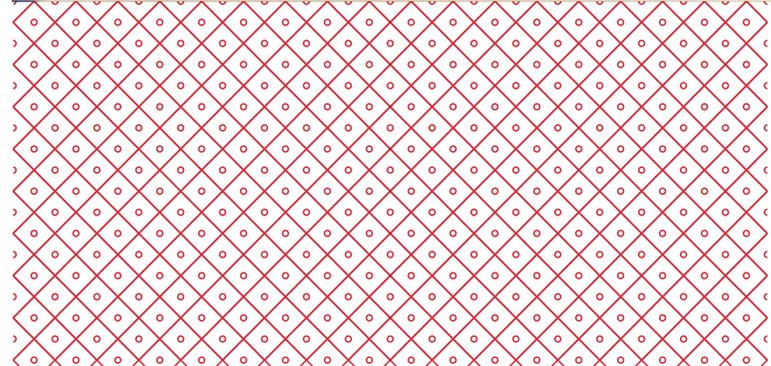
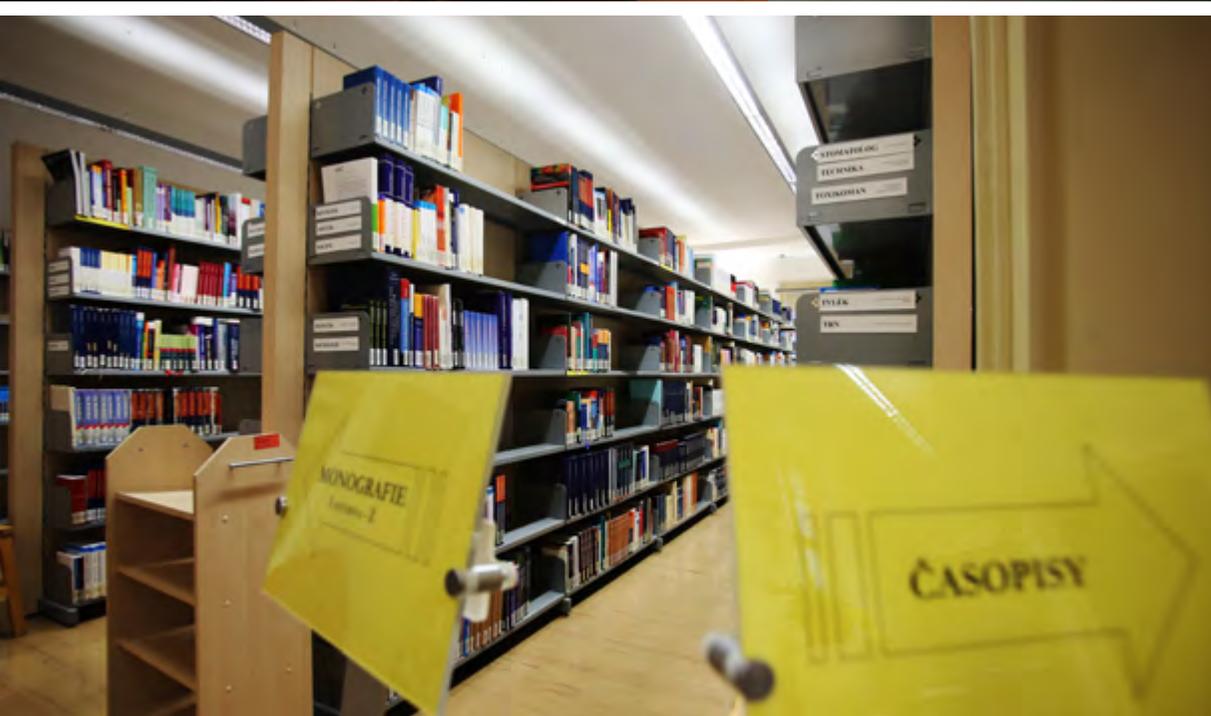
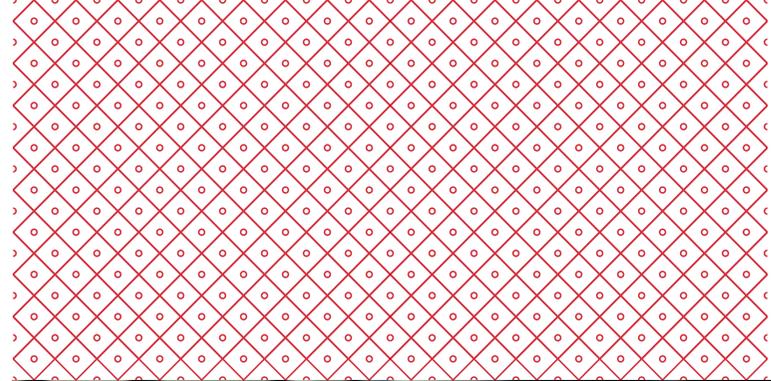


1 Jul. 2017 to 30 Nov. 2021



MUDr. Vladimír Mašín, Ph.D.





# I was here, Fantomas.

No, sorry, that's a different movie. The project that we will now present is more like from the environment of the popular Czech 80s-era TV show Ambulance (Sanitka in Czech), but we also find a few phantoms here as well. The project **Support for Modern Forms of Teaching at the Faculty of Medicine in HK Focused on the Use of Simulators and Phantoms** ensured the creation of a simulation centre for students of the Faculty of Medicine focused on the basics of caring for the critically ill and acquired "phantoms" with Karl in the lead role, who talks, bleeds, and even cries. Karl and other phantoms are sophisticated teaching aids replacing live patients. Teaching innovation in the programmes of study General Medicine, English-language General Medicine, Dentistry, English-language Dentistry, and Nursing took place through the simulation of medical decision-making, practical examinations, caring for the patient, including cannulation, CPR, and other procedures.



Faculty of Medicine in Hradec Králové,  
Charles University



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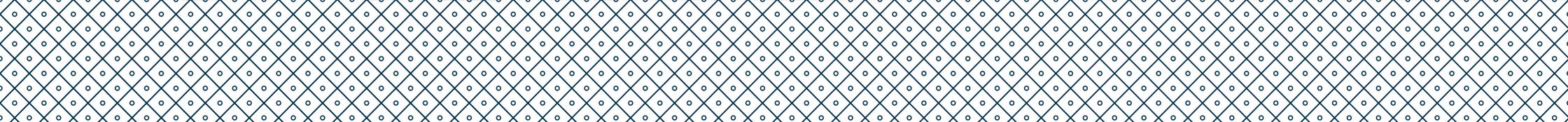
CZK 47,566,024



1 Jul. 2017 to 30 Jun. 2020



doc. MUDr. Miroslav Solař, Ph.D.



# For more modern doctoral studies

The project **Innovation of Doctoral Study Programmes at the Faculty of Medicine in Hradec Králové** deals with – surprisingly – the innovation of doctoral study programmes. No, that's not all, dear readers. This project is much more extensive, and under the surface, we find not only the introduction of new subject areas, the reorganization of the existing educational process, the introduction of courses in innovative experimental and molecular diagnostic methods for biomedical research, internships abroad, the development of scientific activity or the general popularization of science and research, but also expanding the spectrum of methodological options and the interlinking of scientific teams across all of our twenty-two study programmes.



Faculty of Medicine in Hradec Králové,  
Charles University



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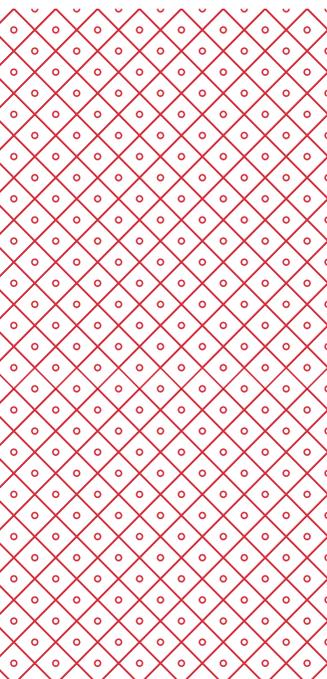
CZK 10,470,258



1 Jul. 2017 to 30 Jun. 2023



prof. MUDr. RNDr. Milan Kaška, Ph.D.



# With a hundred hi-tech instruments

The project **Creation of CORE FACILITIES to Improve the Quality of Research Associated with Instruction at the Faculty of Medicine in Hradec Králové** has equipped the individual workplaces with almost one hundred top-of-the-line instruments and laboratory equipment, similar to top scientific workplaces in Europe and elsewhere in the world. Wow, that's a lot, and among them is the Agilent Seahorse XFe96 Analyzer Power Pak, which provides researchers with easy, fast, and efficient access to information about metabolism in living liver cells using a real-time method, or a transmission electron microscope. As part of the supplementary project Innovation of Doctoral Study Programmes at the Faculty of Medicine in Hradec Králové, doctoral study programmes were modernized, thanks to which our students can take full advantage of these new conditions for scientific work.

Faculty of Medicine in Hradec Králové,  
Charles University



CZ.02.1.01/0.0/0.0/16\_017/0002515



CZK 192,699,824

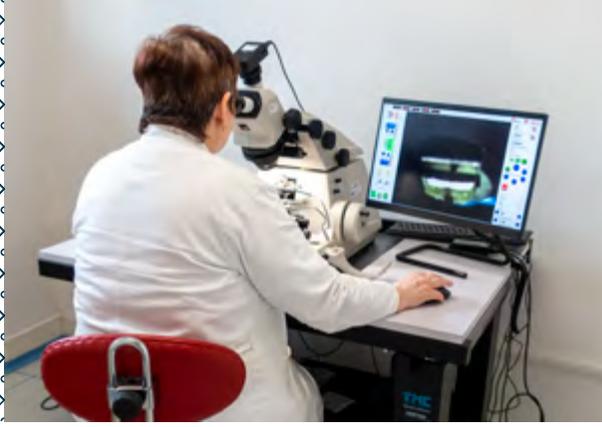
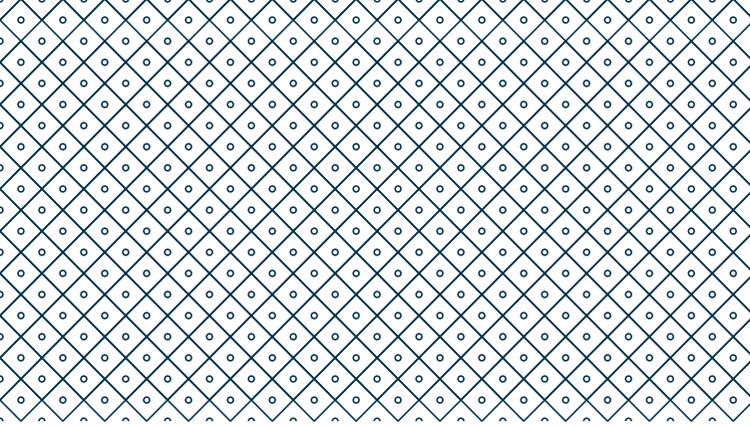


1 May 2017 to 31 Jul. 2021



doc. Ing. Josef Hanuš, CSc..





# Together for stellar knowledge

Preparation of the infrastructural facilities in the form of acquiring high-tech equipment, bringing together top scientists into an excellent team, international cooperation across continents, and the subsequent transfer of know-how. All of this and much more is behind our goal, which was ambitious, yet proved to be realistic. Let's touch the stars together with the STARSS Science Centre of Excellence, created thanks to the support of the project **Creating an Expert Team for Advanced Research in Separation Sciences**. Thanks to the unique cooperation with a key scientist from abroad, it was possible to advance the current state of knowledge of separation sciences to the next "level", which helped to clarify the composition of known and hitherto unknown samples. We proudly published the results in the world's most prestigious scientific journals. Our stellar goals have been met, but we are confident that we are still on the rise!



## Faculty of Pharmacy in Hradec Králové, Charles University



CZ.02.1.01/0.0/0.0/15\_003/0000465



CZK 150,193,320



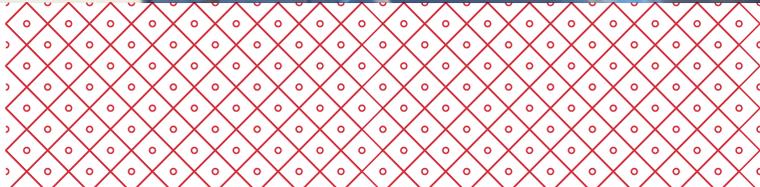
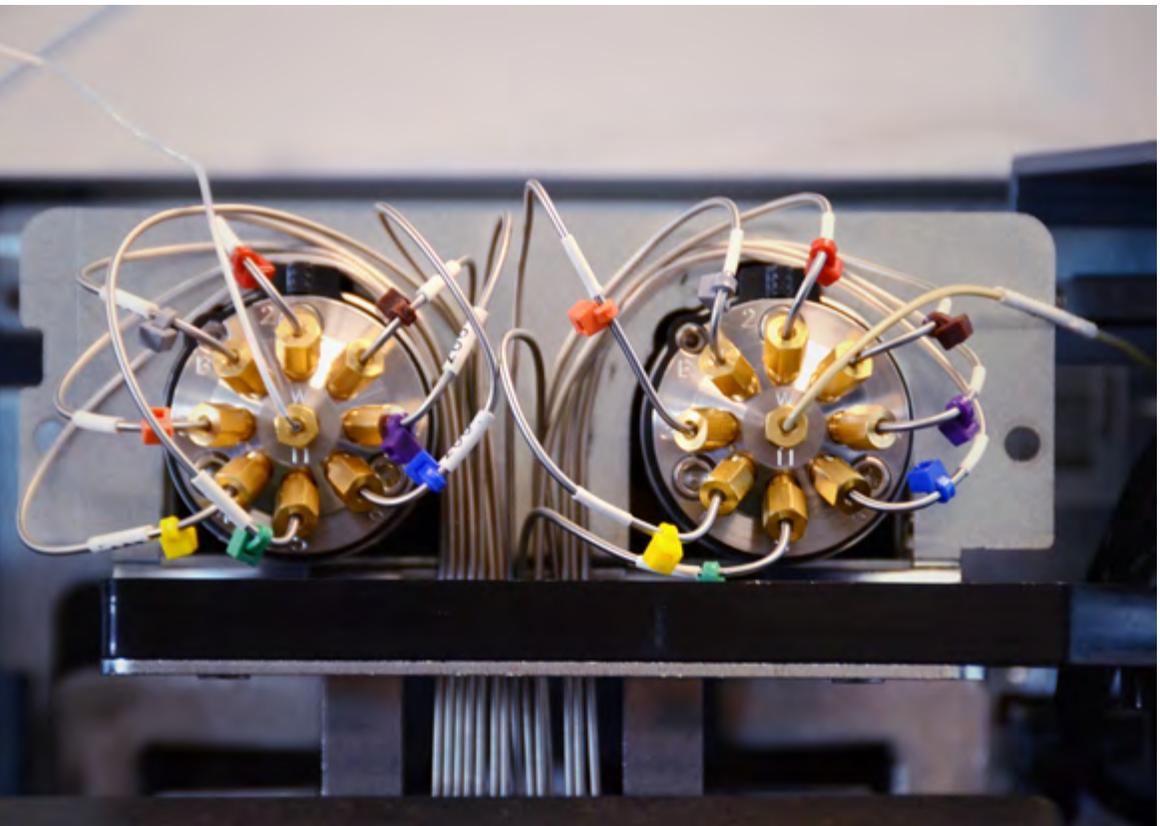
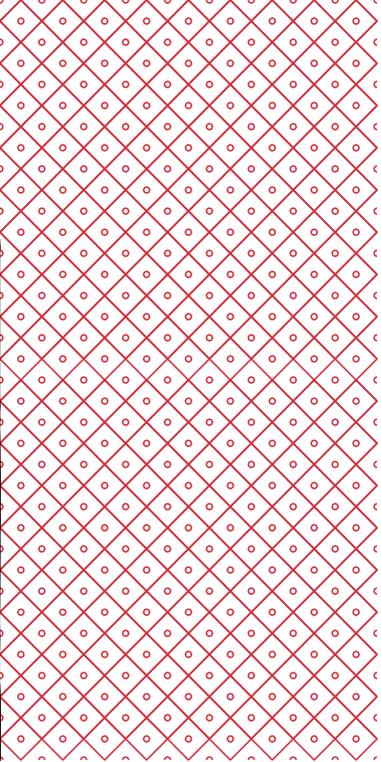
1 Mar. 2017 to 30 Jun. 2023



prof. RNDr. Petr Solich, CSc.



Portugal (REQUIMTE, Universidade do Porto)  
Spain (Universitat de les illes Balears)  
Australia (School of Chemistry, Faculty of Science, University of Melbourne)



# To always be healthy and young

Internships abroad, young and seasoned scientists, modern approaches, top technologies and equipment, professional publications and, of course, international patents in cooperation with international experts. This is exactly what the dynamic implementation of the project **Increasing the Effectiveness and Safety of Medicines and Nutraceuticals: Modern Methods – New Challenges** looks like, the aim of which is, among other things, research in the development of new anti-infection and anti-tumour drugs, overcoming drug resistance, increasing the safety and effectiveness of medicines and nutraceuticals. And what about those nutraceuticals? Google says that they are preparations containing ingredients (often of natural origin) that have an effect on the beneficial functioning of the human organism. Well, who among us wouldn't want them? Especially after thirty, right?



## Faculty of Pharmacy in Hradec Králové, Charles University



CZ.02.1.01/0.0/0.0/16\_019/0000841



CZK 212,766,530



1 Jan. 2018 to 30 Jun. 2023



prof. RNDr. Petr Solich, CSc.



Finland (Lääkietieteellinen tiedekunta, Oulun yliopisto)  
Germany (Freie Universität Berlin)  
Hungary (Magyar Tudományos Akadémia)  
Norway (Farmasøytisk institut, Universitetet i Oslo)  
Poland (Uniwersytet Jagielloński, Collegium Medicum)  
Portugal (ICETA (REQUIMTE), Universidade do Porto)  
Spain (Universitat de les illes Balears)  
Australia (School of Chemistry, Faculty of Science, University of Melbourne)  
Slovenia (Fakulteta za farmacijo Univerza v Ljubljani)



# The reverse side of commonly used drugs

Cancer, inflammatory liver disease, heart disease. These are serious diseases that require specific drugs with a large number of side effects that affect the patient's quality of life. It affects us all, without discrimination. The project **Pre-application Research of Innovative Medicines and Medical Technologies** focused on research that would enable treated patients to live a better and fuller life without many of the side effects. The project also focused on the elderly who are exposed to a higher risk of inappropriate or even dangerous drug combinations due to aging and wear and tear of the organism. Software has even been developed that captures these unwanted drug combinations and alerts physicians.



## Faculty of Pharmacy in Hradec Králové, Charles University



CZ.02.1.01/0.0/0.0/18\_069/0010046



CZK 93,883,307



1 Jan. 2019 to 30 Jun. 2023



prof. Ing. Vladimír Wsól, Ph.D.



Faculty of Medicine in Hradec Králové, Charles University  
University Hospital Hradec Králové



# New equipment for everyone in the field!

Quality research is done by quality people, and they need quality facilities and equipment, without which it is simply not possible. This is precisely why there are investment projects, such as **Modernization of the Laboratory for Cell Interactions with Substances of Natural Origin**, which provided the partial reconstruction of laboratories, instrumentation, laboratory and support equipment, including information infrastructure. In addition, an archive of working samples of natural raw materials was acquired for the PhD study programme Pharmacognosy and Nutraceuticals. This modernization attracted more enthusiastic students to PhD studies and promoted a better form of education and more valuable preparation for dealing with interactions between drugs and natural substances. It goes without saying that we also provide equipment to students of other related PhD programmes, because we are, after all, team players.

Faculty of Pharmacy in Hradec Králové,  
Charles University



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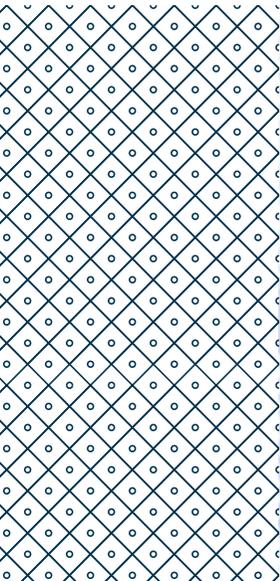
CZK 15,506,179

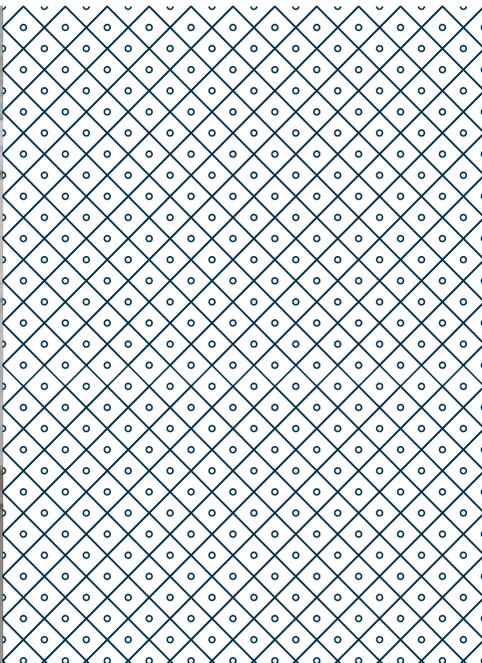


1 May 2017 to 31 Oct. 2020



prof. RNDr. Lubomír Opletal, CSc.





# Innovation of the PhD study programme relating to the knowledge of medicinal and poisonous plants

The project **Modernization and Expansion of the PhD Subject Area Pharmacognosy and Toxicology of Natural Substances in the Pharmacy Study Programme** expands the existing PhD study programme *Pharmacognosy and Toxicology of Natural Substances*. The expanded PhD study programme will support research in the usability of natural substances in the prevention of chronic (formerly civilizational) diseases, in positive interactions with administered drugs and knowledge of the negative effects, especially in the field of nutraceuticals. Of course, we want to support our PhD students as much as possible in their studies so that we have excellent scientists in the future.



**Faculty of Pharmacy in Hradec Králové,  
Charles University**



CZ.02.2.69/0.0/0.0/16\_018/0002736



CZK 5,101,461



1 May 2017 to 31 May 2022



prof. RNDr. Lubomír Opletal, CSc.



# Inspired by nature and our garden

**Modernization of Teaching Spaces at the Faculty of Pharmacy in order to Increase the Quality of Education.** Probably nothing more needs to be added – the name of the project says it all. And after all, why not modernize and functionally improve the teaching spaces of the Faculty of Pharmacy in Hradec Králové, which includes the Medicinal Plant Garden, renovate the interiors and purchase new furniture, since the outdated and aging audio-visual technology does not correspond to modern trends? That would certainly be a shame. Because we go with the times! And that's why we have used the oasis of plant colours for the colourful rendering of the seminar rooms. And we have one more small point of interest, which is the modernization that took place together with the university-wide project Improving the Quality of Education at CU and its Relevance for the Needs of the Labour Market. You may ask why together? Because Charles University is one big team!



**Faculty of Pharmacy in Hradec Králové,  
Charles University**



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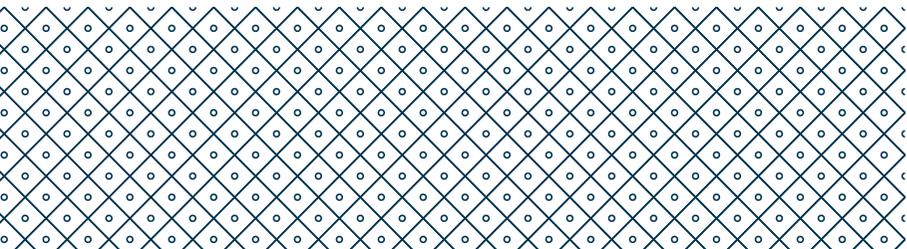
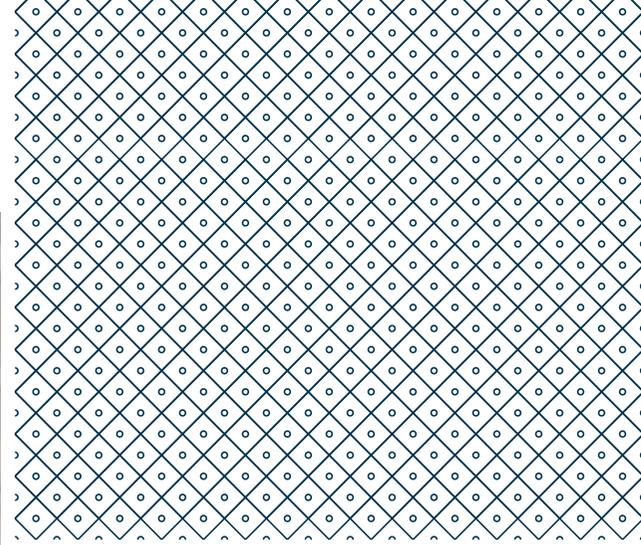
CZK 44,581,793



1 Jul. 2017 to 30 Sep. 2019



Ing. Lenka Vlčková



# Training sessions and quizzes in Czech



No, this is not really about CNC machine tools. In this case of CNC, we are talking about the Czech National Corpus, an electronic file of authentic texts (written or spoken), in which words and phrases can be easily searched and displayed in their natural context. What is it for? If we were to exaggerate a bit: It also comes in handy, for example, when we argue with friends about the difference between the words “pořád” and “furt” (both meaning “always”), except that one of the stubborn people is originally from Moravia... The project **Expanding the Computational Capacity of the CNC Infrastructure** modernized the existing computing capacity of the CNC infrastructure. The acquisition of an annotation cluster strengthens the necessary computing and data capacity of the infrastructure and increases its robustness and reliability.

Faculty of Arts, Charles University



CZ.02.1.01/0.0/0.0/18\_046/0015829



CZK 1,320,000



1 Sep. 2020 to 28 Feb. 2022



Mgr. Michal Křen, Ph.D.

# The more languages you know, the more you are a human being

We just learned what CNC actually means at the Faculty of Arts, and now we will continue with the project **Language Variability in the CNC**, which strengthens the research infrastructure of the Czech National Corpus in two main aspects. The first is the establishment and material security of a new scientific team, which dealt with a comprehensive description of the linguistic variability of the Czech language and increased its scientific excellence, and the second is an upgrade for existing technologies, because modernization is a necessary part of every successful project, as the CNC undoubtedly is.



## Faculty of Arts, Charles University



CZ.02.1.01/0.0/0.0/16\_013/0001758



CZK 17,455,596



1 Jul. 2017 to 30 Jun. 2020



Mgr. Michal Křen, Ph.D.



# A complexly interconnected world

How do you adapt to new social challenges? In particular, the global interconnecting of the world, the migration of people and ideas or new technologies and creatively find solutions? Under the banner of the large-scale research project **Creativity and Adaptability as a Prerequisite for the Success of Europe in an Interconnected World**, a number of publications were created and conferences, lecture series, public lectures, readings of works and publications followed by debates, and meetings of cultural associations took place on topics relating to the fields of geopolitics, archaeology, literature, linguistics, history, and many more. In this project, we focused on the foundations and the nature of a European identity, including the comparative study of non-European civilizations, in a broader cultural perspective, including philosophical, religious, communicative, linguistic, and historical contexts. All of this and much more in the spirit of the belief that crisis phenomena relating to confrontation with foreigners cannot be understood as threats, but rather as incentives to shape the future of Europe and its values. Together we can do more!



## Faculty of Arts, Charles University



CZ.02.1.01/0.0/0.0/16\_019/0000734



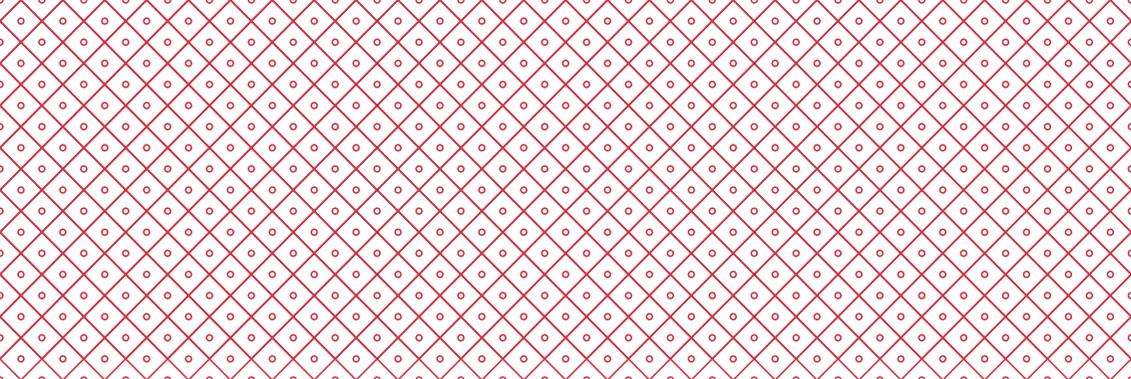
CZK 458,757,295



1 Jan. 2018 to 30 Jun. 2023



doc. Mířjam Friedov, Ph.D.



# From benches to conference tables

The project **Reconstruction of the Large Lecture Rooms of the Faculty of Arts** probably does not need much of an introduction. It is already clear from previous investment projects that, without quality equipment and facilities, it is very difficult to move forward and provide quality education, and not always with satisfactory results, especially in such a competitive environment as international academia. So we have renovated several lecture halls, including a large hall for 403 students, and newly equipped a classroom for practicing interpreting in professional interpreting booths. Come and see for yourself.



Faculty of Arts,  
Charles University



CZ.02.2.67/0.0/0.0/16\_016/0002394



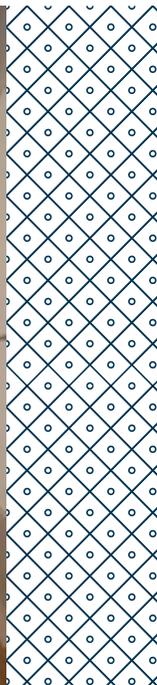
CZK 89,284,203



1 Aug. 2017 to 31 Dec. 2022



Mgr. Zdeňka Filipová



# New materials for the future – We save the planet and reduce greenhouse gas emissions

Modern society faces many challenges, including environmental pollution, energy shortages, and sustainability for future development. One promising solution to these challenges is the rational synthesis of materials, such as new zeolite materials. These materials have unique structures and properties that are suitable for various applications, such as catalysis, gas separation and water purification. By developing new zeolite materials using rational synthesis, we can solve some of the most pressing problems of modern society, such as reducing greenhouse gas emissions, improving energy efficiency, and more efficient use of resources. Excellent scientific research based on strong international cooperation and knowledge exchange is a key element for solving the complex challenges facing our world today. This is why we have established appropriate facilities for the **Centre for Targeted Synthesis and the Application of Prospective Materials**. The centre is involved in the development of new zeolite materials, is based on a strong interplay of experimental research and computational modelling, and places great emphasis on international cooperation.



Faculty of Science, Charles University



CZ.02.1.01/0.0/0.0/15\_003/0000417



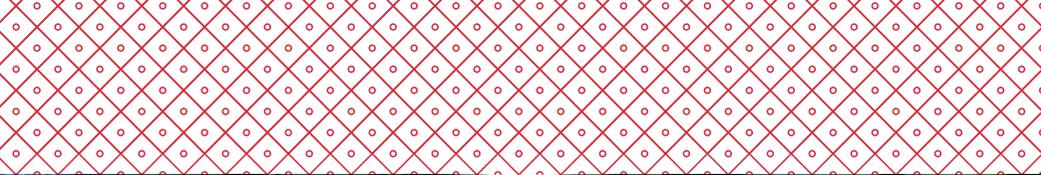
CZK 215,214,556



1 Aug. 2016 to 31 Dec. 2022



prof. RNDr. Petr Nachtigall, Ph. D.



# Heat from inside the Earth – and how about trying “thermals”?

Today, almost all of us have felt the effects of the energy crisis. The big questions are still: “Where to get energy?” and “Where to get a lot? And cheaply?”. Our society is increasingly turning to alternative energy, which will be provided by solar, wind, and water power. And what about geothermal energy? It has many uses, for example in spas or recreational natural facilities, but it is also used for heating or cooling buildings. Its potential is being investigated by top teams in the highly specialized geothermal centre in Litoměřice, where key equipment, technology, and facilities are concentrated. All of this thanks to the project **Modernization of the RINGEN Research Infrastructure**. Among other things, there is also a place for testing seismic monitoring methods. Why? Because the earth sometimes shakes even in our country, so let's be well prepared.



## Faculty of Science, Charles University



CZ.02.1.01/0.0/0.0/16\_013/0001792



CZK 102,779,042



1 Jun. 2017 to 31 May 2020



RNDr. Jan Šafanda, CSc



Czech Technical University

Technical University of Liberec

Czech Geological Survey

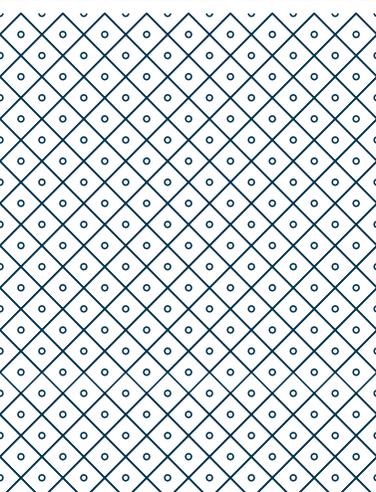
Institute of Geophysics of the Czech Academy of Sciences

Institute of Geonics of the Czech Academy of Sciences

The Institute of Rock Structure and Mechanics of the Czech Academy of Sciences

Jan Evangelista Purkyně University in Ústí nad Labem

VSB – Technical University of Ostrava



# Annoying and dangerous parasites on the trail

Even if we don't admit it too much, summer vacations in the Czech Republic or visits to exotic foreign countries can be associated with the risk of transmitting various serious diseases. While in the Czech Republic, these are mainly ticks that transmit borreliosis and tick-borne encephalitis, in attractive foreign destinations, there may be a risk of infection with other dangerous pathogens causing, for example, malaria, sleeping sickness, intestinal diarrheal diseases, and the like. **The Centre for Research in the Pathogenicity and Virulence of Parasites** has focused on the study of parasite virulence factors, not only to understand their role as molecular tools that allow parasites to invade and colonize the host, but also for their potential use in the development of new vaccines, therapeutics, and diagnostic methods. In this research, parasitologists from Charles University (including staff of Charles University in the BIOCEV research centre), the Biology Centre of the Czech Academy of Sciences (Institute of Parasitology of the Czech Academy of Sciences), and the University of Ostrava joined forces, and with the support of the project, they have modernized the infrastructures of the participating laboratories and have made numerous essential findings – in cooperation with foreign partners as well.



## Faculty of Science, Charles University



CZ.02.1.01/0.0/0.0/16\_019/0000759



CZK 280,576,158



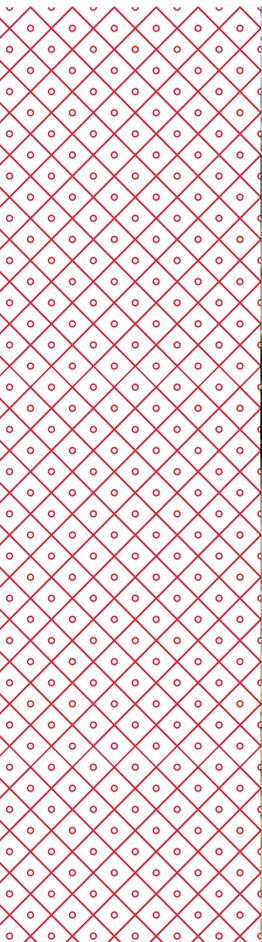
1 Mar. 2018 to 31 Dec. 2022



Prof. RNDr. Jan Tachezy, Ph.D.



University of Ostrava  
Biology Centre of the Czech Academy of Sciences



# Facilities and instruments for the modern instruction of biological sciences



Every young scientist needs unique tools for their work, whether they are a little scientist with their first chemistry set or an adult researcher. Precisely for these researchers and through the project **Modernization of the Infrastructure for Master's Studies at the Faculty of Science**, we were able to modernize the equipment, renovate teaching spaces, and purchase modern instruments, such as a unique system of student fluorescent microscopes, and stereomicroscopes equipped with Wi-Fi cameras, which enable live observation of researched objects on tablets, laptops, or mobile phones. All of this for the students of our new continuing Master's study programmes *Reproductive and Developmental Biology and Evolutionary Biology*.

## Faculty of Science, Charles University



CZ.02.2.67/0.0/0.0/16\_016/0002266



CZK 91,651,209



1 Jun. 2017 to 30 Nov. 2020

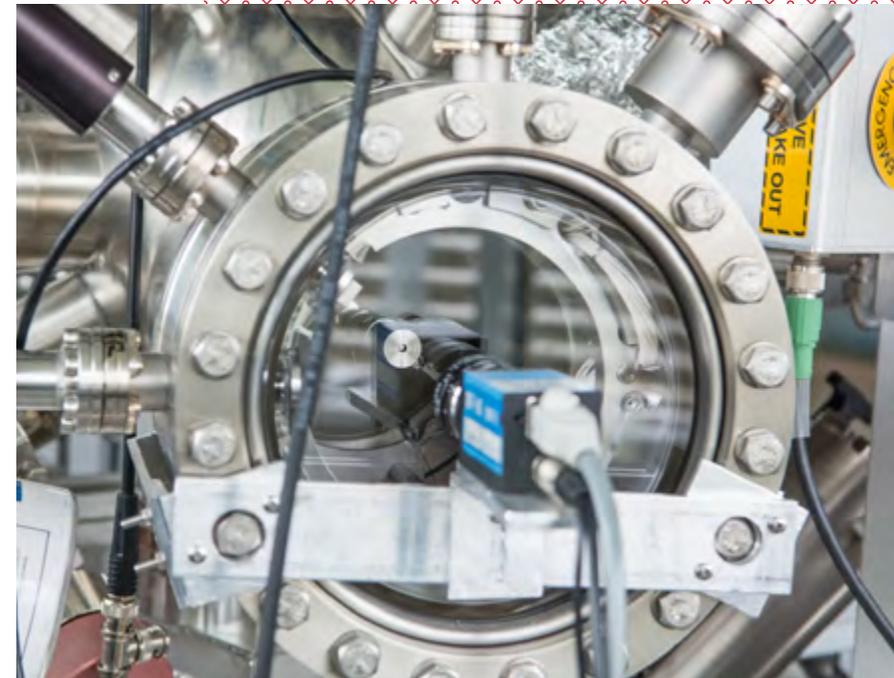


doc. RNDr. Ing. Vladimír Krylov, Ph.DS



# We are saving planet Earth

Our planet is warming at an unsustainable rate. And people play a large role in this, the ever-increasing hunger for cheap energy and thus also cheap fuels, the burning of which produces greenhouse gases that grip the “blue planet” in a deadly embrace. The replacement of fossil fuels and the development of sustainable energy have, therefore, become one of the main priorities of the European Union and the civilized world. The pillar of these efforts is the production and use of so-called renewable hydrogen, produced by electrolysis using practically inexhaustible energy from renewable sources, mainly from the wind and the sun. The development of hydrogen technologies for the production of hydrogen and reproduction of electricity in the hydrogen cycle were also the main content of the project **Fuel Cells with a Low Content of Platinum Metals**. The result of the research was the development of patented electrocatalysts, which fundamentally reduce the costs of introducing the hydrogen cycle into practice. The team of scientists at the Faculty of Mathematics and Physics can now go to sleep with a good feeling that they have contributed to the effort to keep our planet habitable for future generations as well. However, the team is not resting on its laurels – and is looking forward to further challenges on the way to a sustainable Earth.



**Faculty of Mathematics and Physics,  
Charles University**



CZ.02.1.01/0.0/0.0/16\_025/0007414



CZK 81,022,435



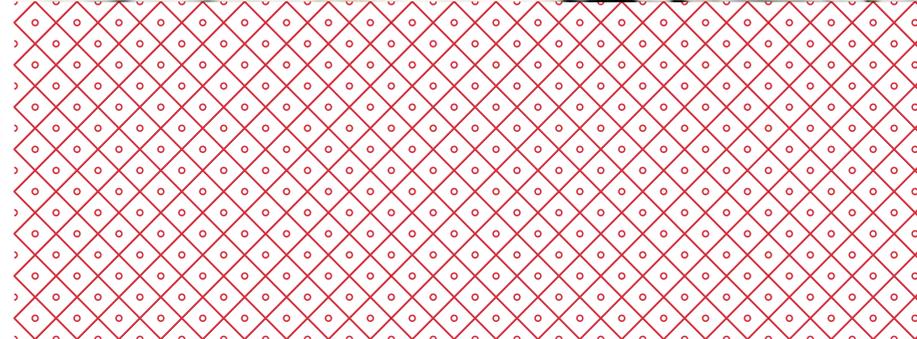
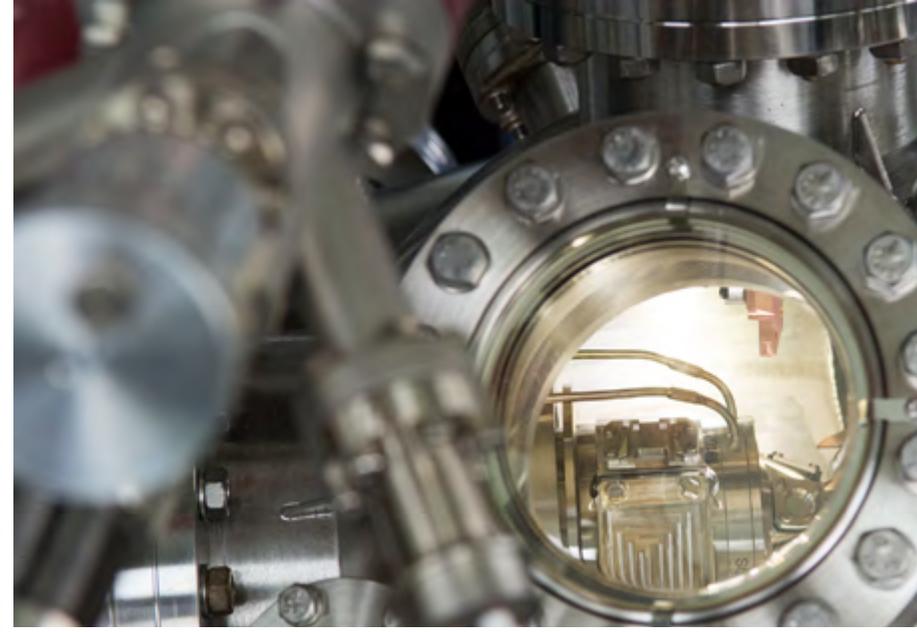
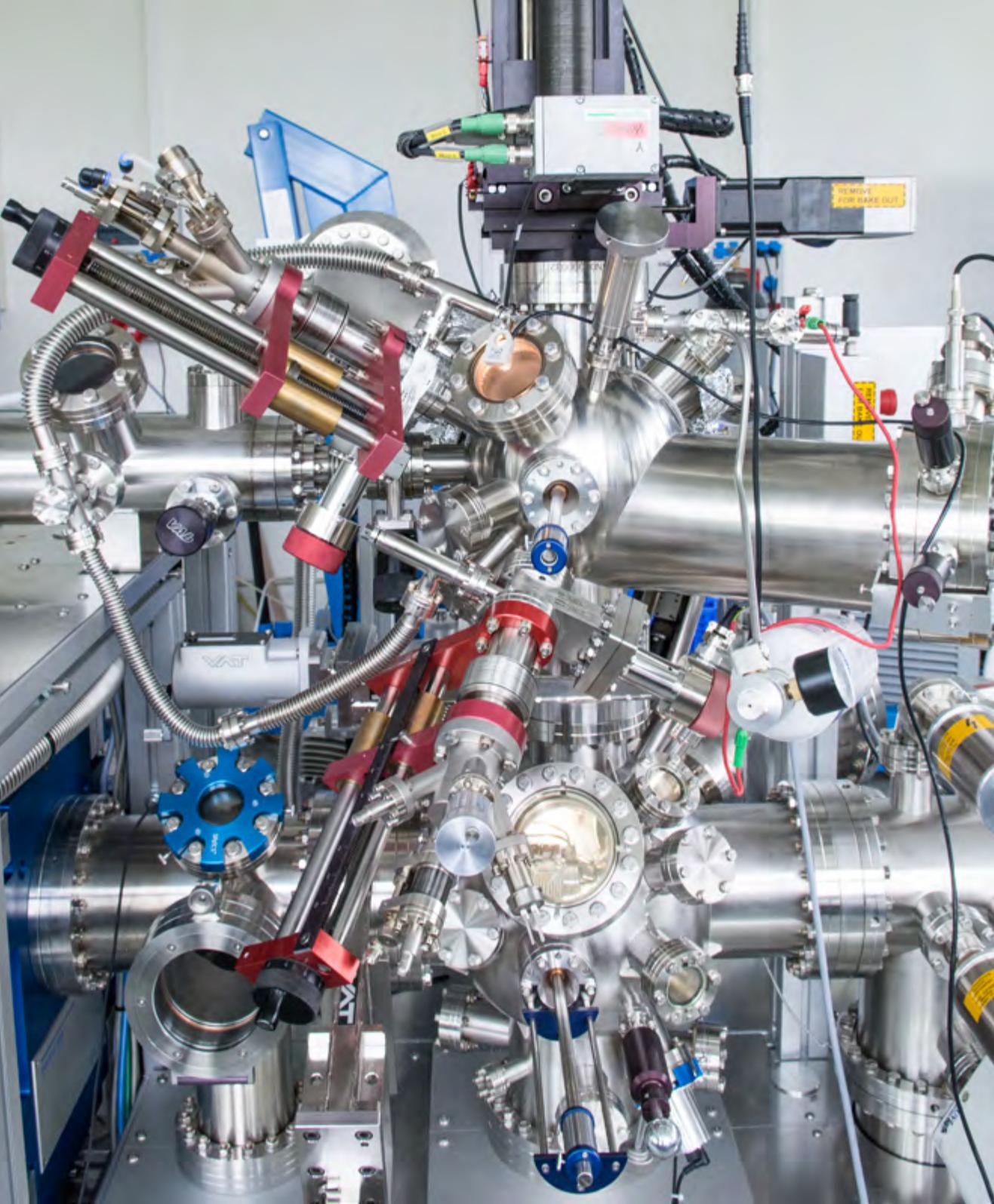
1 Apr. 2018 to 31 Dec. 2022



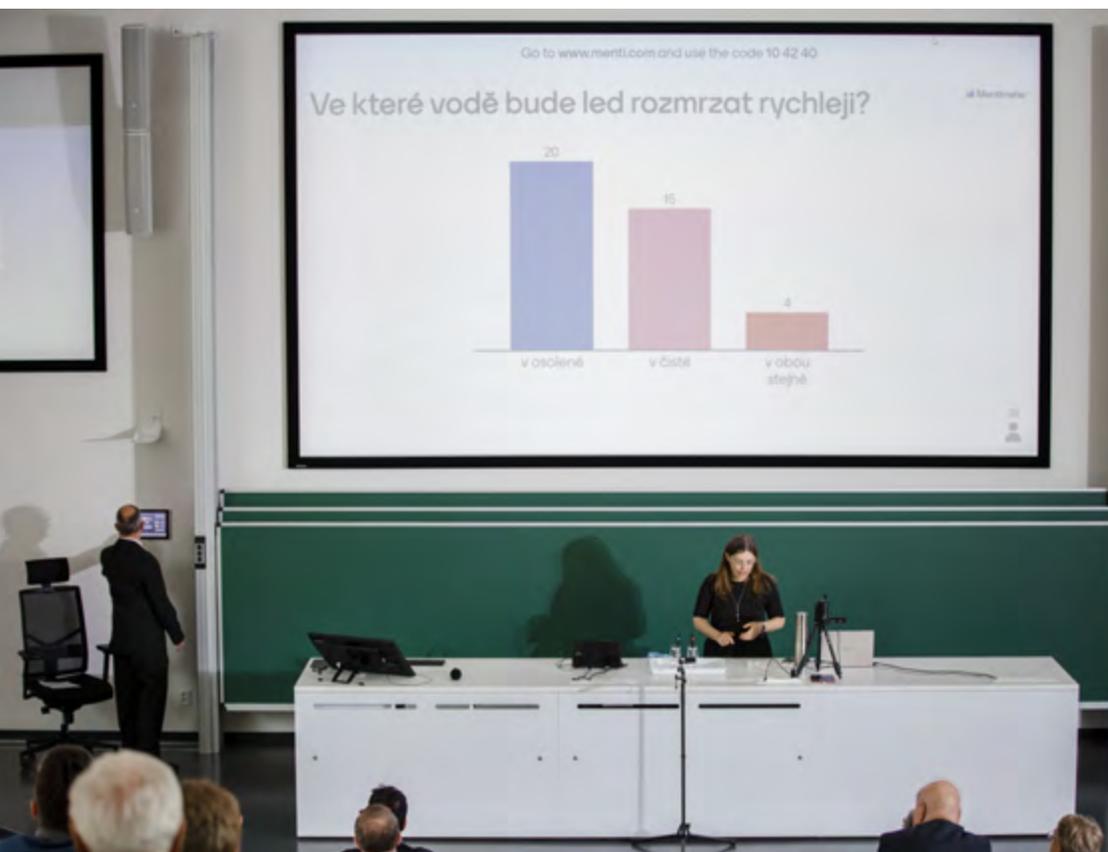
prof. RNDr. Vladimír Matolín, DrSc.



University of Chemistry and Technology, Prague



# Where do we attend lectures?



Equipment for ten large lecture halls (capacity of over fifty seats), seven medium lecture halls (capacity of thirty to fifty students), fifty small lecture halls (capacity of up to thirty seats), and equipment for a virtual and parallel laboratory for the teaching of computer science at the Faculty of Mathematics and Physics. This is a large investment, which was accomplished thanks to the project **Equipment for the Lecture Halls of the Faculty of Mathematics and Physics**.

**Faculty of Mathematics and Physics,  
Charles University**



CZ.02.2.67/0.0/0.0/16\_016/0002372



CZK 42,329,822



1 Aug. 2017 to 31 Mar. 2020



doc. RNDr. Pavel Svoboda, CSc.

# Designed for the fuel of the future

It's not just a coincidence that hydrogen is called the fuel of the future, because its combustion produces only water, and it can be produced from water by electrolysis using energy from the sun or wind. The most efficient electrolyzers are nanostructured systems where trillions of highly reactive rare metal nanoparticles are split in electrochemical reactions of water molecules into oxygen and hydrogen. These little "creatures" change their surface chemical states from oxidized to reduced and vice versa during reactions. The dream of electrochemists is to "see" these processes in real time, and thus better understand the mechanisms of the reactions. This will also make it possible to design new, more efficient and cheaper catalysts. Thanks to the projects **Surface Physics Laboratory – Optical Track for Materials Research<sup>1</sup>** and **Surface Physics Laboratory – Optical Track for Materials Research II<sup>2</sup>** designed to finance *large research infrastructures*, in addition to ensuring the conditions for research, the groundbreaking EnviroESCA, the so-called photoelectron spectrometer, was acquired, which allows observation of these changes in chemical states.



## Faculty of Mathematics and Physics, Charles University

<sup>1</sup>  CZ.02.1.01/0.0/0.0/16\_013/0001788

 CZK 43,498,455

 1 Dec. 2016 to 31 Dec. 2019

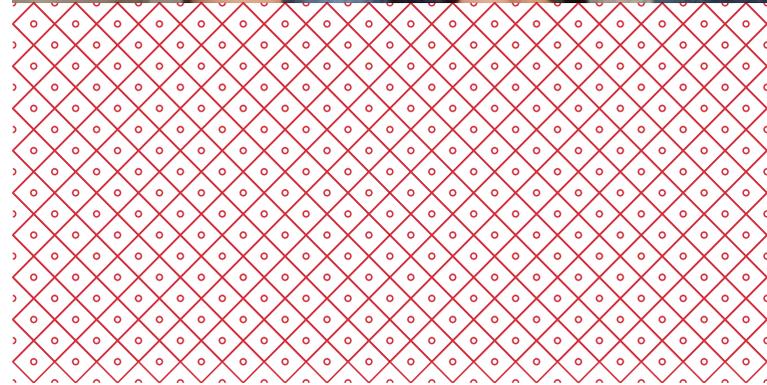
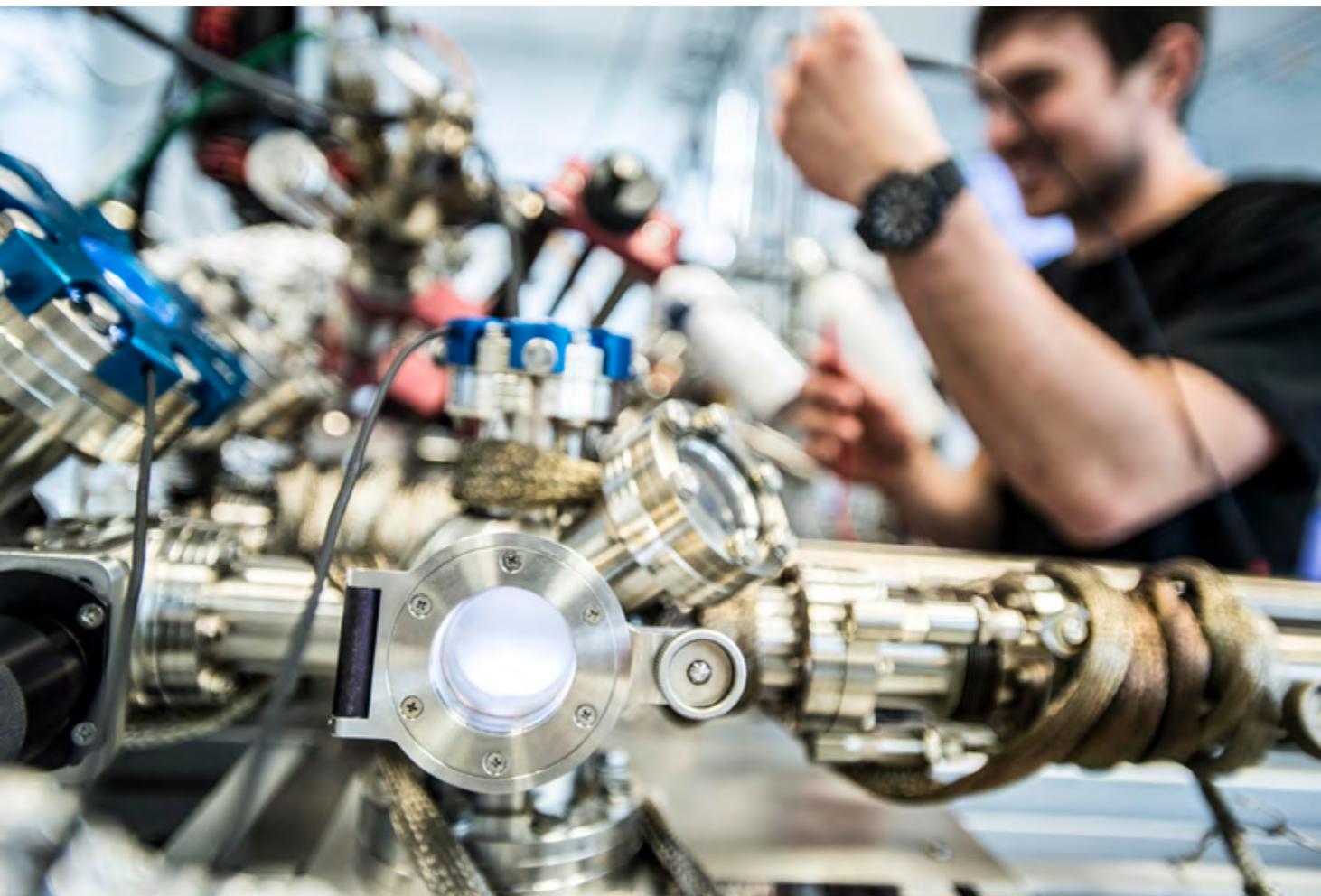
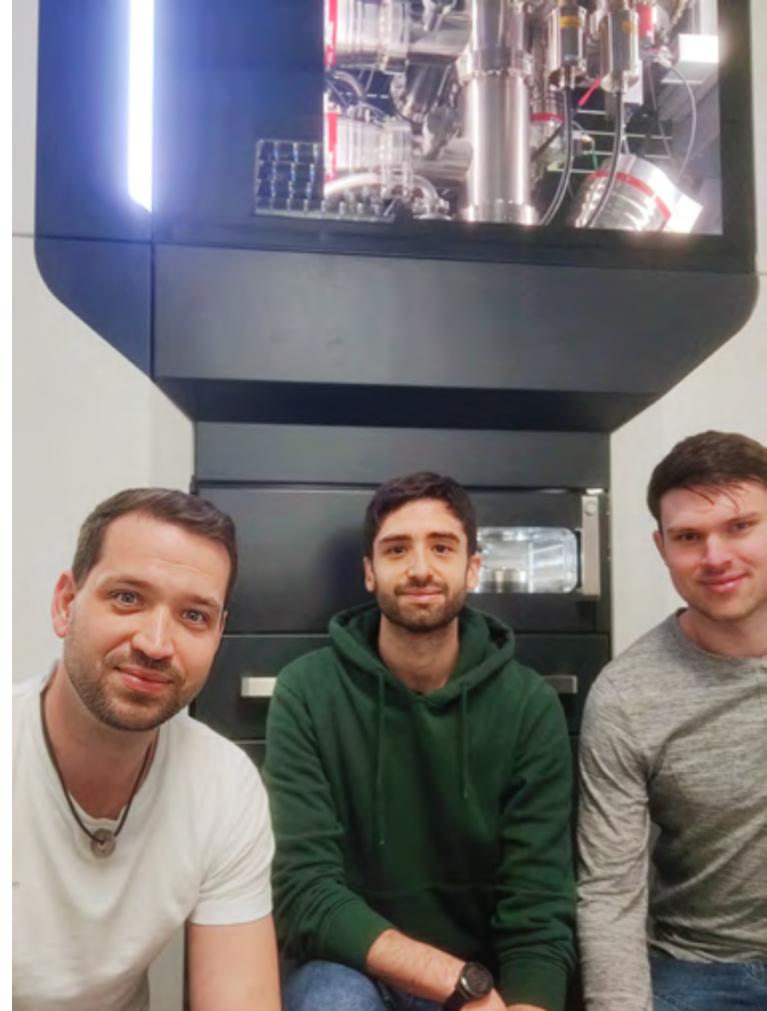
 prof. RNDr. Vladimír Matolín, DrSc.

<sup>2</sup>  CZ.02.1.01/0.0/0.0/18\_046/0015962

 CZK 32,312,500

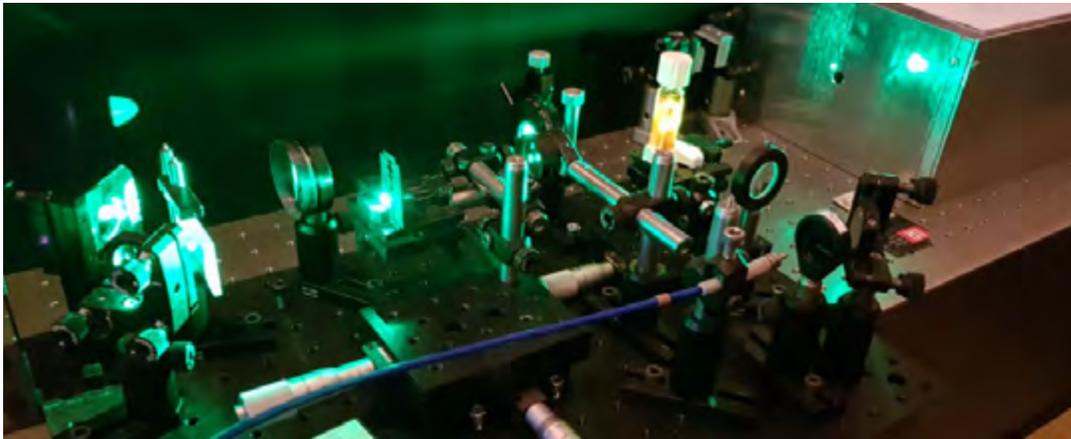
 1 Jan. 2020 to 31 Dec. 2022

 prof. RNDr. Vladimír Matolín, DrSc.



# Better experiments for the climate

The first snow fell and we happily ran outside to build a snowman, and suddenly our legs gave out, and lo and behold, we didn't hurry so much anymore and adapted to the icy road so that we wouldn't fall... That's when we unknowingly performed a physical experiment and put the result into practice – we slowed down. Physical experiments and their evaluation are an inseparable part of the investigation of natural phenomena. We routinely use many techniques and technologies that have gone through a large amount of experiments and, of course, theoretical research. In order to enable our students to carry out experiments and subsequently evaluate them professionally, we must provide them with access to the most modern technologies, and this is exactly what the investment project **Laboratory Equipment for the Experimental Component of Teaching Physics** did for us. The acquired laboratory instruments and equipment are mainly intended for the preparation, direct detection, and study of modern materials in the field of nanotechnology, biomedical applications, and materials technology, which are one of the priorities of European research today. All of this leads, for example, to the replacement of non-renewable energy sources and contributes to reducing the use of substances that cause climate change.



Faculty of Mathematics and Physics, Charles University



CZ.02.2.67/0.0/0.0/16\_016/0002371



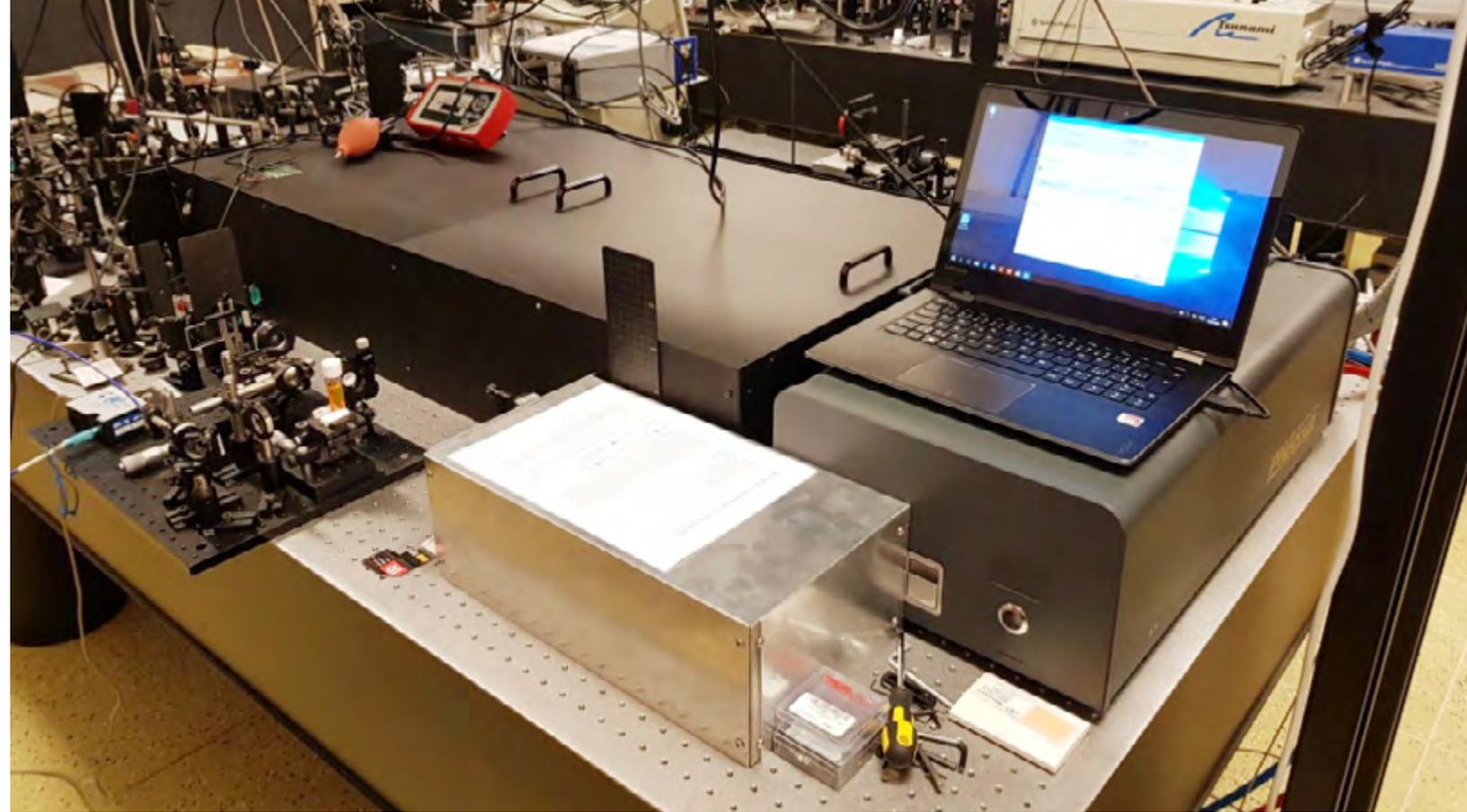
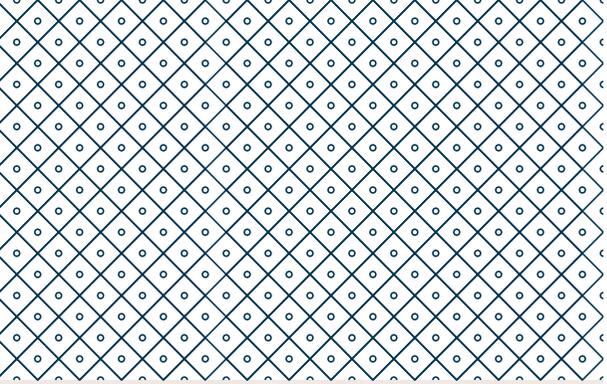
CZK 113,867,572



1 Jul. 2017 to 28 Feb. 2020



prof. RNDr. Vladimír Baumruk, DrSc.



**Faculty of Mathematics  
and Physics, Charles University**

<sup>1</sup>  CZ.02.1.01/0.0/0.0/16\_013/0001781

 CZK 19,562,153

 1 Jan. 2017 to 31 Dec. 2019

 prof. RNDr. Jan Hajič, Dr.

 Masaryk University  
University of West Bohemia  
Czech Language Institute of the  
Czech Academy of Sciences

<sup>2</sup>  CZ.02.1.01/0.0/0.0/18\_046/0015782

 CZK 31,997,832

 1 Jan. 2020 to 31 Dec. 2022

 prof. RNDr. Jan Hajič, Dr.

 Library of the Czech Academy  
of Sciences  
University of West Bohemia  
Institute of Philosophy of the Czech  
Academy of Sciences  
Institute of History of the Czech  
Academy of Sciences  
National Gallery in Prague  
Ministry of Culture

# Language as the basis of civilization

Language is the primary means of exchanging information. Without set language rules, we would not be able to fully understand each other. Such a simple exchange of the letter i for y can cause quite a lot of trouble. Language also carries information about our national and cultural heritage. The rule of law is based on the accurate interpretation of laws and regulations. The project **LINDAT/CLARIN – Research Infrastructure for Language Technologies – Expansion of the Repository and Computing Capacity**<sup>1</sup> and the ongoing project **LINDAT/CLARIAH-CZ – Expansion of the Repository, Services, and the Computing Cluster of the Research Infrastructure**<sup>2</sup> could, thanks to the support from OP VVV, expand the repositories and computing capacities, with which it mediates open access to language data and technologies, especially for the humanities and social sciences. It also provides public services in the field of language correctness (spelling, grammar, dictionaries). It collects, processes, annotates (manually and automatically), publicly provides and stores language data related to the Czech language environment, including from a historical standpoint. The analysis of texts and multimedia data using linguistic technologies contributes to the wider possibilities of research necessary for the preservation of national heritage and cultural identity. The open nature of data and services is a guarantee that they will be used widely in subsequent research and in education at all levels at universities and the Czech Academy of Sciences.



# Collaboration with Fermilab from the USA

An excellent American particle physics laboratory, which is a part of the Fermilab research infrastructure, has more than 4,200 scientists from around the world. And we are part of it. Use of the results for measurements at the accelerators at Fermilab contributed substantially to the development of cancer treatment and imaging technologies such as PET (positron emission tomography) and MRI (magnetic resonance imaging). Particle accelerators can shrink tumours, improve the properties of tires, identify suspicious cargo, clean polluted drinking water, or help design drugs. Thanks to projects like **Collaboration on Experiments in Fermilab<sup>1</sup>** and **Collaboration on Experiments in Fermilab 2<sup>2</sup>**, Fermilab-CZ will enable researchers, technicians and students from the Czech Republic to access these technologies, contribute to their further development, and thus be part of the global capacity that helps make the world a better and safer place.



## Faculty of Mathematics and Physics, Charles University

<sup>1</sup> 🔍 CZ.02.1.01/0.0/0.0/16\_013/0001787

€ CZK 19,306,410

📅 1 Apr. 2017 to 31 Mar. 2020

👤 RNDr. Karel Soustružník, Ph.D.

🏢 Institute of Physics of the Czech Academy of Sciences

Institute of Computer Science of the Czech Academy of Sciences

<sup>2</sup> 🔍 CZ.02.1.01/0.0/0.0/18\_046/0015954

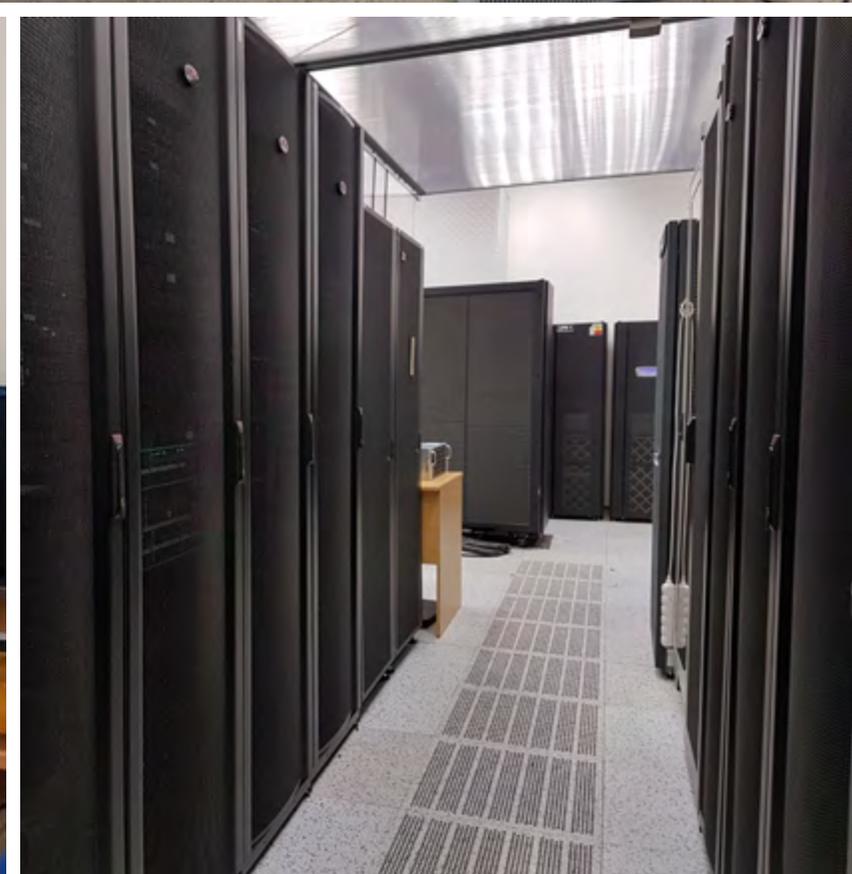
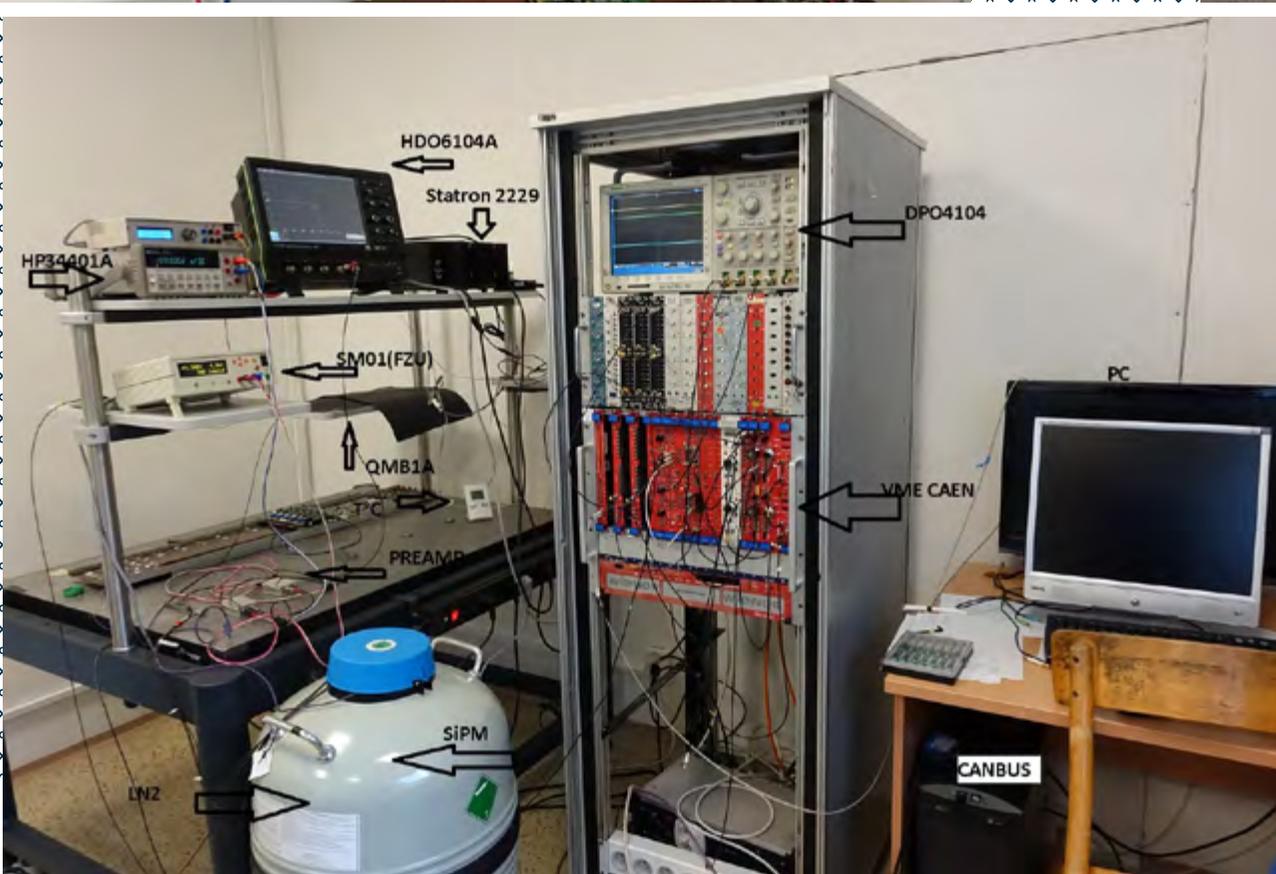
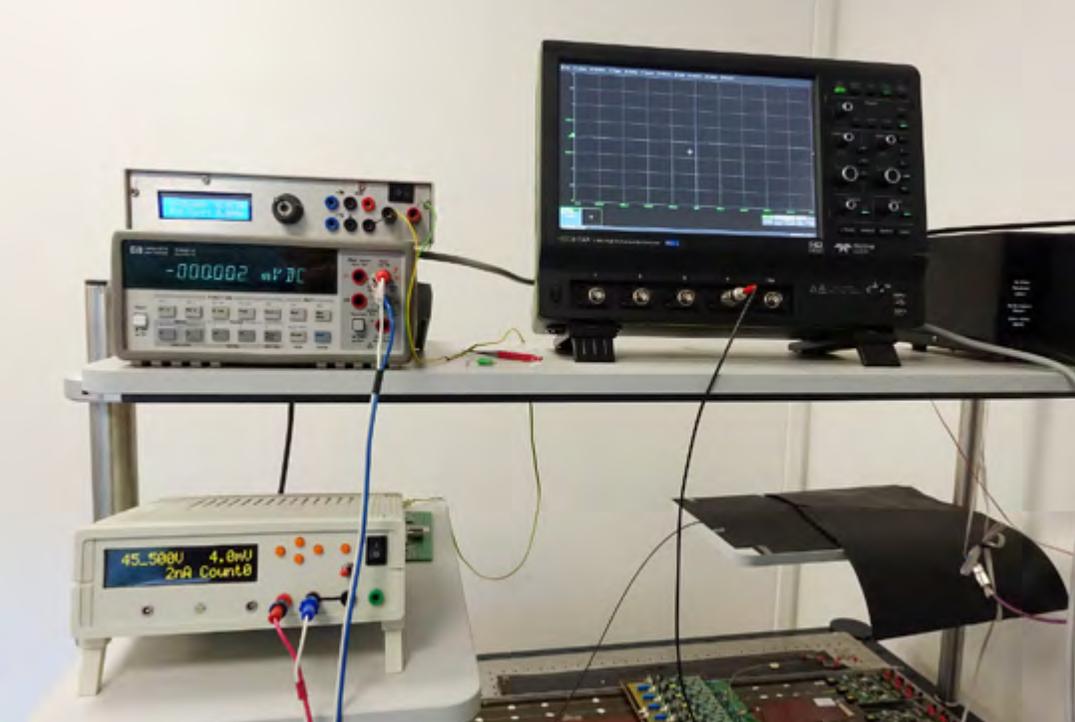
€ CZK 3,410,000

📅 1 Apr. 2020 to 30 Jun. 2022

👤 RNDr. Karel Soustružník, Ph.D.

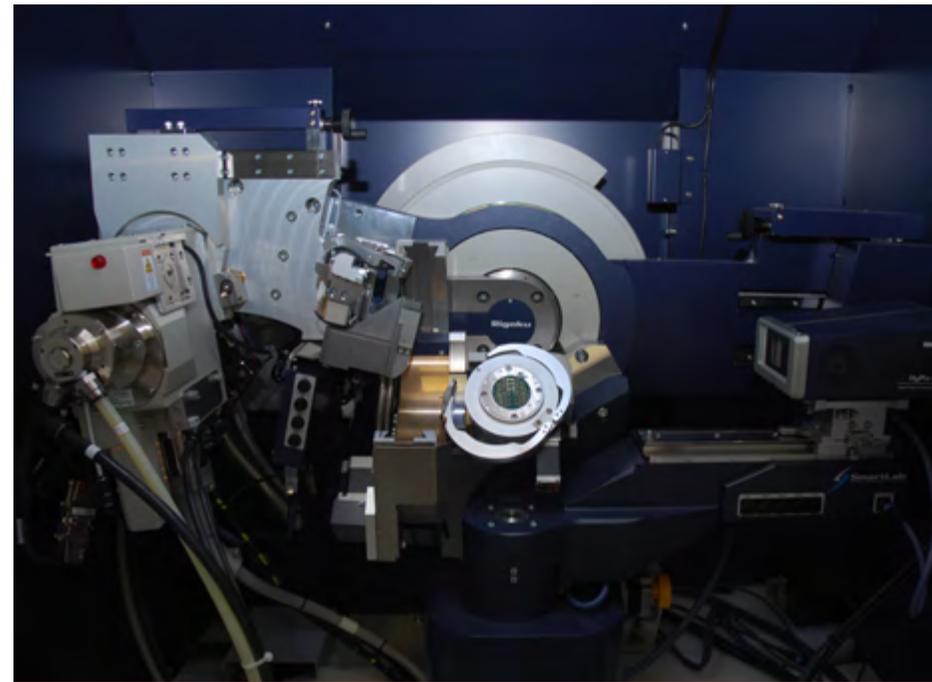
🏢 Institute of Physics of the Czech Academy of Sciences

Institute of Computer Science of the Czech Academy of Sciences



# A cyborg may also be waiting for us at the end of the road

Establishment of a cutting-edge scientific centre that will integrate scientists engaged in nanomaterials research – this is the NANOCENT project (the full name is **Centre for Nanomaterials for Advanced Applications**, but NANOCENT sounds much cooler). And what are they researching in the new research centre? For example, materials based on strongly disrupted carbon used in surface chemistry, energy applications and microelectronics, or ultrafine-grained titanium and magnesium alloys for biomedical applications. For example, if you need a new hip joint, it will last longer and not crack. All of this is made possible with the acquired high-end equipment, such as the universal X-ray diffractometer or the SAXS/ GISAXS system.



Faculty of Mathematics and Physics, Charles University



CZ.02.1.01/0.0/0.0/15\_003/0000485



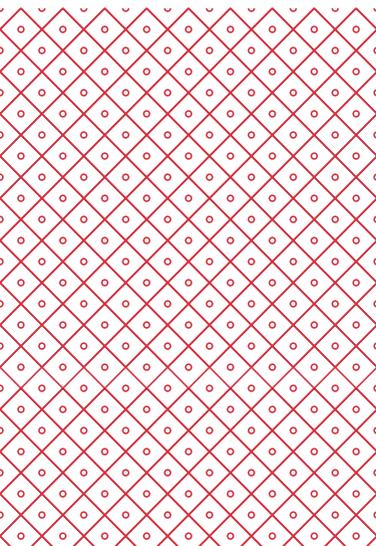
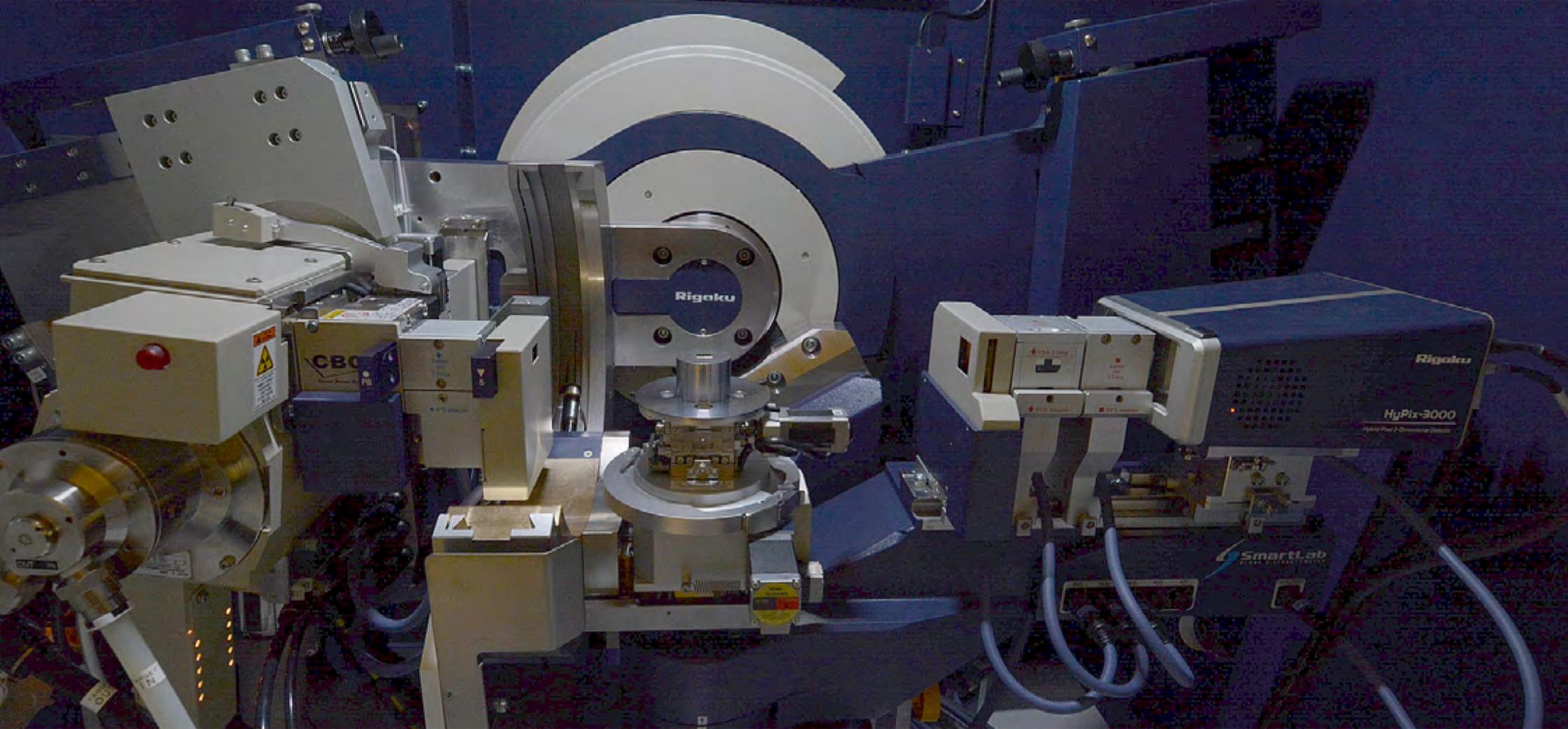
CZK 132,668,170



1 Feb. 2017 to 31 Oct. 2022



RNDr. Milan Dopita, Ph.D.



# AI and languages, lots of languages

Computer processing of natural language has undergone significant changes during the past decade in the areas of deep machine learning, big data processing, and the portability of models across languages. Thanks to this advancement, we can now use automatic translators, search engines, and even text generators. The project **Modernization of the Field of Mathematical Linguistics** focuses on the creation of new study materials and study concepts for students of the PhD study programme *Mathematical Linguistics*, which will make it possible to further improve and develop these and other state-of-the-art, powerful mathematical and computing tools.



## Faculty of Mathematics and Physics, Charles University



CZ.02.2.69/0.0/0.0/16\_018/0002373



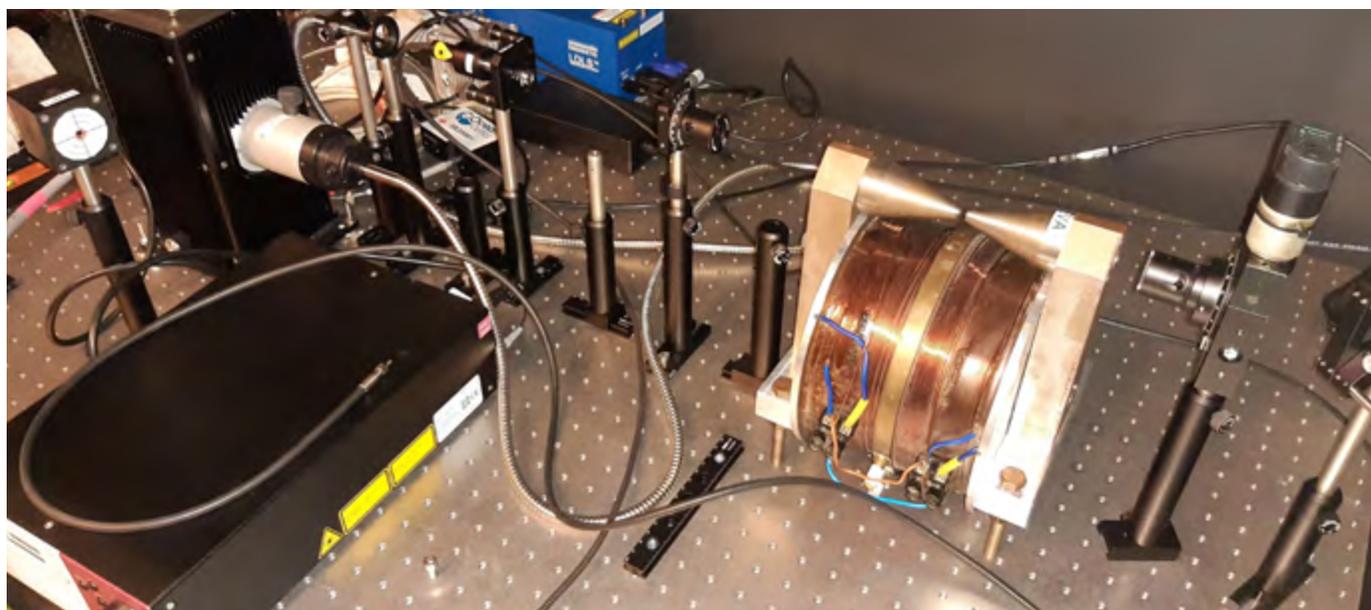
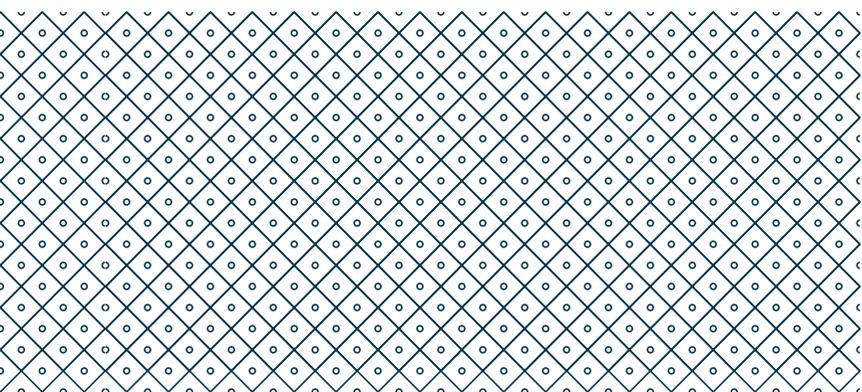
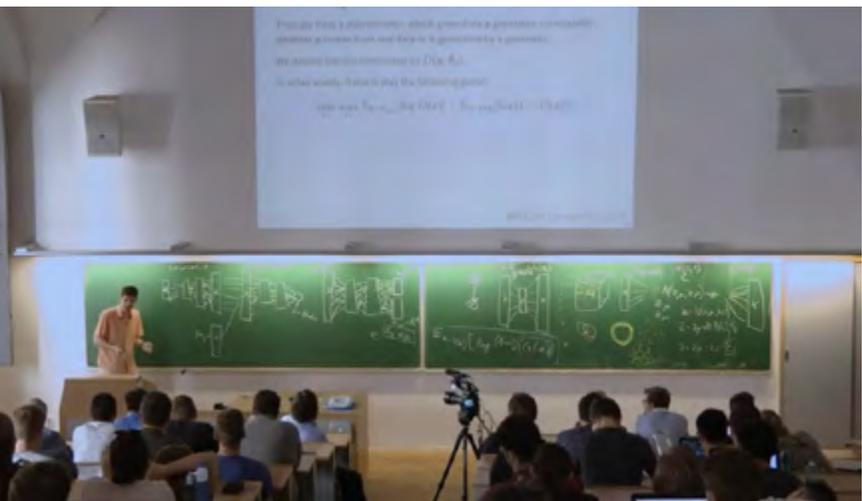
CZK 9,484,534



1 Jan. 2017 to 30 Sep. 2022



doc. Ing. Zdeněk Žabokrtský, Ph.D.



# How to attract young people to the Math Olympics

Did you participate in a Math Olympics in secondary school? No? We bet it would definitely be the other way around if Math Olympics had been more popular in the past. Everyone would like to go to the Olympics if a friend is also going to be there! The project **Improving the Quality of Math Education in Secondary Schools: Motivation to Study and Preparation for Math Contest and Olympics** was carried out by secondary school teachers. It showed them how to entice their students to study mathematics more in depth and how to learn and understand math better. That's not even close to being everything. As part of semester courses and summer schools, teachers also addressed the topic of how to attract and motivate highly talented students. Even during Covid, we weren't idle and organized these activities online. These will be the new young math Olympians!



**Faculty of Mathematics and Physics, Charles University**



CZ.02.3.68/0.0/0.0/16\_010/0000512



CZK 5,007,065



1 Oct. 2017 to 31 Dec. 2021



doc. RNDr. Jarmila Robová, CSc.

# Even materials remember things

Not only people or computers have memories, but also materials. In the case of magnetic shape memory, the material changes its shape under the influence of a magnetic field. However, it still remembers its initial state and returns to it as soon as we turn off the magnetic field. Such materials are needed wherever we want to induce mechanical movement without the presence of lead wires, such as micropumps for delivering drugs inside a patient's body. The phenomenon of magnetic shape memory is caused by the presence of a special structure in the material called the martensitic phase. In order to make the best material, we first had to understand how the martensitic phase works. The project **Physics of Martensitic Transformation for Extending the Functionality of Crystalline Materials and Nanostructures**, abbreviated MATFUN, has helped us out.

Faculty of Mathematics  
and Physics, Charles University



CZ.02.1.01/0.0/0.0/15\_003/0000487



CZK 111,966,726



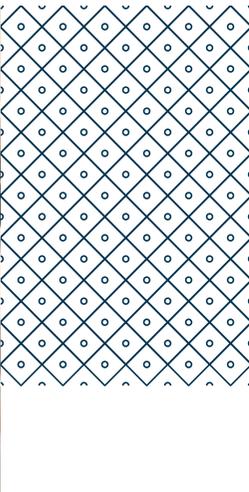
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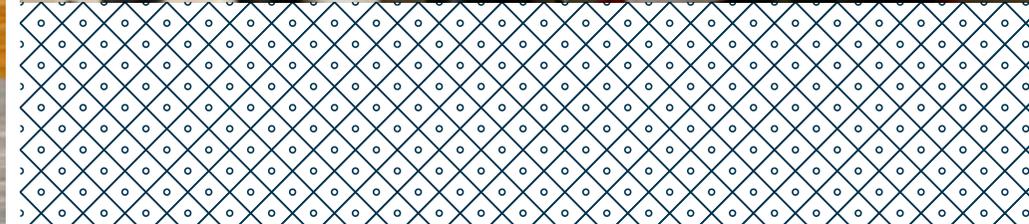
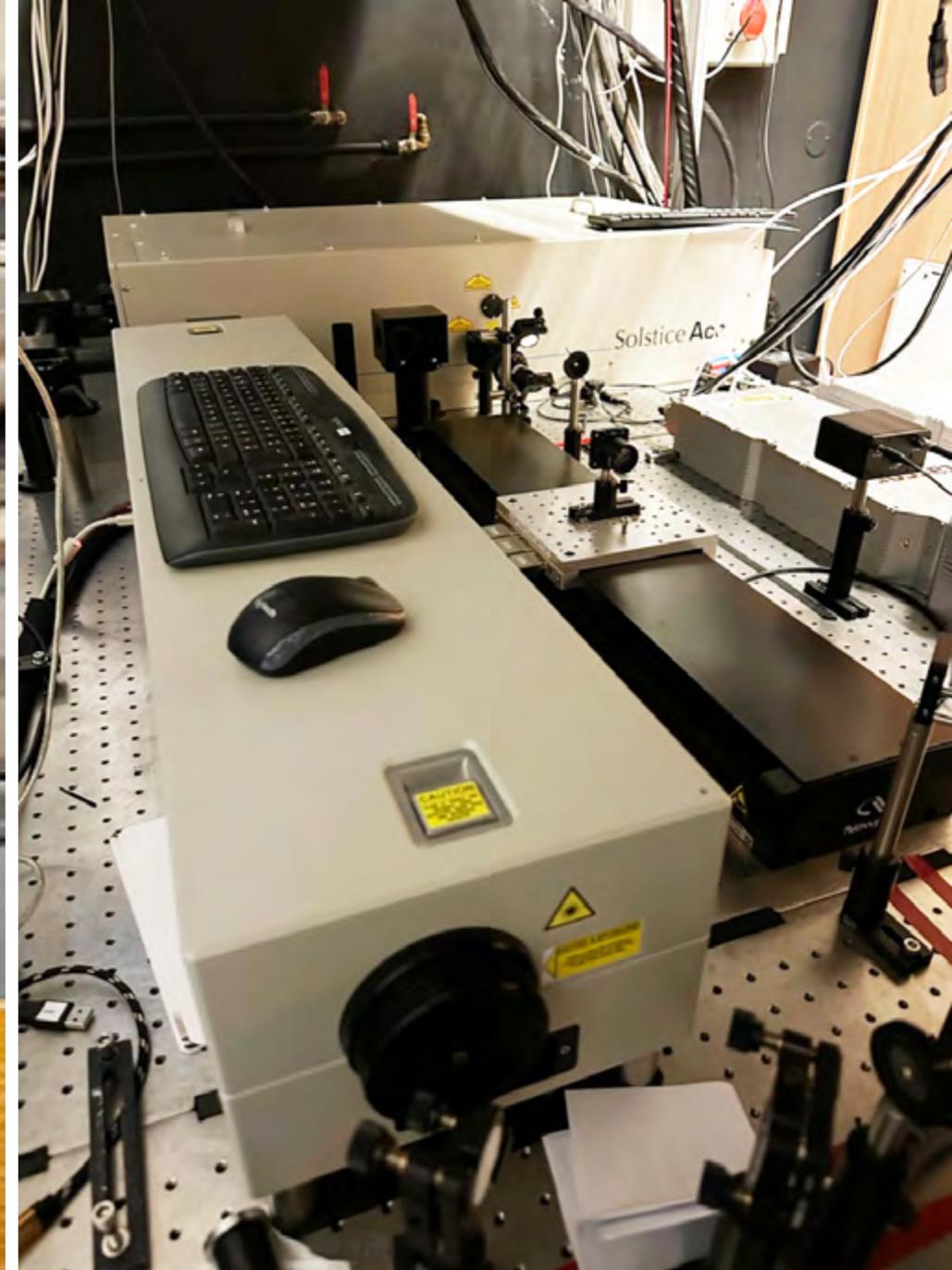
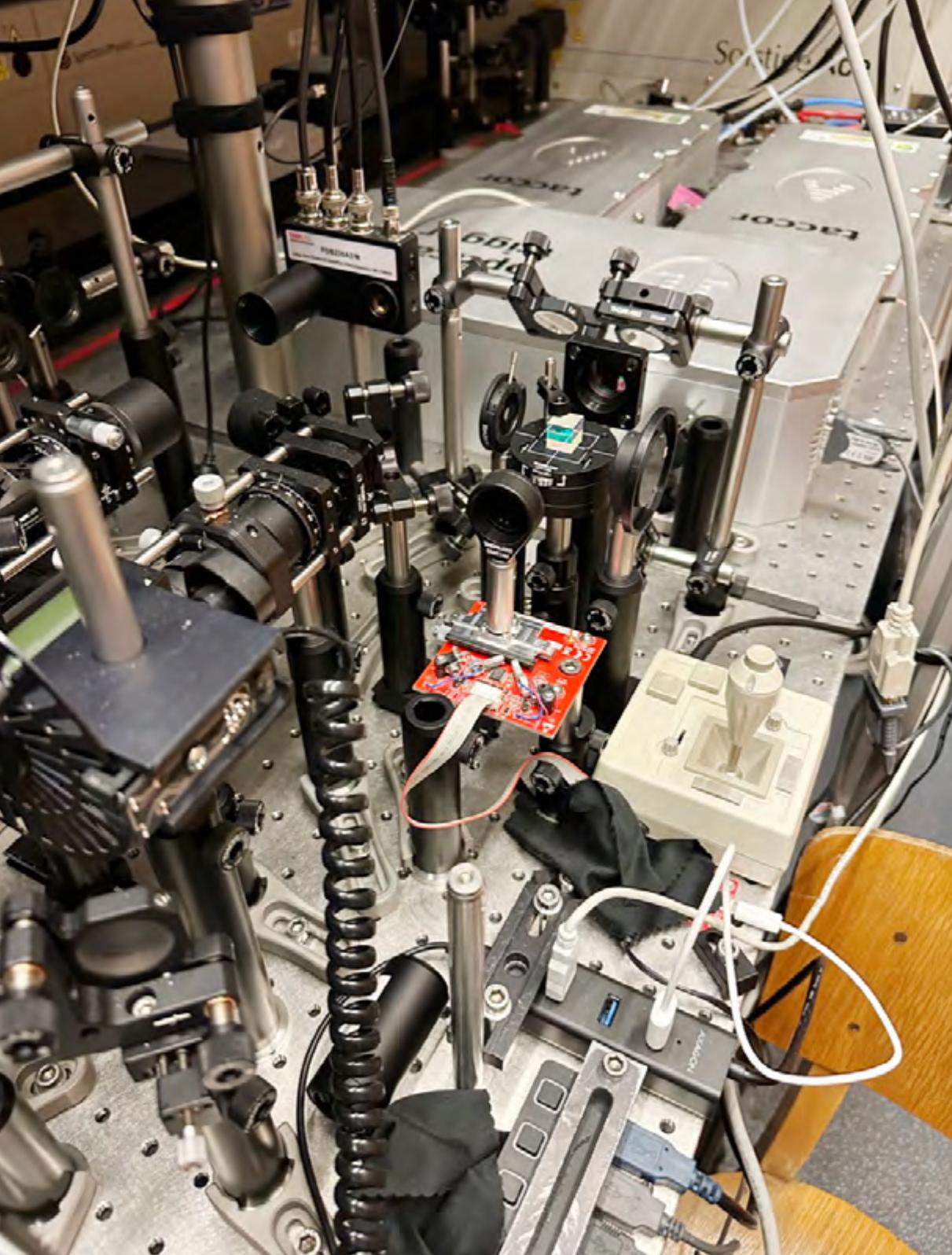


Ing. Ladislav Straka, D.Sc.



University of Chemistry  
and Technology, Prague





# First steps towards education

Taking first graders to school. A big bag of candy, a schoolbag, a notebook, crayons, and a favourite stuffed animal. Necessary equipment, and almost no first-year pupil could do without this on their first day of school. But what about the other days? The notebook runs out of pages, the crayons are used up, the stuffed animal stays at home more and more often, and nothing familiar remains; everything is new. The project **Pre-Literacy Support in Preschool Education** was created for all future school children, which prepared large teams of current and future teachers of preschool children in six regions in order to make the transition between nursery school and primary school easier for children. The participants underwent training in developing reading, mathematical, and didactic skills, which leads to the transfer of good practice to our little ones, who will then feel satisfied and confident in their first year at school, because they already know all those things very well.



Faculty of Education, Charles University



CZ.02.3.68/0.0/0.0/16\_011/0000663



CZK 45,157,815



1 Jan. 2017 to 31 Dec. 2019



prof. PaedDr. Radka Wildová, CSc.



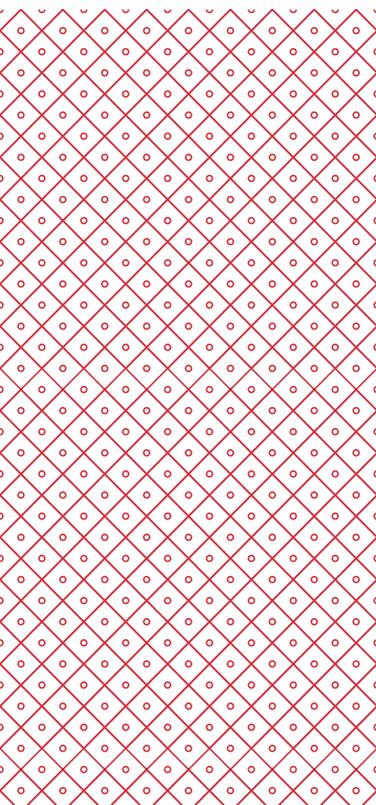
University of South Bohemia in České Budějovice

Technical University of Liberec

Masaryk University

Palacký University Olomouc

META, o.p.s.



# If you can't beat them, join them

First, green chalkboards were replaced by whiteboards with markers, and these in turn were replaced by interactive boards, which use specialized educational software. We are now developing digital educational resources that expand teaching methods. One must be able to handle such tools both from a technical standpoint and with respect to practical use in teaching. Who else but a teacher should teach pupils and students how to handle digital tools and use them effectively? But who will teach the teacher these skills? The project **Support for the Development of Digital Literacy** has prepared dozens of supporting didactic courses for educators across all educational levels, from nursery schools to secondary schools, and this has resulted in a number of digital educational resources, such as mobile applications or 3D modelling, both for students and educators.



## Faculty of Education, Charles University



CZ.02.3.68/0.0/0.0/16\_036/0005366



CZK 109,790,407



1 Jan. 2018 to 31 Mar. 2021



PhDr. Tomáš Jeřábek, Ph. D.



University of South Bohemia in České Budějovice  
Technical University of Liberec  
Masaryk University  
University of West Bohemia in Plzeň  
Palacký University Olomouc  
University of Ostrava  
University of Hradec Králové  
Jan Evangelista Purkyně University in Ústí nad Labem  
National Institute for Education



# Together we are stronger and smarter



It's nice when a person is not alone in everything and knows where to turn for advice and help if necessary. This is doubly true when one is responsible for the education of the younger generation. The practice community is a group of hundreds of teachers, academics and non-profit employees throughout the Czech Republic, which is the result of several years of efforts to cooperate between the individual education sectors and partnerships in creating a teaching concept. One of the projects that led to the creation and maintenance of this group is **Improving the Quality of School Education, Development of Key Competencies, Areas of Education, and Literacy**. Through seminars and workshops focused on mathematical, reading, and information literacy and civic or social competence, the participants shared experiences, shared problems, and proposed solutions together with the transfer of experience, including good practice. One of the key results are databases of teaching materials that contain unique, already tested and working tips, as well as videos on YouTube with specific teaching situations, where we can be inspired, how to arouse children's interest in literature, or videos with chemical experiments (for example, what hides in a bottle of propane-butane), which we can play during a chemistry class when we don't have the right tools or when there is a substitute teacher.

## Faculty of Education, Charles University



CZ.02.3.68/0.0/0.0/16\_011/0000664



CZK 53,565,226



1 Jan. 2017 to 31 Dec. 2019



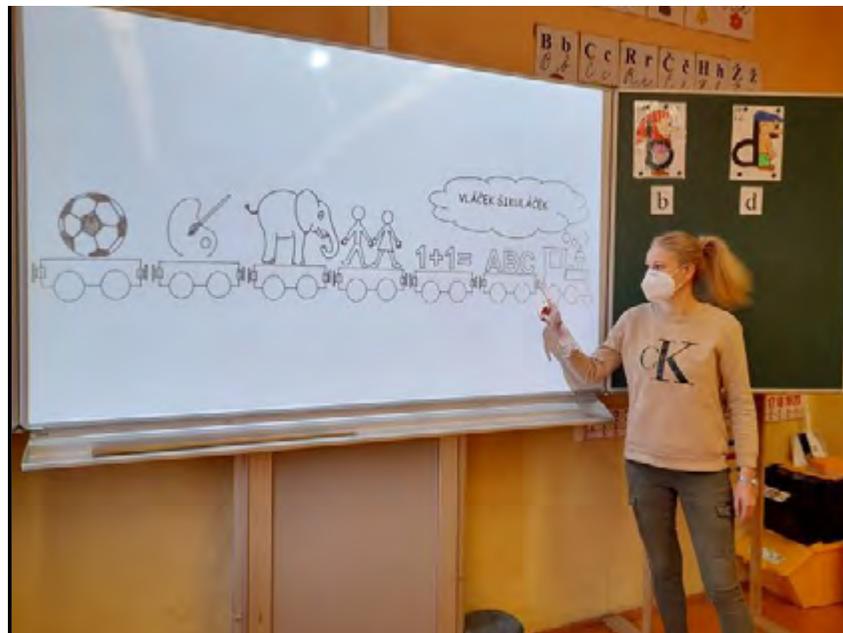
doc. PhDr. PaedDr. Anna Kucharská, Ph.D.



University of South Bohemia in České Budějovice  
Technical University of Liberec  
Masaryk University  
META, o.p.s.

# And why? And why? And why?

Formative assessment. Who has ever gotten an F in school and had absolutely no idea what it was for?! This person reliably knows how much injustice there is in the world. In practice, formative assessment means saying "why" not only for an F, but also for the other grades. Each grade contains feedback that can tell us what we are good at and what to focus on, and conversely, what we are lacking in and how to eliminate this. The project **Implementation of Formative Assessment in Primary Schools** supported teachers in developing their skills relating to effective feedback. A network of collegial support centres was also created at nine schools in the Czech Republic, which serve as meeting places for teachers from nearby schools.



Faculty of Education,  
Charles University



CZ.02.3.68/0.0/0.0/16\_032/0008212



CZK 16,042,228



1 Jan. 2019 to 31 Dec. 2021



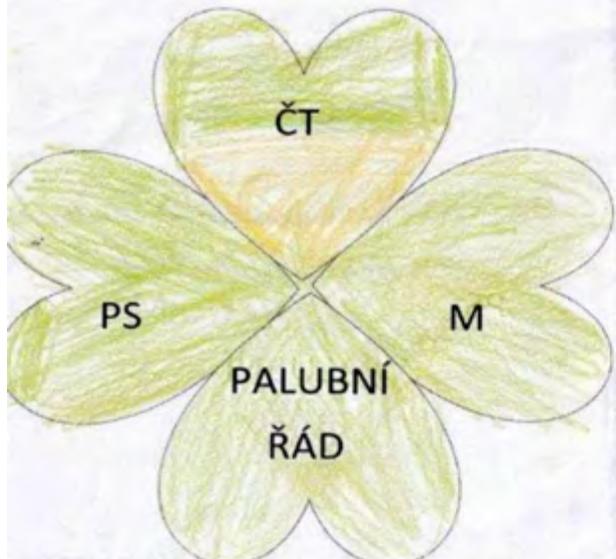
PhDr. Karel Starý, Ph.D.



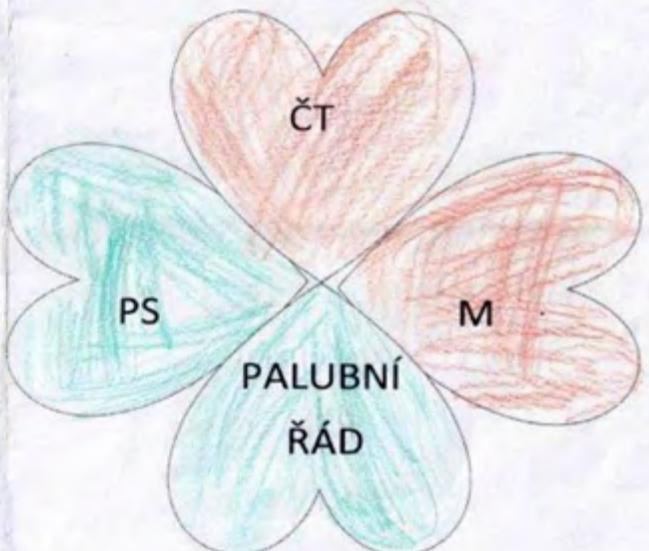
EDUkační LABoratoř

Jméno: NATY, MÁMA

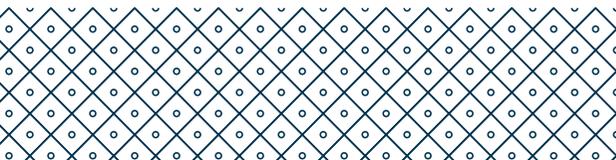
JÁ

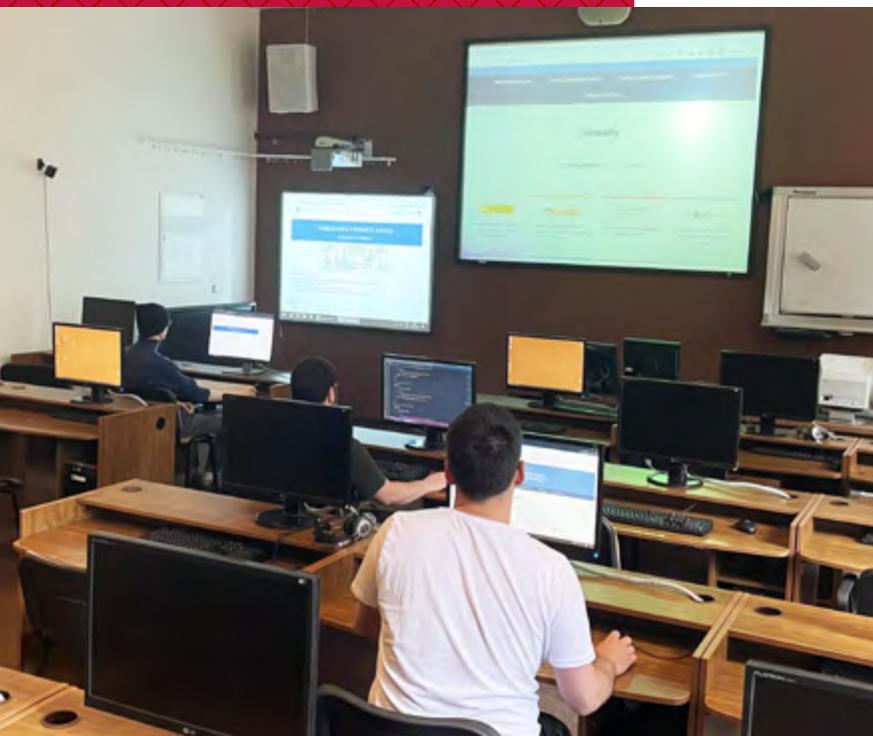


MÁMAMA, JÁ



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Jaký byl dnešní den?				





# Computers for more effective studies

Those investments again. Without them, we would not be able to apply modern teaching methods, prepare teaching materials reflecting the current needs of the young generation, and create a better future together with students. Improvements in teaching for the full-time and combined forms of bachelor's and follow-up master's programmes, both in terms of direct teaching and the independent and creative work of students, was also made possible by the project **Modernization of Computer Classrooms and Increasing the Capacity of Study Rooms**. Take a look for yourself and see how we managed it.

Faculty of Education, Charles University



CZ.02.2.67/0.0/0.0/16\_016/0002412



CZK 4,532,648



1 Jan. 2018 to 31 Dec. 2018



doc. RNDr. Vasilis Teodoridis, Ph.D.

# Where have all of the young teachers gone?

Innovation in education. This is the big challenge that all educational facilities face. We mentioned a moment ago about property investments, which are a necessary part of progress. Yes, but what about non-material investment? Specifically, what about human capital and investing in it? Why are a quarter of the graduates of teaching programmes not employed in education? What are the barriers to improving this situation? What reasons lead young graduates to such a decision? These questions and many more as well as possible solutions are proposed by the project **Reasons that Graduates of Pedagogical Faculties Do Not Take Up the Profession of Teacher/Pedagogical Employee.**



## Faculty of Education, Charles University

 CZ.02.3.68/0.0/0.0/19\_076/0016404

 CZK 13,690,790

 1 Apr. 2020 to 30 Nov. 2023

 Ing. Jan Koucký, Ph.D.

# With an effort to understand failure

Mathematics and the Czech language. Graduation. Chances of getting into university. Let's go back to where it all began. To the first grade. Failure to pass the graduation exam and subsequently a blocked path to university can already start here. A fundamental influence on reducing the risk of school failure in Czech and mathematics is the way teachers work with factors threatening their pupils and the conditions of a specific class. As part of the project **Teachers' Understanding of the Causes of School Failure and the Effectiveness of Pedagogical Intervention**, we collaborated with primary school teachers and found out what the culprit might be.



Faculty of Education, Charles University



CZ.02.3.68/0.0/0.0/19\_076/0016390



CZK 12,402,479



1 Apr. 2020 to 31 Oct. 2023



doc. PhDr. Irena Smetáčková, Ph.D.

# Even educators constantly learn

A while ago, we touched on the issue “The teacher teaches, but who teaches the teacher?”. The answer can now be found in the project **Support for Undergraduate Education at the Faculty of Education**, where we focused on everything from students of pedagogy to specialized capacities behind the department. The main subjects included linking theoretical knowledge with practice, formative assessment (if you forgot, look back a few pages at [Introducing Formative Assessment in Primary Schools](#)), mentoring with feedback, effective cooperation with parents, tandem cooperation of academics with teachers and, of course, there was also support for professional growth with the aim of building teams, because more heads know more.

Faculty of Education,  
Charles University



CZ.02.3.68/0.0/0.0/16\_038/0006965



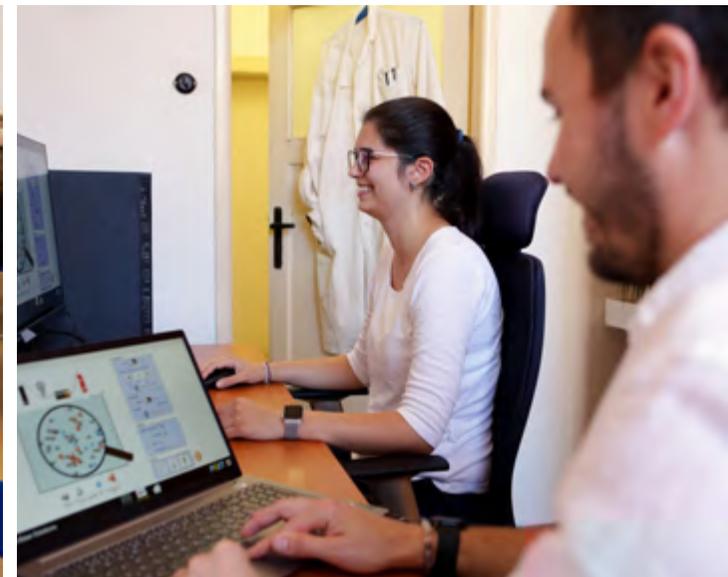
CZK 52,325,839



1 Jan. 2018 to 31 Dec. 2020



Ing. Lucie Černá



# Playful even for our littlest ones

Maintaining the attention of primary school pupils during educational activities has always been and will always be difficult. It is also necessary today to provide pupils with digital materials that develop their digital competences and do not make them mere passive consumers of multimedia. For this reason, we have implemented the project **Creating Innovative Digital Educational Resources**, with the help of which we have created media for students and teachers making additional curriculum available in an innovative, interactive, and above all, attractive form. Thus, the publication is not only for passive reception of information, but also actively engages students during lessons with the help of games, tasks, exercises, and interactive graphs or animation.



## Faculty of Education, Charles University



CZ.02.3.68/0.0/0.0/18\_067/0012276



CZK 9,878,706



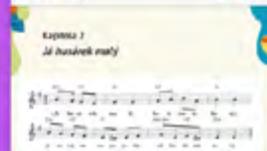
1 Jan. 2020 to 31 Dec. 2022



prof. PaedDr. Michal Nedělka, Dr.



Primary School Bří Jandusů, Prague 10  
Primary School V Rybníčkách, Prague 10  
Primary School Prague-Lipence, p.o.  
Primary School and Nursery School Chelčického, Prague 3  
Primary School and Nursery School Chýně



# Let's look at the differences in detail

Everyone is different. Each of us can do something different. We all learn differently. We all have a talent for something different. Some go to primary school, some to grammar school. The project **Forms of Differentiation in Primary Schools** investigates how educational approaches differ not only between individual types of schools, but also within one school when dividing pupils into selective and non-selective classes. Subsequently, we can suggest which tools can be used to reduce the differences between pupils and thereby increase the added value of education for young people. The results of this project will provide us with a solid foundation for further work in ensuring better conditions for the development and application of students both in further education and then on the labour market. The results of the long-term surveys also help us in this process: Trends in International Mathematics and Science Study (TIMSS), Progress in International Reading Literacy Study (PIRLS), and Czech Longitudinal Study in Education (CLOSE).

Faculty of Education, Charles University



CZ.02.3.68/0.0/0.0/19\_076/0016391



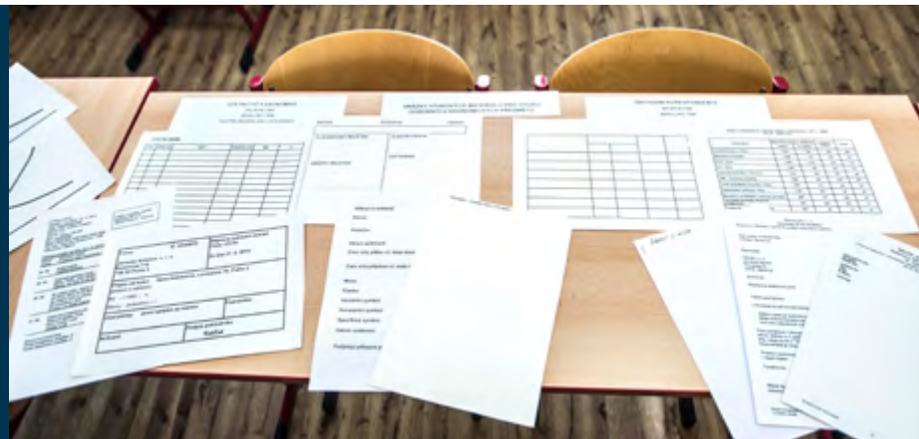
CZK 14,918,298



1 Jul. 2020 30 Jun. 2023



PhDr. David Greger, Ph.D.



# On a creative note

Art. Even for wall rock paintings, our ancestors needed equipment, either in the form of proper spaces where the paintings were not exposed to weather conditions, or they could not do without dyes from various clays. Bone flutes and blood or ash paint have undergone a major upgrade over the past tens of thousands of years, and we are still moving forward as human beings in this area. Among other things, also with the help of investments in the modernization of classrooms. The project **Support for Verifying Student Performance as a Part of Pedagogical and Pedagogical Art Activities** created a multimedia and technological framework in the fields of art, music, and language so that every young modern artist from among our future teachers could meet here. Of course, if someone is interested in the traditional form, there are no limits with us! However, choice is important, which is why we are modernizing so that everyone can choose.

Faculty of Education,  
Charles University



CZ.02.2.67/0.0/0.0/16\_016/0002377



CZK 5,242,342

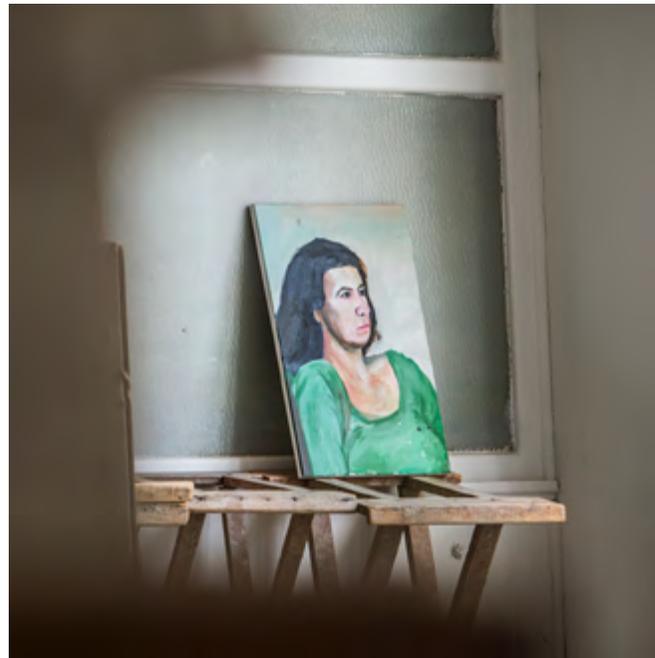


1 Jan. 2018 to 31 Mar 2019



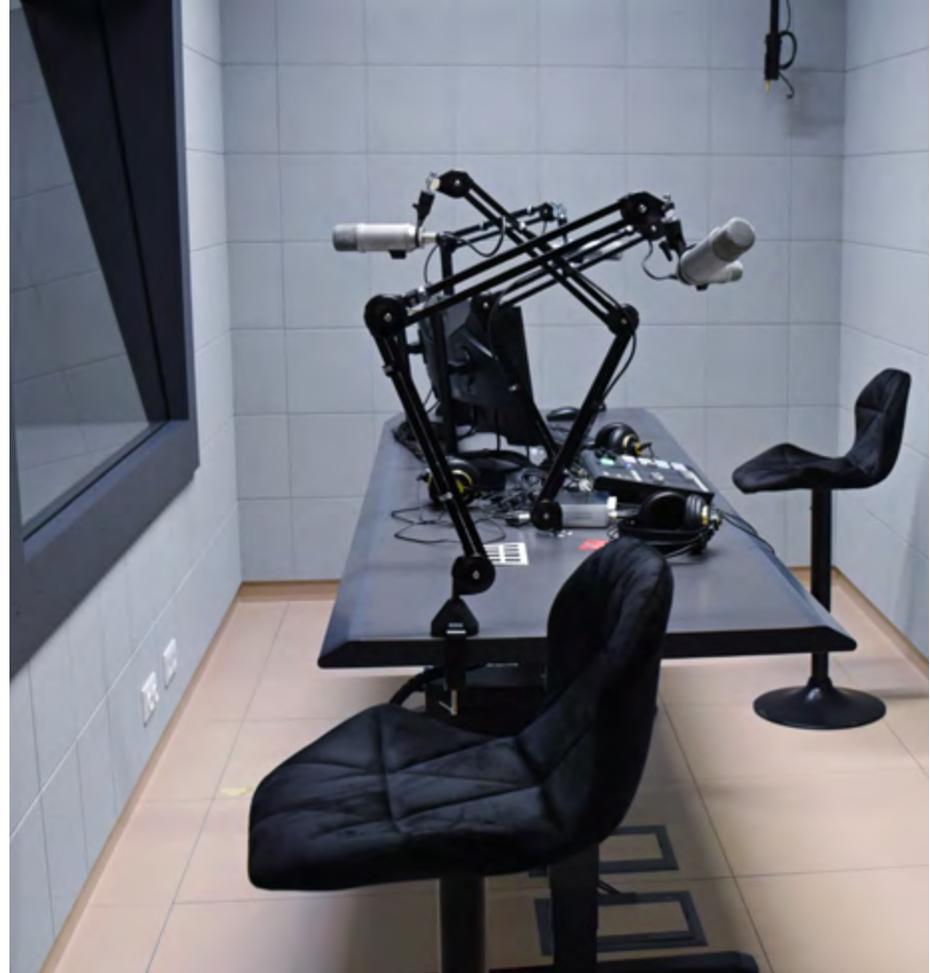
prof. PaedDr. Michal Nedělka, Dr.





# Attention, get ready for casting

The project **Modernization and Expansion of the Teaching Premises at the Jinonice Campus** includes not only the construction, modernization, and expansion of the premises, but also new furniture, new computer equipment and multimedia technology, equipment for the radio and television laboratory, and photo labs for the Faculty of Social Sciences. Last but not least, the project financed the purchase of electronic databases and books for the needs of the faculty. So when you visit us, you can read some of the study e-book. And maybe the star of the new study podcast will walk past you.



## Faculty of Social Sciences, Charles University



CZ.02.2.67/0.0/0.0/16\_016/0002336



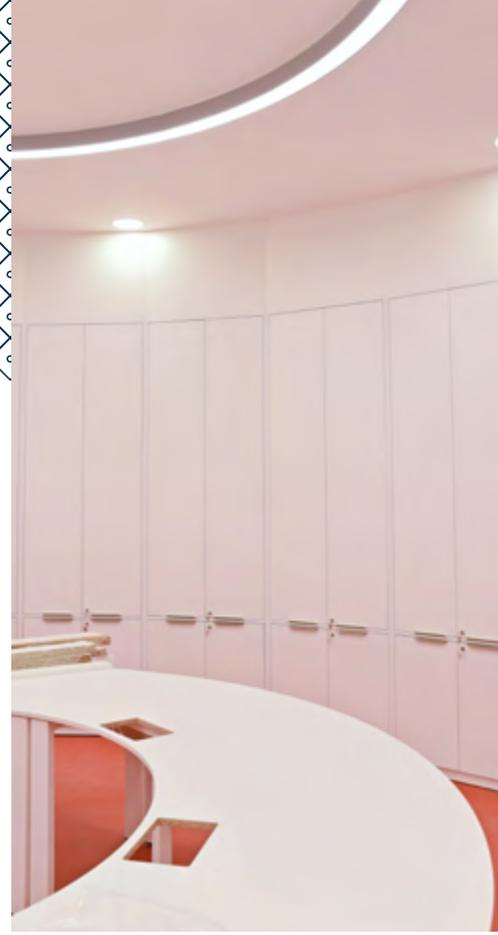
CZK 839,714,845



1 Sep. 2017 to 30 Jun. 2023



PhDr. JUDr. Tomáš Karásek, PhD.



# Let's talk about it



Effective communication = the basis of a good relationship. This applies not only to the family level, but also to the corporate level. Imagine how wonderful it would be if someone could analyse the communication between us and our children/parents/partners, and based on that, experts would then give us recommendations on what to improve and what to further develop in communication, thus ensuring us at home greater well-being, understanding, and more efficient performance of daily tasks. We have such an analysis available for the Ministry of Education thanks to the project **Research on Communication of the Ministry of Education in relation to Various Stakeholder Groups**, which will serve as the initial materials for preparing the documents for the communication of problematic phenomena, especially with respect to such target groups as school principals, founders, or parents.

Faculty of Social Sciences,  
Charles University



CZ.02.3.68/0.0/0.0/19\_076/0016432



CZK 5,983,191



1 Apr. 2020 to 31 Mar. 2022



doc. PhDr. Denisa Hejlová, Ph.D.

# Entertaining sports for everyone

Everyone wants to be part of a team, and even more so when something fun is happening. Sports can undoubtedly be fun, and the project **Support for Joint Education in the Area of School Physical Education and Movement-Oriented Programmes** ensures that all children without distinction can be part of a team and enjoy it to the fullest extent with others. Among other things, this project helps cultivate positive experiences with physical activities so that children who have it a little harder than others, for whatever reason, have the desire to do sports even in their free time. And what are these great photos? Doesn't it look great? The images are from events, such as "the Paralympics School Day", "Teambuilding", "Integrated Suburban Camps". The project also incorporates the teaching staff who took part in internships abroad and thus brought valuable and modern knowledge to our academic environment.



Faculty of Physical Education and Sport,  
Charles University



CZ.02.3.62/0.0/0.0/16\_037/0004664



CZK 5,190,145



1 Sep. 2017 to 31 Aug. 2020



PhDr. Klára Daďová, Ph.D.



# You can't stop progress!

A pandemic? Ugh... Even thanks to projects such as **Innovation of ICT Technical Equipment for Electronic Education at the Faculty of Physical Education and Sport**, we were better prepared for the challenges of working and teaching from home. Of course, the electronization of processes and e-learning is an absolutely necessary part of every modern society, but it was only during the pandemic that we were able to experience how absolutely necessary investments in the modernization of classrooms, the acquisition of modern equipment, and the teaching of innovative courses were, which is exactly what this project was about. Of course, it wouldn't be possible without facilities, which is why we focused on modernizing and merging two existing classrooms into one computer classroom, building a video editing room and, as a bonus, we purchased equipment for creating educational videos – so that we can make contributions ourselves and cater to our own needs.



**Faculty of Physical Education and Sport, Charles University**



CZ.02.2.67/0.0/0.0/16\_016/0002478



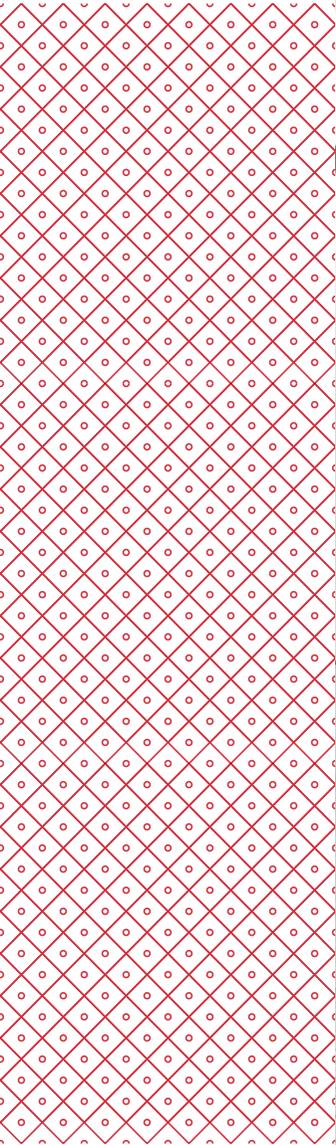
CZK 6,661,325



1 Jan. 2017 to 31 Oct. 2019

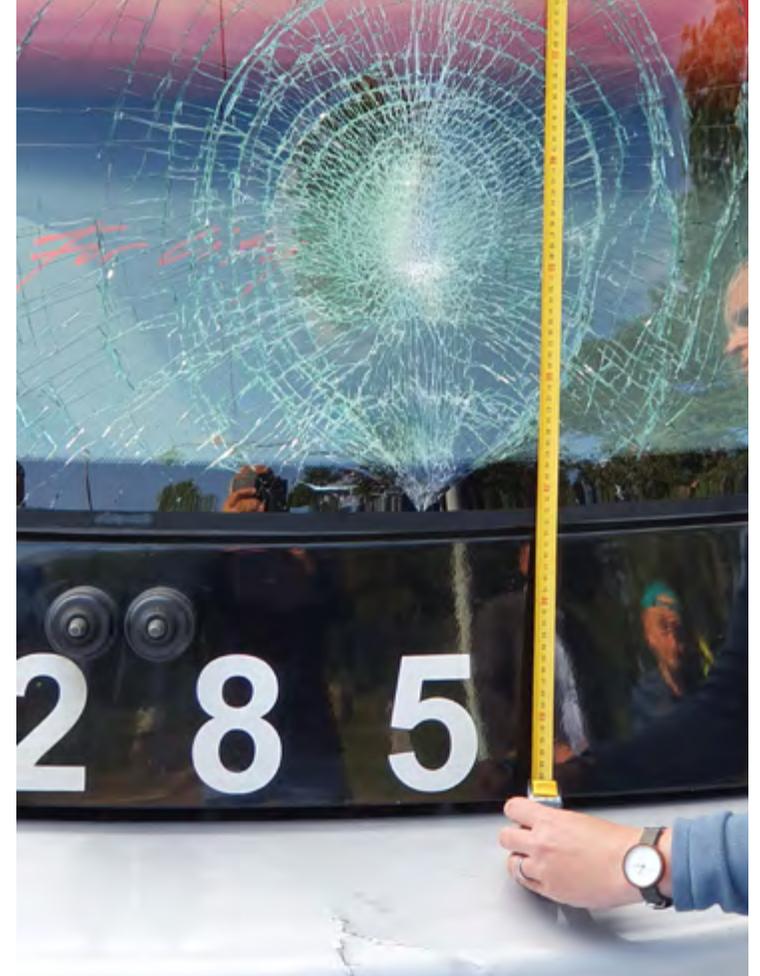


Ing. Milan Skrbek



# Ideas for safer streets

How many times today have you seen someone run across the tram tracks without a marked crossing? And be honest: how many times have you run across the tracks yourself? Sometimes everyone is in a hurry, and under such stress, you do not always pay attention to danger. Thus, to ensure our safety, smart devices and the results of a modern scientific approach come into play. Precisely those that were used in the project **Analysis of Pedestrian Tram Accidents – Validation of Simulation Models**. It helps ensure the safety of us and our loved ones, and not only when we are in a hurry somewhere and simply need to cross the tracks – no matter what happens. And how does it help, you ask? For example, the developed ACS system, which is automatic braking before an obstacle, or modification of the material and shape of the front surface of trams.



**Faculty of Physical Education and Sport,  
Charles University**

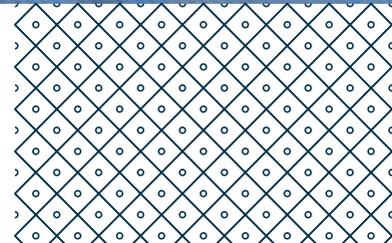
 CZ.02.1.01/0.0/0.0/16\_026/0008401

 CZK 43,449,413

 1 Sep. 2018 to 30 Jun. 2023

 doc. PaedDr. Karel Jelen, CSc.

 VÚKV a.s.  
ŠKODA TRANSPORTATION a.s.  
Advanced Engineering s.r.o.



# For lovers of e-books

Last but not least, we must not forget our independent units, which were also actively involved in the implementation of projects from the Operational Programme Research, Development, and Education. Which ones? Let's take a look at the Central Library of Charles University, which has put into operation computer study rooms for hybrid teaching, an audio-visual laboratory, and significantly strengthened the infrastructure of its E-learning Centre, including a new high-capacity computer network and completely upgraded the technical structure for the university's LMS Moodle. The total number of LMS Moodle CU users in 2020 reached an incredible 26,394 people and a total of 3,121 new courses were created! That's a lot of work, but that's not all! Thanks to the project **Creation of the Infrastructure for the E-learning Centre**, it was also possible to create a completely new Digitalization Centre for the CU Central Library, which purchased, among other things, a book cleaner. The main task of the centre is the digitalization of study materials. More than 700 additional textbooks are available in CU's Kramerius Digital Library. The historical collection of legal texts offers remote online access to 150 titles. Would you like to visit us? From home or in person, it's not that big of a difference anymore.



## Central Library of Charles University



CZ.02.2.67/0.0/0.0/16\_016/0002301



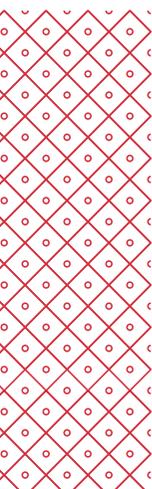
CZK 15,880,487

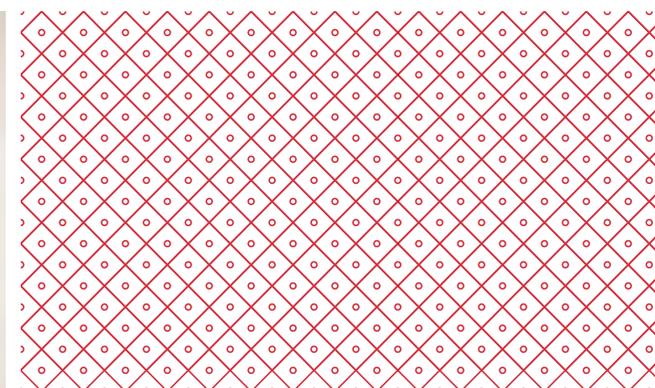
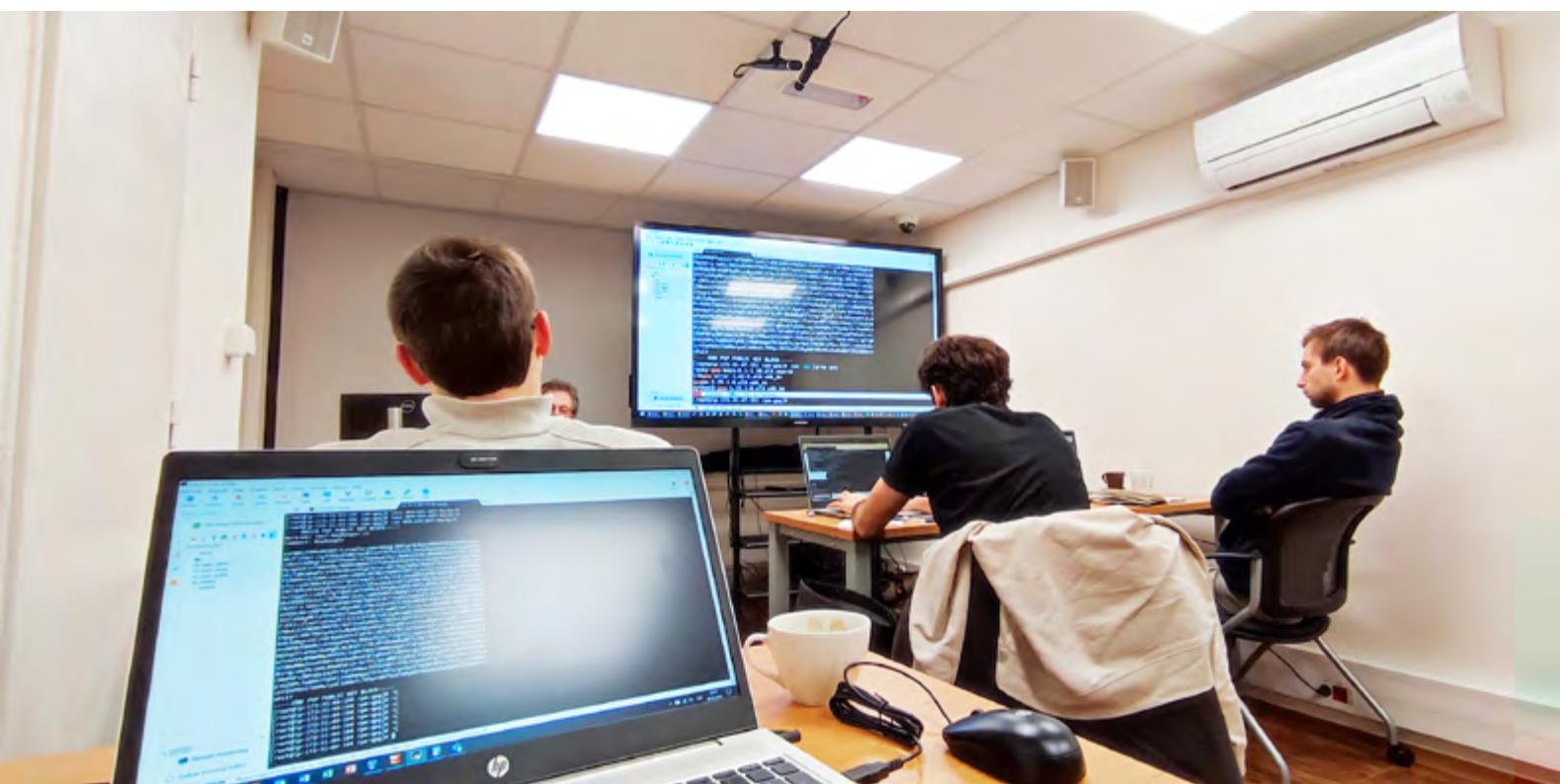


1 May 2017 to 31 Dec. 2020



MUDr. Jitka Feberová  
Ph.D., PhDr. Radka Římanová, Ph.D.





# Together we create innovations for life

We have excellent students who become excellent scientists and who come up with new and novel ideas and inventions to help society solve problems and improve people's lives in many areas, from technical or natural sciences to medicine and humanitarian needs. But how to get all of these great "enhancers" to the people? That's why we founded the University Innovation Network in 2014, and thanks to the project **University Innovation Network of Charles University**, we were able to further develop it so that it includes so-called scouts and coordinators responsible for searching for ideas among research teams at CU, as well as the subsidiary Charles University Innovations Prague a.s. to accelerate the commercialization of research results.

A subsidiary of the university? It is a common and useful thing abroad, so we have introduced this practice here in the Czech Republic to ensure effective communication between private companies and the university. And it works almost flawlessly.



## The Centre for Knowledge and Technology Transfer, Charles University



CZ.02.2.69/0.0/0.0/16\_014/0000651



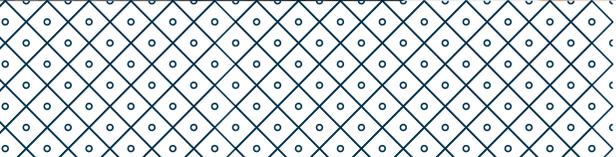
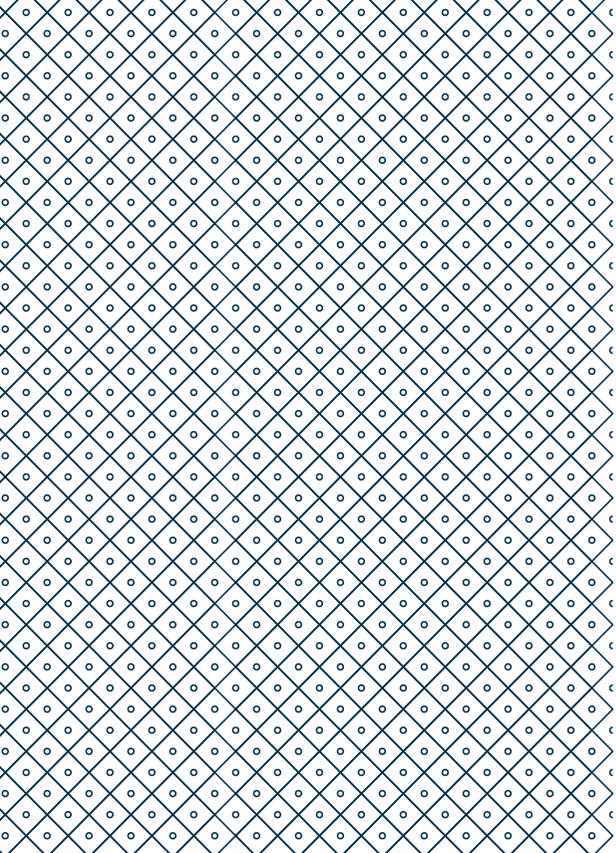
CZK 37,068,954



1 Feb. 2017 to 31 Jan. 2020



Mgr. Jiří Valach



# Student Information System – an invisible helper

If we didn't have the Student Information System, abbreviated "SIS", we students would have no place to register for courses and exams or monitor our results. But very few people realize that, without SIS, there would be no place to enter assessments or surveys and no place to download statistical data about everything that happens inside the university. With the amendment to the Higher Education Act in 2016, higher demands were placed on institutions of higher education regarding the quality assurance of their activities. This is why, thanks to the project **Modification and Expansion of the Student Information System of Charles University in association with Development of the Quality Assurance and Internal Evaluation System**, we have created four modules in the Student Information System (Accreditation, Questionnaire, Tracking, and Evaluation), which deal with monitoring and development of the quality of education at Charles University. These remain hidden from the student's eye, but fulfil an irreplaceable role.

## Department of Analyses and Strategy, Charles University



CZ.02.2.67/0.0/0.0/16\_016/0002264



CZK 2,926,968



1 Jul. 2017 to 31 Dec. 2020

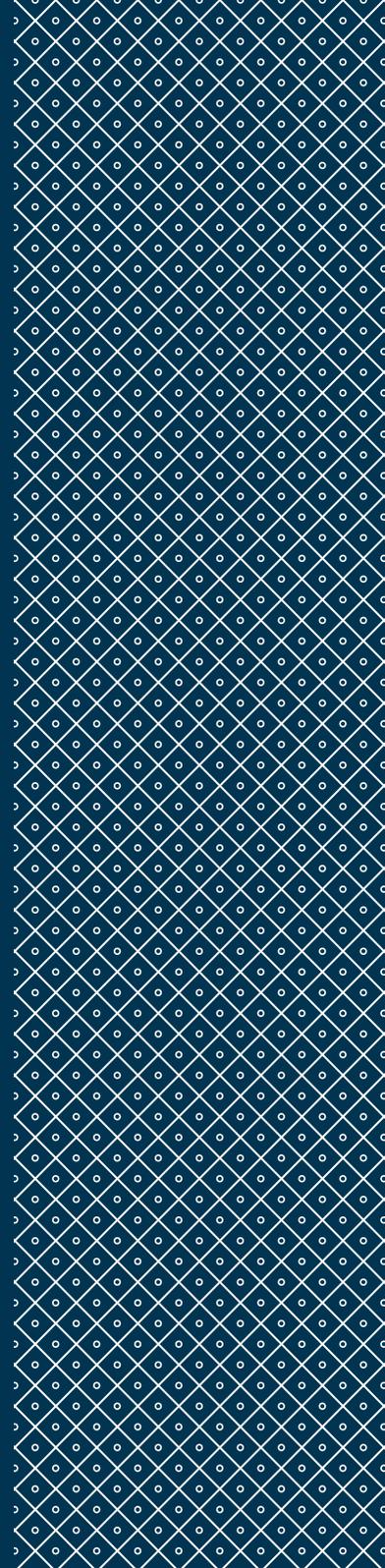


Mgr. Filip Machart



# Are you still with us? Excellent!

Because we are far from done. We have just managed together to go through a huge number of wonderful projects for the faculties and units of Charles University, and now we have come to the projects that we implemented university wide, and you can believe that it really took a lot of work, and sometimes we even shed a tear – of course, full of emotion and joy for successfully completing the projects. Maybe there was even a drop of stress before that, but that's part of succeeding.



# Magnificent plans and growth

Because we want to constantly improve and offer our students and employees the highest quality support and facilities both at home and abroad, we embarked on the project **Increasing the Quality of Education at CU and its Relevance for the Needs of the Labour Market**, which started the path of three more projects to fulfil all of the needs (and maybe secret wishes) of those we care about most. In a nutshell, what was involved: the modernization of almost fifty study programmes, the creation of four new study programmes, more external experts also from the commercial sector in teaching, strengthening teaching in foreign languages, internships abroad, long-term study stays, support for disadvantaged students and, last but not least, staff training.



## University-wide project, Charles University



CZ.02.2.69/0.0/0.0/16\_015/0002362



CZK 189,808,200



1 Jun. 2017 to 30 Jun. 2023

# So where will it be today?

A while ago, we presented the start of projects aimed at the comprehensive development of the university, and now we have before us the project **ESF for Universities II at CU**, which focuses primarily on the area of instruction in English, experience abroad for students, employees, and academics, and above all, on supporting students with specific needs. For these students from Prague faculties, physical education programmes were created at the Faculty of Physical Education and Sport and the activities of three counselling workplaces at CU Point, the Faculty of Arts, and the Faculty of Education were expanded.



## University-wide project, Charles University



CZ.02.2.69/0.0/0.0/18\_056/0013322



CZK 59,963,984



1 Jan. 2020 to 30 Jun. 2023

# That new smell and the promise of anticipation

The previous two projects go hand in hand with the investment project **ERDF for Universities II at CU – VRR<sup>1</sup>**, which focused on the Prague faculties, and the project **ERDF for Universities II at CU – MRR<sup>2</sup>**, which focused on faculties outside of Prague. Thanks to these projects, we were able to secure equipment, such as a virtual dissecting table, a teaching laboratory for the ELISA methodology, and simulators, devices, and aids for the newly reconstructed classrooms. We created a new Simulation Centre in which students practice real procedures on simulators, from indirect heart massage, artificial respiration up to completely advanced procedures from intensive and emergency medicine, and we provided a university-wide facility for the physical education activities of students with specific needs from all Prague faculties: Centre for the Health and Physical Education of Students with Specific Needs.

## University-wide project, Charles University

-  CZ.02.2.67/0.0/0.0/18\_057/0013298  
 CZK 123,798,302  
 1 Jan. 2019 to 30 Jun. 2023
-  CZ.02.2.67/0.0/0.0/18\_057/0013295  
 CZK 97,796,428  
 1 Jan. 2020 to 30 Jun. 2023





# Let's do sports... and then relax in the botanical garden

We will stay with development and the necessary investments for a while longer. But this will be more fun. We invite you to the renovated sports centre in Prague Hostivař, where you can go swimming or run (that is, if you study or work at Charles University) or stop and meditate for a while in our botanical garden of medicinal plants of the Faculty of Pharmacy in Hradec Králové. The project **Support for the Development of the Study Environment at Charles University – VRR<sup>1</sup>** focused on the Prague faculties, and the project **Support for the Development of the Study Environment at Charles University – MRR<sup>2</sup>** focused on the faculties outside of Prague. Thanks to these two projects, it was also possible to secure teaching simulators, furniture, audiovisual and ICT technology, the server infrastructure was strengthened, the ski lift at the university's mountain chalet (Patejdlova bouda) in the Krkonoše Mountains was reconstructed, a snowmobile was purchased, and last but not least, we also thought of our aforementioned Garden of Medicinal Plants and renovated the greenhouses.



## University-wide project, Charles University

<sup>1</sup>  CZ.02.2.67/0.0/0.0/17\_044/0008562

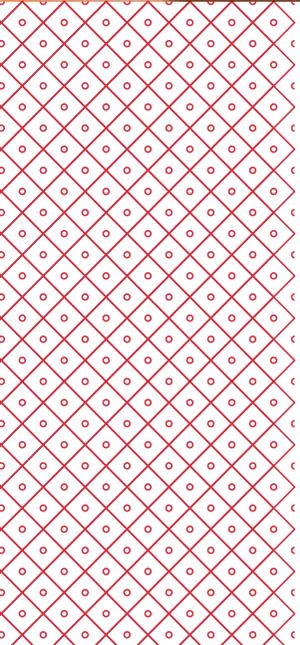
 CZK 472,270,810

 1 Jan. 2017 to 31 Oct. 2019

<sup>2</sup>  CZ.02.2.67/0.0/0.0/17\_044/0008561

 CZK 77,435,440

 1 Jan. 2017 to 31 Oct. 2019



# Hope dies last

You have a wonderful research idea! And you manage to “put it on paper” and then even prepare it in the form of a complex project with achievable goals. Of course you need money, and you apply for it through a grant application. “Wow!” The project was approved! It’s really a good idea, and even project evaluators at the European level think so! But there are so many applicants that the available money is not enough for everyone. Unfortunately, it didn’t get to you. Don’t worry, CU is here with its four projects that are precisely for you: **Improving Internationalization in the Field of Research and Development at Charles University through the Support of Quality MSCA-IF Projects<sup>1</sup>**, **Mobility of CU Employees MSCA-IF II<sup>2</sup>**, **Mobility of CU Employees MSCA-IF III<sup>3</sup>**, and **Mobility of CU Employees MSCA-IF IV<sup>4</sup>** (here only at the Faculty of Science, but that does not change the content). These projects financed research stays abroad by CU researchers and international researchers at CU that were not covered by the Horizon 2020 Marie Skłodowska-Curie Actions programme. The topics of supported research were very diverse, such as the return of spirituality to East Central Europe, the fields of dynamic meteorology and climatology, or investigating the influence of the forest structure on the occupancy of nests and hollows by cavity-nesting birds in boreal forests.



## University-wide project, Charles University

<sup>1</sup>  CZ.02.2.69/0.0/0.0/17\_050/0008466

 CZK 24,069,120

 1 Apr. 2018 to 31 Oct. 2021

<sup>2</sup>  CZ.02.2.69/0.0/0.0/18\_070/0010462

 CZK 6,215,688

 1 Mar. 2019 to 30 Jun. 2021

<sup>3</sup>  CZ.02.2.69/0.0/0.0/19\_074/0016231

 CZK 11,904,000

 1 Feb. 2020 to 31 Dec. 2022

## Faculty of Science, Charles University

<sup>4</sup>  CZ.02.2.69/0.0/0.0/20\_079/0017987

 CZK 6,092,520

 1 Oct. 2020 to 30 Jun. 2023

# We explore and carry out research – not only at home

**International Mobility of Researchers at Charles University** – This is 84 individual departures or arrivals of researchers in clearly defined research areas, which are handled by faculties of Charles University. The transfer of knowledge and research procedures from abroad to CU, strengthening the internationalization of individual research teams, strengthening the interpersonal competencies of the employees of CU, and expanding their professional networks abroad. Compliance with the principles of the *European Charter for Researchers*, the Code of Conduct for the Recruitment of Researchers, and increasing the international prestige of Charles University. It sounds very strict, but in principle, this is mainly about us not being behind in various research fields that bring more comfort, safety, and security to our lives. International mobility is the perfect tool for exchanging good practice and sharing innovative ideas (including their development). There are even those who, for example, come from Germany for a six-month research stay and like Charles University so much that they move to Prague and continue to work at Charles University as employees. So where will it be next?

## University-wide project, Charles University



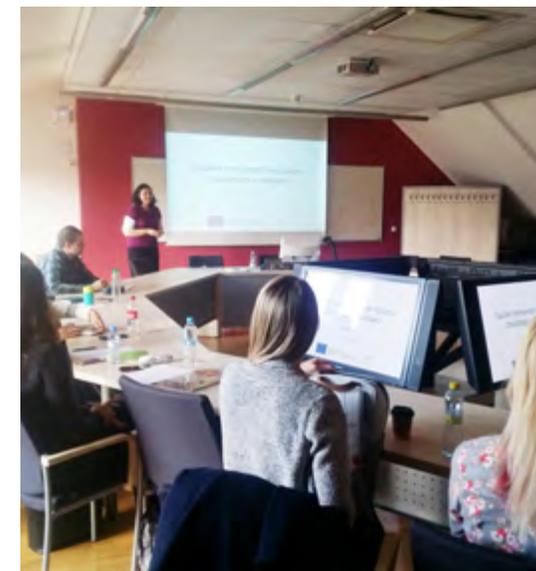
CZ.02.2.69/0.0/0.0/16\_027/0008495



CZK 90,813,106



1 Dec. 2017 to 31 Aug. 2022



# The indispensable ones

The importance of work trips abroad for researchers is very clear. But haven't we forgotten someone? How could we conduct cutting-edge research without cutting-edge administrative and technical support? After all, we are not enough on our own, which is why we create teams. The team consists of, for example, a good IT person, a great assistant or accountant, but also a system maintenance manager. Do you know any? And there are many. The project **International Mobility for Research, Technical, and Administrative Employees at CU** thought of everything and carried out an incredible 122 mobilities all over the world, for example, to South Africa, Australia, or the USA. It's time to spread your wings again and discover how they do it abroad. Will you join us?



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University-wide project, Charles University



CZ.02.2.69/0.0/0.0/18\_053/0016976



CZK 67,996,576



1 Dec. 2019 to 30 Jun. 2023

# Who teaches the teachers?

For our students who are preparing for the teaching profession, we launched a project aimed at combining theoretical knowledge with practice. The innovation project **Supporting the Undergraduate Education of Future Teachers at CU** focused not only on innovations in areas supporting students' professional knowledge, but also on pedagogical-psychological competencies and the transfer of good practice of university educators and teachers of cooperating schools. And what do we expect from our efforts to innovate study programmes for future teachers? Among other things, the application of acquired knowledge and skills in their pedagogical practice for implementing changes in their future schools as well as efforts towards systemic changes in the field of education.

University-wide project,  
Charles University



CZ.02.3.68/0.0/0.0/19\_068/0016093



CZK 47,862,060



1 Jan. 2020 to 31 Mar. 2023



# Let's put our heads together

Some start a band at university, and some start a research team. Young researchers, their novel ideas, and international cooperation. This is the START programme at CU funded by the project **Grant Schemes at CU**. Mobility and international cooperation have already been discussed, and this programme is exceptional in that it supports newly formed student research teams and their research. Exactly 97 teams! We even send teams of up to five PhD students on internships of up to three months all over the world as a part of the programme. Each team has its own mentor from among the staff of the CU who professionally supports the team in research, but they are not part of the team. Either way, whether you're playing in a band or doing research in a team, everyone can see the world.

University-wide project,  
Charles University



CZ.02.2.69/0.0/0.0/19\_073/0016935



CZK 264,565,303



1 Jan. 2020 to 30 Jun. 2023



# We lend a helping hand to anyone who asks for it

Who wouldn't want to work or study where they are well taken care of? Establishment of the CU Staff Welcome Centre, PhD platforms for coordinating education for PhD students, Welcome Day for PhD students and for those interested in studying, a handbook for new employees and Career Pages for job seekers, Pedagogical Skills Courses, a Unified Education Portal, e-learning courses, an equal opportunities plan, all of this and much more – both in Czech and English – was supported by the project **Improving Strategic Management at Charles University in the Area of Human Resources in R&D**. There is also the popularization of science among young people via Junior University at CU, which, thanks to the project, has expanded to include electronic platforms and an English version. We do everything for our current and future students, academics, and employees. Our main goal is to meet the requirements for maintaining the HR Award received in 2019 (the European Commission's "HR Excellence in Research" award). We can say that we are doing quite well.



## University-wide project, Charles University



CZ.02.2.69/0.0/0.0/16\_028/0006210



CZK 40,371,524



1 Dec. 2017 to 31 May 2021

# People are the key players

We do not stop caring for our valued employees. The project **Strategic Development of Science and Research Capacities and the Strengthening of Charles University's International Competitiveness** is a continuation of the previous successful university-wide project. We have now focused mainly on ensuring a professional and transparent environment for employees, ensuring high-quality language training for employees, so that they can confidently communicate with foreign students and employees without any problems, and last but not least, innovating the service for international researchers and employees planning to work at CU for a longer time.



## University-wide project, Charles University



CZ.02.2.69/0.0/0.0/18\_054/0015222



CZK 62,838,554

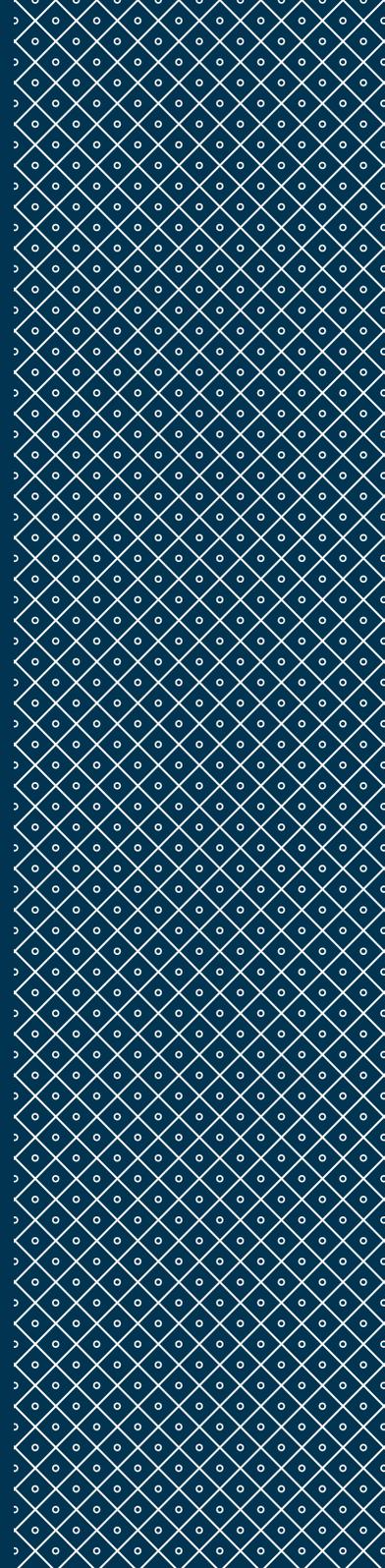


1 Jan. 2020 to 30 Jun. 2023

# Do you still have enough energy for another round?

Yes, for sure? Well, that's not surprising when the journey between our projects is so varied and fun. But if you are still a little out of breath, have something good to eat and your favourite drink. We'll wait a while.

So are you ready? Can we continue? Ahead of us is the last part of our journey, which leads us even beyond the borders of Charles University. We will talk about projects in which CU was not in the main role of "implementer", but was a faithful and indispensable partner.



# Want to get involved in science?

You could even be a participant in this project! **Analysis of Czech Genomes for Theranostics, A-C-G-T** was looking for volunteers from all over the Czech Republic to compile a control database of genetic information typical for the Czech population. Our 1<sup>st</sup> Faculty of Medicine handled the DNA sequencing of the samples taken, in other words: what information does the DNA contain. Don't worry. If you are not one of the volunteers, we will tell you that it was only a small amount of blood. Nothing horrible. This database will then be used to compare samples of patients with suspected genetic diseases in the future. The results of this research can help in the early and accurate diagnosis of genetically determined diseases, in setting up ideal "tailor-made" therapies (this is solved by theranostics = THERAPY + DIAGNOSIS), and in further research into the role of genetic factors in the development of diseases.

1<sup>st</sup> Faculty of Medicine, Charles University



CZ.02.1.01/0.0/0.0/16\_026/0008448



CZK 94,757,913



1 Jan. 2019 to 30 Jun. 2023

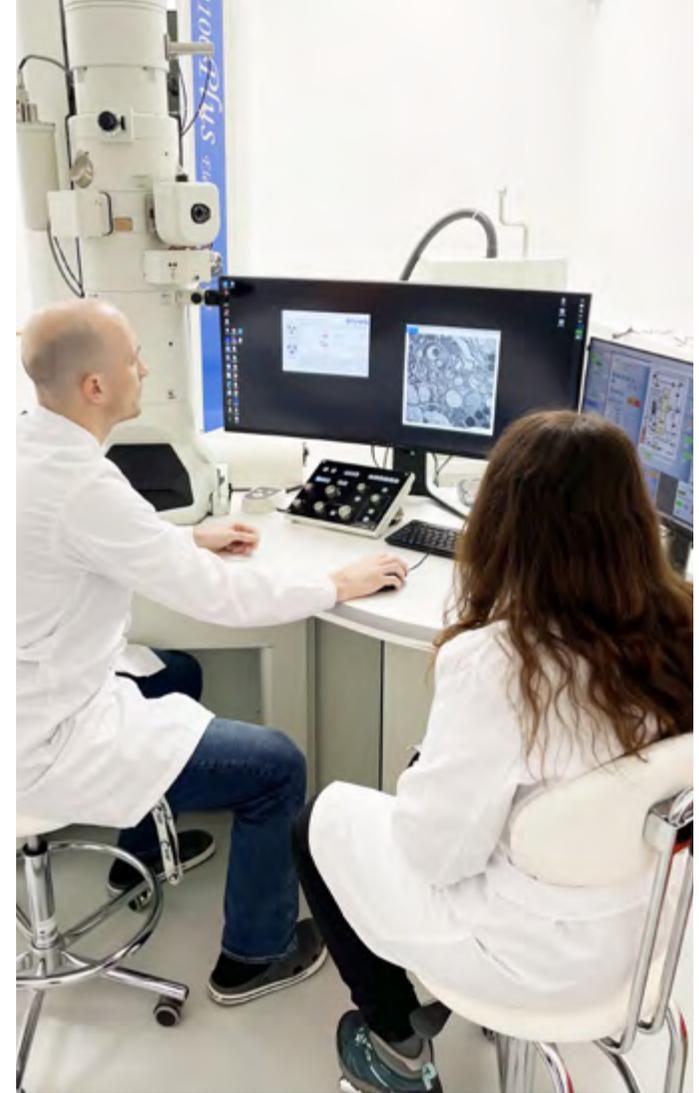


Masaryk University



# A breakthrough imaging method

If we want to know more about something, we look at it closely. But that won't be enough. We want to know even more! Thus, we needed to break the boundaries of what such a "close-up view" actually means. It is no longer enough to place a sample on a larger glass slide, place a second glass slide on top and look at the sample through the lens of a microscope. Sometimes we need to follow processes in vivo, i.e. to observe a complete 3D model of organs and tissue changes in living cells and organisms. Thanks to this, we can observe whether the drugs are distributed to specific organs of a patient. And thanks to this skill, we can, for example, test new drugs and subsequently recommend their use in medicine. Hence, the project **Modernization and Support of Research Activities of the National Infrastructure for Biological and Medical Imaging Czech-BioImaging** enabled us to finance the purchase of special equipment and ensure quality conditions, including facilities for our excellent scientists.



1<sup>st</sup> Faculty of Medicine, Charles University  
Faculty of Science, Charles University

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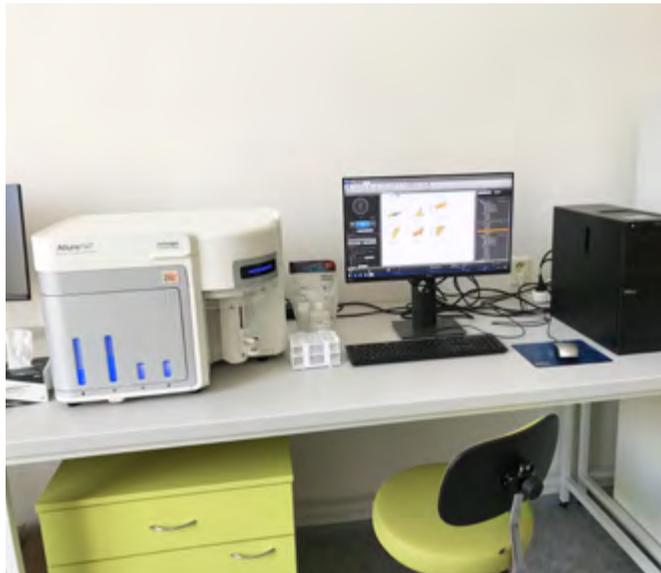
 CZK 330,279,758

 1 Feb. 2017 to 30 Apr. 2021

 Institute of Molecular Genetics  
of the Czech Academy of Sciences

# Is something getting on your nerves?

**PharmaBrain** has devoted itself to three areas of research in the field of diseases of the central nervous system. In many aspects, these diseases represent an exceptional group due to the need for long-term treatment associated with the risk of relapses, dynamic changes of the disease, long-term loss of productivity, reduction of the quality of life of the patient, and their surroundings, which significantly increases the costs of treatment and social care. Our faculty participated in a new concept aimed at studying the causes of their occurrence, the diagnostics of psychopathology, searching for new therapeutic strategies, and creating clinically relevant animal models, and for this, it was necessary to acquire a flow cytometer – a system for flow analysis of nerve tissue cells.



**3<sup>rd</sup> Faculty of Medicine,  
Charles University**



CZ.02.1.01/0.0/0.0/16\_025/0007444



CZK 148,262,697

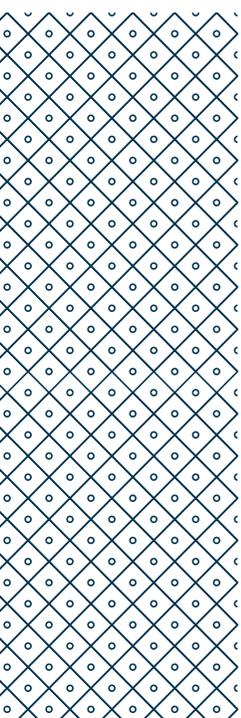


1 Jan. 2018 to 30 Apr. 2023

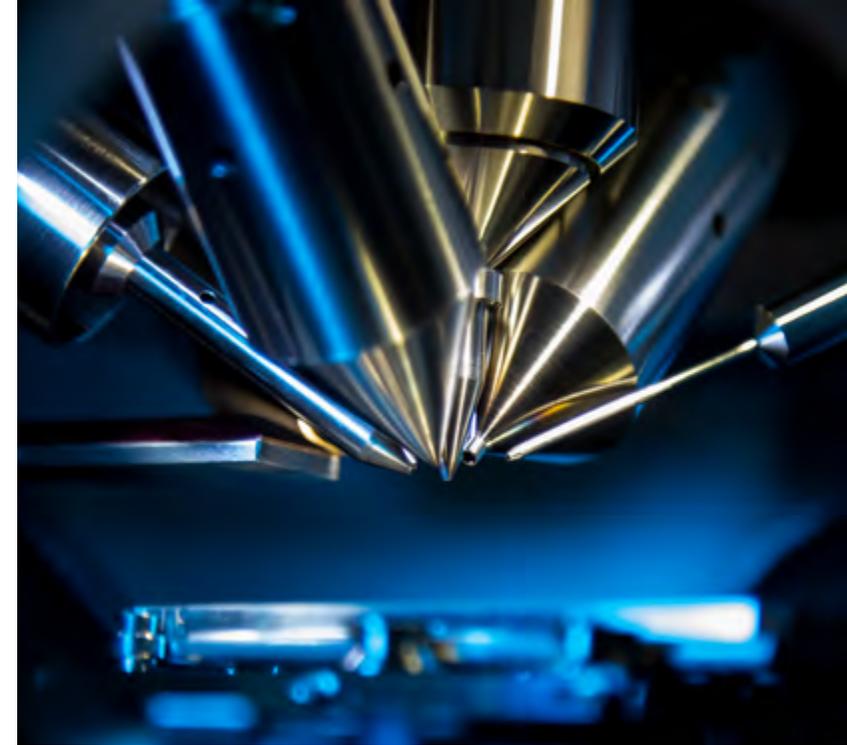


National Institute of Mental Health

# Phantoms and the way of the future



The development of imaging methods is moving in a more humane direction from living creatures to phantoms. Here we are talking about phantoms made by the process of plastination, which means replacing the water in the samples with a special resin. These phantoms replace living animals, and we can meet them, for example, in the *Special Laboratory of Experimental Imaging*. The laboratory develops non-destructive imaging methods with minimal use of contrast agents. The project **Engineering Applications of the Physics of the Microworld** was comprehensive research and development of progressive technologies for the detection of ionizing radiation and their application, not only in healthcare, but also in space, hadron therapy, biology, materials research, radioecology, and basic physical experiments. We cooperated with partners abroad, we supported young researchers, students of the PhD study programme, and thanks to the project, special equipment was also purchased, such as a Micro CT for high-resolution scanning of biological samples, X-ray sources, or a FLAT panel.



**3<sup>rd</sup> Faculty of Medicine, Charles University**



CZ.02.1.01/0.0/0.0/16\_019/0000766



CZK 196,292,981



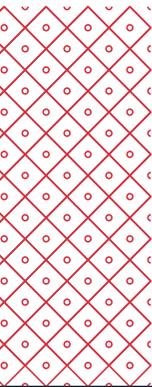
1 Sep. 2017 to 31 Oct. 2022



Czech Technical University in Prague

# For successful tissue regeneration

Modern surgical treatment of cancer has advanced significantly and brought with it the possible loss of functional organ tissue. For example, removal of an extensive malignant tumour in the liver when the very functioning of the organ is significantly threatened. The project **Application of Modern Technologies in Medicine and Industry** served research and development specifically in the area of modelling the regenerative capacity of liver tissue. At the same time, a prototype of an integrated interoperable system for the transfer and processing of medical data was also developed, which will enable the creation of a large prospective database of complex data and knowledge. Based on this extensive data, it will be possible to implement a wide range of data mining methods to obtain new knowledge and enrich the possibilities for current clinical diagnostics. This will make the diagnosis of patients more accurate and speed up a physician's decision on treatment procedures, whether to choose surgical intervention or conservative treatment.



## Faculty of Medicine in Plzeň



CZ.02.1.01/0.0./0.0./17\_048/0007280



CZK 98,227,676



1 May 2018 to 31 Oct. 2022



University of West Bohemia in Plzeň

# Tailored medicine

Helping pregnant women with serious pregnancy complications and developing treatment and diagnostic procedures in the field of personalized medicine. This is the main focus of the project **PERSONMED (Centre for the Development of Personalized Medicine for Age-related Illnesses)**. In cooperation with University Hospital Hradec Králové, a group of pharmacologists at the Faculty of Medicine in Hradec Králové focused on a specific liver disease in pregnant women, which can result in damage to the foetus, premature birth, or cardiac arrest of the newborn. The Hepatic Pharmacology research group (LivPharm) has developed a method that allows the sensitive measurement of the entire spectrum of bile acids to the extent of measuring plasma concentrations of ursodeoxycholic acid, the main drug used in women with this form of cholestasis. In addition, a mouse model of cholestatic liver disease in pregnancy was developed, which enabled the testing of the ability of the drugs to worsen or improve bile production, including the synthesis and secretion of bile acids. With its use, the potentially cholestatic effect of the drug metformin, which is now approved for the treatment of gestational diabetes, was revealed. Since gestational cholestasis and diabetes show an increased simultaneous occurrence, the administration of metformin in this situation could worsen the accumulation of bile acids in the body, thus endangering the development of the foetus.



## Faculty of Medicine in Hradec Králové



CZ.02.1.01/0.0/0.0/17\_048/0007441



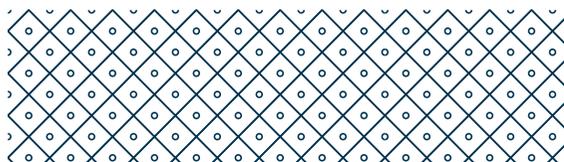
CZK 38,957,652



1 Jan. 2018 to 30 Jun. 2023

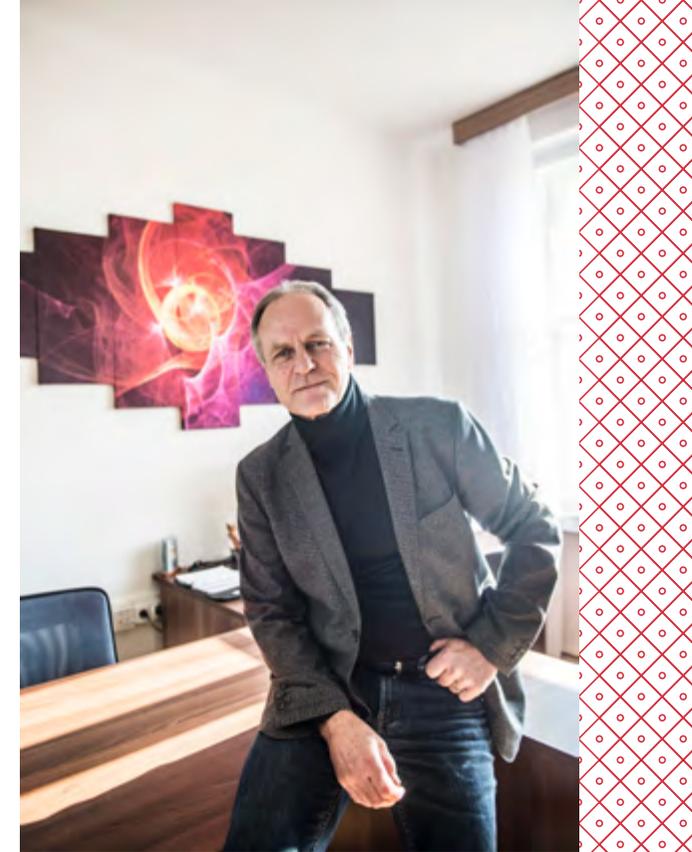


University Hospital Hradec Králové



# For safer nanomaterials

We appreciate the unique physical and chemical properties of nanomaterials, but we still don't know much about their negative effects. This is why scientists from the Faculty of Medicine in Hradec Králové, the University of Pardubice, and University Hospital Hradec Králové decided on the joint project **Strengthening Interdisciplinary Cooperation in the Research of Nanomaterials and in Studying their Effects on Living Organisms**. In this project, the University of Pardubice is dedicated to the development of new nanomaterials, surface modifications, and the biofunctionalization of nanomaterials and, together with our Faculty of Medicine in Hradec Králové, develops and modifies methods for determining the toxicity and biocompatibility of such modified substances. Hradec Králové scientists are evaluating risks in the area of cytotoxicity and genotoxicity, and the hospital is investigating the adverse effects on the functions of the immune system. Based on all of these findings, the scientists then created a panel of experimentally verified methods for testing the effect of nanomaterials on humans; they now make a set of methodologies available to all laboratory workplaces that show an interest in them.



## Faculty of Medicine in Hradec Králové



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CZK 115,906,987



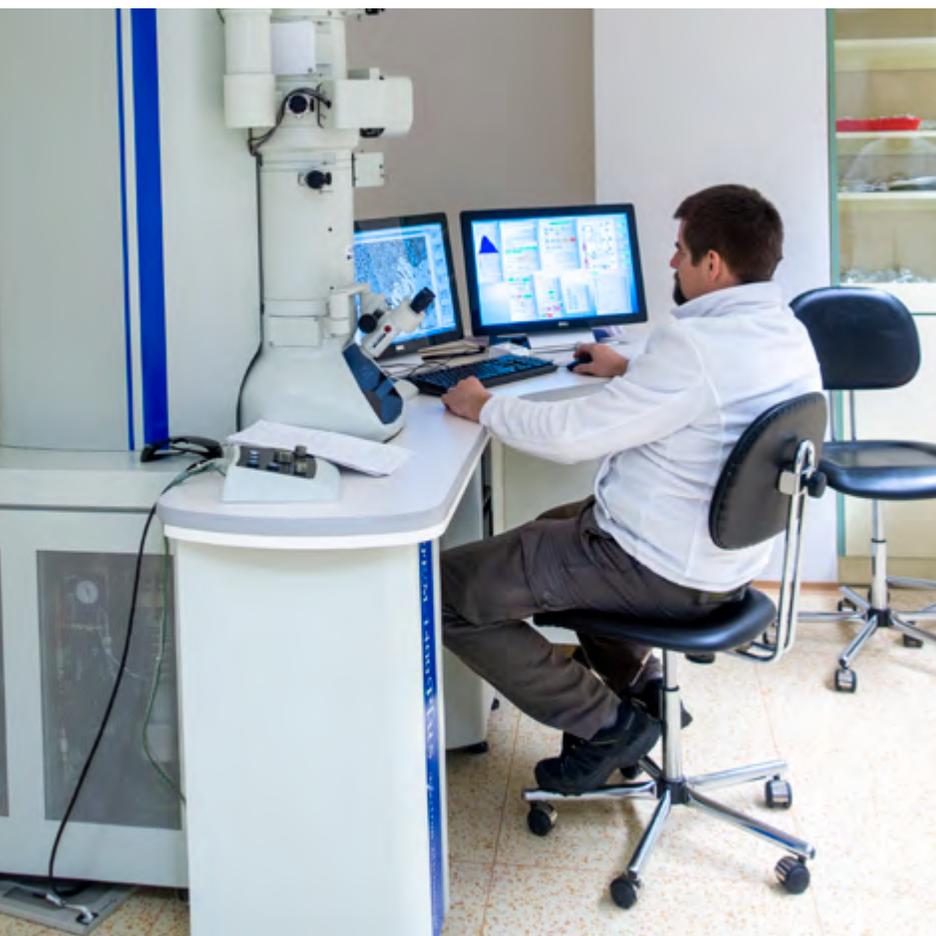
1 Mar. 2018 to 31 Aug. 2022



University of Pardubice

# Ultra-sensitive sensors and super sensors

Highly sensitive new sensors, composite mechanical stress sensors, or new low-density materials based on polymer nanocomposite materials and nanostructured polymer foams with low thermal conductivity for thermal insulation purposes – the industry cheers and claps! The development of these active and passive innovative materials took place thanks to the project **Sensors with High Sensitivity and Materials with Low Density Based on Polymer Nanocomposites NANOMAT**. Due to their exceptional properties, the developed materials will find use in the automotive, aviation, and defence industries, healthcare and others, where the most important thing is not the price of the material, but its extraordinary useful properties. And our Faculty of Medicine in Hradec Králové is an important link thanks to the transmission electron microscope, because it takes photos of nanomaterials and passes them on to the main partner.



## Faculty of Medicine in Hradec Králové



CZ.02.1.01/0.0/0.0/17\_048/0007376



CZK 69,347,328



1 Jul. 2018 to 30 Jun. 2023



University of Pardubice

# Living water for our future

The development and well-being of human society is based on soil fertility, plant growth, the purity and abundance of water, the drinking water supply, water retention in the landscape, climate regulation, and securing a food base. This seems to be something we have taken for granted, but now these ecosystem functions are at risk. The *SoWa Research Infrastructure*, which was created with the support of the project **Research on Key Soil-Water Ecosystem Interactions for the SoWa Research Infrastructure**, helps to improve basic ecosystem services, especially in the areas of recultivation, remediation and decontamination, provision of raw clean water for the production of drinking water, flood protection, use of land for sustainable agricultural and forestry production, and the protection of nature. We installed an experimental watershed (a globally unique combination of microcosms, mesocosms and an artificial watershed supplemented by long-term monitoring in natural watersheds) and created databases for data sharing and processing, restored the basic equipment and expanded it with modern equipment and instruments for monitoring physical-chemical, biochemical, and biological phenomena on all observed scales, from the microenvironment to the landscape level.



Faculty of Science, Charles University



CZ.02.1.01/0.0/0.0/16\_013/0001782



CZK 113,794,000



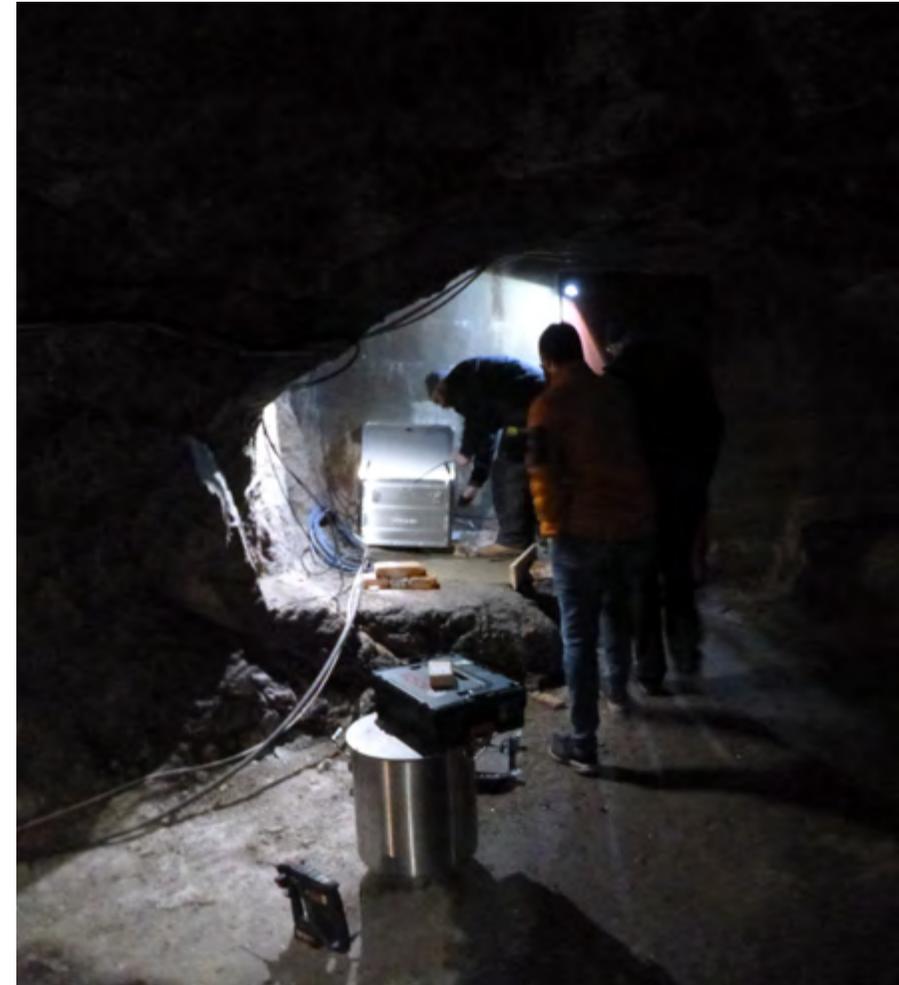
1 May 2017 to 30 Apr. 2020



Biology Centre of the Czech Academy of Sciences

# Earthquake protectors

The research infrastructure *CzechGeo/EPOS* is a comprehensive system of observing geophysical fields operated by seven geoscience institutions in the Czech Republic. This system is made up of permanent observatories mainly connected to worldwide networks, local stations, or networks of stations in selected areas. A part of the system is connecting current observations with geological and geophysical databases. The project **Distributed System of Observatory and Field Measurements for Geophysical Fields** completed and modernized the observatories and their networks and supported five research programmes. The modernization improved the quality of data in terms of accuracy and sensitivity and the spatial coverage of the area and significantly increased the number of stations with qualitatively better equipment and with online transmission to data centres. Some of the observations, data, and research results obtained by the project participants are of considerable social importance – they are used for the prevention of dangerous natural phenomena (West Bohemian earthquakes, natural CO<sub>2</sub> emissions, landslides), in oil prospecting (seismic wave propagation), for the sustainable use of geothermal energy (monitoring the character of micro-earthquakes), for monitoring anthropogenic pollution of the natural environment through soil magnetism, or for assessing the porosity and microstructure of the environment intended for the storage of hazardous waste.



## Faculty of Science, Charles University



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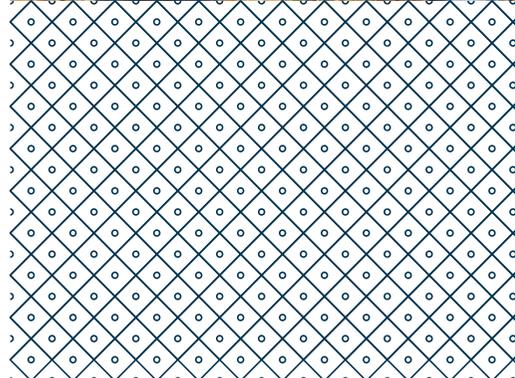
CZK 64,230,000



1 Apr. 2017 to 31 Jul. 2020



Institute of Geophysics  
of the Czech Academy of Sciences



# Mobility today and tomorrow – transportation for the future

What is your favourite mode of transportation? There is sure to be someone among you who loves trains (despite the fact that, here in the Czech Republic, they are sometimes a bit “delayed”). We bet that high-speed trains sound better already. High-speed lines are already operating in various European countries, and we want to join them. In order to connect to the network of high-speed lines (VRT) and thus use more efficient and faster train transport, we have to prepare for a lot of things. And the project **New Mobility – High-speed Transportation Systems and the Transport Behaviour of the Population** has helped us with this. Our part in this complex project was to identify factors that influence the adaptation of population movement in the case of new transportation technology and the development of extensive research work aimed at obtaining information on real changes in mobility behaviour after the opening of high-speed lines in various European countries and regions.

Faculty of Science,  
Charles University

Faculty of Social Sciences,  
Charles University



CZ.02.1.01/0.0/0.0/16\_026/0008430



CZK 88,150,794



1 Jul. 2018 to 31 Dec. 2022

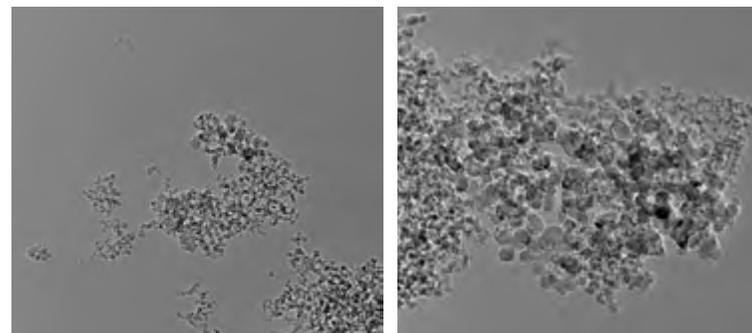


Masaryk University



# Protection of the environment and human health

Carbon is a unique element whose cycling between living and non-living components of planet Earth significantly affects the maintenance of a stable climate. Its different crystalline forms are well known, namely black graphite and the radiant diamond. But what do we imagine under the term "nanocarbon"? The unique properties of different types of nanocarbon, whether derived from graphite or diamonds with typical dimensions in the range of nanometres, are today absolutely essential for the development of modern technologies for energy storage, environmental protection, and human health. The research of these modern forms of carbon was the topic of the project **Carbon Allotropes with Rationalized Nanointerfaces and Nanojunctions for Environmental and Biomedical Applications**, in the framework of which, for example, supersensitive sensors for the detection of pollutants in the environment, intracellular thermometers, and drug carriers were developed. Among the major results of the project is the introduction of a unique method of nanodiamond production, which simulates the extreme conditions for the formation of a diamond using a controlled explosion. You just don't get bored with carbon!



Faculty of Mathematics and Physics,  
Charles University



CZ.02.1.01/0.0/0.0/16\_026/0008382



CZK 98,980,276



1 Oct. 2018 to 31 Dec. 2022



J. Heyrovský Institute of Physical Chemistry  
of the Czech Academy of Sciences

# A new field of science dealing with supercomputers

With the rapid development of high-performance supercomputers, which has been particularly evident during the last decade, computational methods are penetrating even such areas of science and technology where realistic calculations and simulations would not have been conceivable until recently. And so the field of High Performance Computing (HPC) was born and is developing just as rapidly. The certainly positive development in the field of HPC, however, places greater and greater demands on the sufficient supply of highly educated specialists in the field for the ever-increasing development in this field. And not only that, the deepening integration of often very different fields falling under HPC places additional demands on these specialists in terms of their broad outlook in various areas where HPC methods are increasingly penetrating. And that was the main goal of the project **Math-In-HPC.EDU: Doctoral School for Education in the Field of Mathematical Methods and Tools in HPC** as well as at its newly established doctoral school. To create conditions for the education of specialists who would never be surprised by the difficulties of the challenges that HPC sets before us.

Faculty of Mathematics  
and Physics, Charles University



CZ.02.2.69/0.0/0.0/16\_018/0002713



CZK 12,054,972



1 Sep. 2017 to 30 Sep. 2022

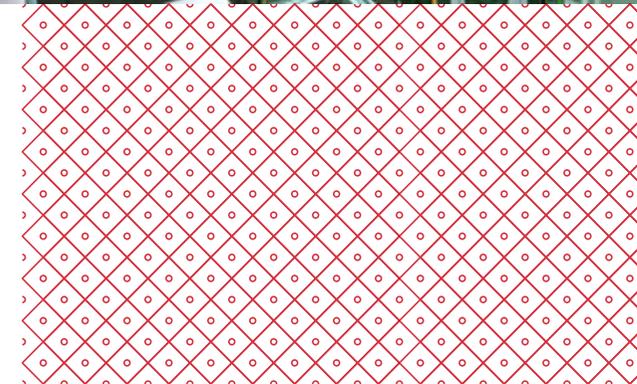
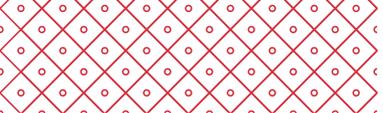


VSB – Technical University  
of Ostrava



Institute of Mathematics of the  
Czech Academy of Sciences





# Fair research on antiprotons and ions

We have building blocks, so let's build a castle. We can do that and know how to do that. How about looking at it from the opposite point of view. We have a castle made of blocks, and now we have to find out what kind of blocks. Let's make it a little harder. The castle that we have to dismantle and find out what it is made of was built by nature itself. In this task of ours, it is impossible to do it without complex experimental devices, with which scientists can observe those basic blocks. The smaller the building block, the more complex (and larger) the facility we will need to discover it. And one such facility is FAIR (Facility for Antiproton and Ion Research). FAIR is an international laboratory for antiproton and ion research, built in cooperation with partners from many countries. It is one of the world's largest projects for the construction of centres for top-notch international research. The core of FAIR's large research infrastructure is a world-unique particle accelerator with a circumference of 1,100 metres. Nine countries are directly involved in the project, and 3,000 scientists from 53 countries are planning their experiments there in the upcoming years, including the Czech Republic, which also supplies part of the technological equipment (as a part of the projects **FAIR - CZ - OP: Laboratory for Research with Antiprotons and Heavy Ions – Participation of the Czech Republic** and FAIR-CZ II). Data from the experiments will be collected and analysed in one of the most energy-efficient computer centres in the world, the core of which is the Green IT Cube supercomputer; specially adapted water cooling of the computer components will also be used.

## Faculty of Mathematics and Physics, Charles University



CZ.02.1.01/0.0/0.0/16\_013/0001677



CZK 27,943,000



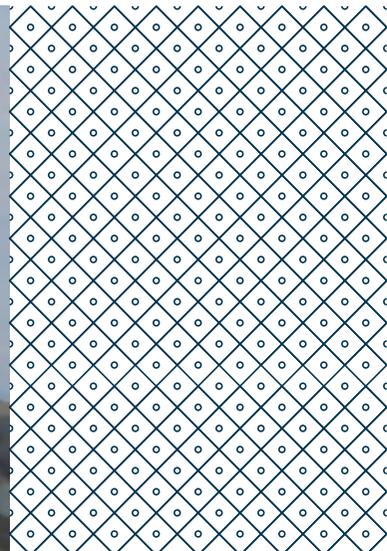
1 Nov. 2016 to 31 Mar. 2021



Nuclear Physics Institute  
of the Czech Academy of Sciences



Czech Technical University in Prague



# We want to answer the big questions

On the previous page, we read how we can find out what the world around us is made of, what the pieces of nature's building kit look like. We, therefore, present another helper for our discoveries: the Electron-Ion-Collider EIC built at the Brookhaven National Laboratory (BNL) in the United States, and we can be there thanks to the project **Brookhaven National Laboratory – Participation of the Czech Republic**. The science at the EIC is serious, current, and fundamental. The scientific questions to be answered by research at the EIC are fundamental to a complete understanding of atoms and are also an integral part of the nuclear physics agenda today. Research at the EIC can uniquely help address three fundamental questions about nucleons—neutrons and protons—and how they combine to form the nuclei of atoms. How is the mass of a nucleon created? How is the spin of a nucleon created? What are the essential properties of dense systems of gluons as a component of the structure of matter? These three high-priority scientific questions can be answered by research at the EIC with highly polarized electron and ion beams, with sufficiently high luminosity and sufficient and variable collision energy. There is great worldwide interest in physics at the EIC.



Faculty of Mathematics and Physics,  
Charles University



CZ.02.1.01/0.0/0.0/16\_013/0001569



CZK 19,595,277



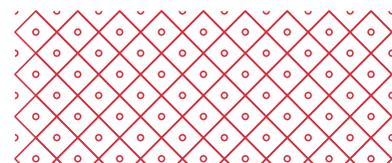
1 Jun. 2017 to 31 May 2020



Czech Technical University in Prague



Nuclear Physics Institute  
of the Czech Academy of Sciences



# Less stress, more happiness

A full-fledged education for all. We work on this constantly and try to improve not only the technical conditions in schools, but also help pupils with adaptation problems. In the project **School for All: Inclusion as a Path to the Effective Education for All Pupils**, we helped, from the position of partner, pupils from a socio-economically disadvantaged and culturally different environment who were starting school for the first time and pupils who were transitioning from first to second grade so that the changes meant as little stress as possible for them. Specially created individual transition plans also assisted them in this, where, for example, in the form of clubs or an older classmate "guide", the children learned to accept a new group of classmates and also found out what the organization of the day is and how to manage their school duties.

Faculty of Education,  
Charles University



CZ.02.3.61/0.0/0.0/15\_007/0000210



CZK 67,434,631



1 Aug. 2016 to 31 Jul. 2019

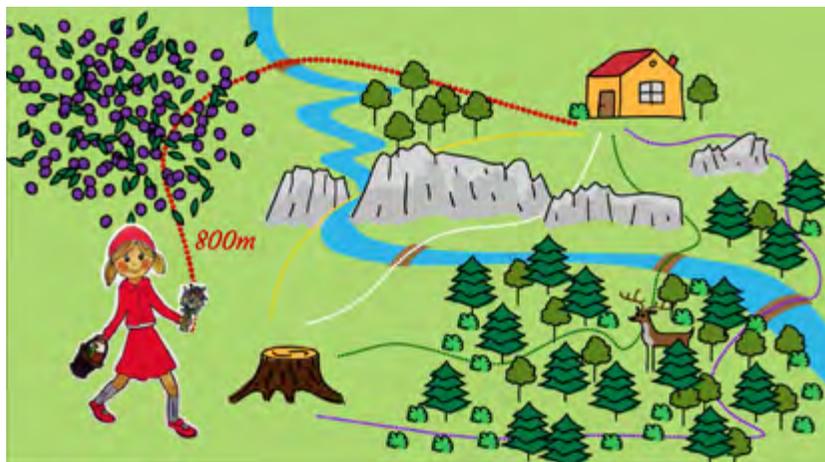


Jana Evangelista Purkyně  
University in Ústí nad Labem  
Czech Academy of Sciences



# What if we looked at things differently?

Do you also write your shopping list according to how the items are arranged in the store, so that you don't have to skip over the items on the list and so that you can easily pick out everything at once without jumping back and forth between the shelves and aisles? And then you choose a checkout that will have the least amount of waiting time? In that case, you are using computational thinking. Now imagine what you could do if you systematically learned computational thinking under professional guidance starting from the first grade! Thinking computationally means making smart decisions. Thanks to the project **Support for the Development of Computational Thinking**, countrywide online courses were held, electronic textbooks and educational materials for schools were created, as well as school educational programmes, so that we could include all of this in the curriculum for our children, and watch out: there is also an [iMyslení YouTube channel!](#) Wow! That's quite a long way from the shopping list, you see?



Faculty of Education, Charles University



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1 Oct. 2017 to 30 Nov. 2020



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