
CEITEC
Central European Institute of Technology
BRNO | CZECH REPUBLIC
ANNUAL
REPORT
2017

# Foreword

**Dear CEITEC Friends,**

During this last year we have been able to realize our achievements which were based on a foundation developed during the very early stages of CEITEC. Two key steps come to mind, the first being the development of a culture and support system which values international grants. CEITEC has been very successful as a recipient of both domestic and international grants, and 2017 is no exception - to name a few examples of very competitive European grants: FET-OPEN, ERC, first phase Teaming, and others. The second step is the continued dedication of our International Scientific Advisory Board (ISAB), and the willingness of the CEITEC community to embrace their recommendations. Each year our ISAB members spend several days in Brno, which provides the eyes, ears and wisdom of outside feedback to help us improve. The value of such input is several-fold: it fosters greater international connectivity, advises our scientists on how we can be more impactful, and has stimulated the recruitment of new group leaders. We are very happy that within this year, CEITEC has recruited and filled 8 new Group Leader positions, which is detailed within this report.

As we see the first of our PhD students graduating, it reminds us of the development of our alumni relations, and the legacy that CEITEC will have through those who have spent part of their research careers with us. Our goal is that the training and experience gained at CEITEC will serve those well, no-matter where their career takes them. Our ability to foster relations with other research institutes and universities throughout the world, and R&D intensive companies is vital to building a positive legacy.

Please find many of the 2017 highlights contained in this annual report, which we feel have contributed to a very successful year for CEITEC.

**Markus Dettenhofer**
**CEITEC Executive Director**

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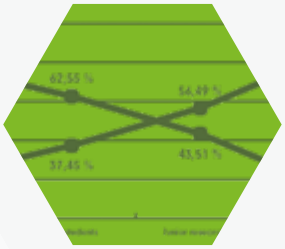


# Central European Institute of Technology (CEITEC)

In 2008, the Brno universities began preparations for a project which would concentrate high quality scientific teams under one label. The idea was born to create a critical mass of scientists and their teams, to encourage higher standards of research performance and PhD training, while encouraging interdisciplinary investigations in the fields of life and material sciences. The founders of this idea to join forces are Masaryk University, Brno University of Technology, Mendel University, University of Veterinary and Pharmaceutical Sciences Brno, Institute of Physics of Materials of the Czech Academy of Sciences and Veterinary Research Institute, which are all located in Brno.

Within each of these 6 institutions, locally embedded teams were chosen and affirmed through an international assessment. The teams which were deemed to have the competitive potential for research at European levels became part of the CEITEC project. The main initial financial resources came from the European Commission, with additional support from the Czech Ministry of Education, Youth and Sports, where CEITEC received 208 M € to found a Centre of Research Excellence. This grant allowed for the construction and development of new laboratory buildings within Masaryk University campus in Bohunice and within Brno University of Technology campus in Královo Pole, as well as the purchase of a vast array of state-of-the-art instrumentation. The project build-up phase of CEITEC was completed in 2015, and thus an institute was created with ultra modern laboratories which has also attracted new scientific talent to Brno.

Within the individual institutions participating in CEITEC, autonomous departments were established (CEITEC MU, CEITEC BUT, etc.) which are financially independent of the other CEITEC partners, but still operate under one brand, cooperate mutually on interdisciplinary subjects, and are linked to each other through the international CEITEC PhD School. Research activities within the area of life sciences includes structural biology, molecular medicine, research of plant systems, and brain and mind research.

In the fields of material sciences, CEITEC covers the area of nanotechnology, microtechnology and advanced material research. A concentration of scientific instrumentation is housed within 12 core facilities or laboratories equipped with the most advanced devices and technologies. These laboratories work as shared worksites, not only for all CEITEC scientists and researchers, but also within an Open Access system which allows access for external users as well.

CEITEC, despite its short existence, has managed to push the levels of its science to achieve greater impact, and has built on a solid foundation which has become visible within the European research landscape.

## HEADQUARTERS

Markus Dettenhofer, Executive Director
Jaroslav Koča, Scientific Director

## CEITEC MASARYK UNIVERSITY

Jiří Nantl, Director
Karel Říha, Deputy Director for Research

## CEITEC UNIVERSITY OF TECHNOLOGY

Radimír Vrba, Director
Pavel Krečmer, Deputy Director
Jiří Očadlík, Deputy Director for Innovation and Strategy
Radim Chmelík, Deputy Director for Science and Study Affairs

## CEITEC MENDEL UNIVERSITY IN BRNO

Vilém Reinöhl, Director

## CEITEC UNIVERSITY OF VETERINARY AND PHARMACEUTICAL SCIENCES BRNO

Jiří Smola, Director

## CEITEC INSTITUTE OF PHYSICS OF MATERIALS, CZECH ACADEMY OF SCIENCES

Luboš Náhlík, Director

## CEITEC VETERINARY RESEARCH INSTITUTE

Martin Anger, Director

# Science for Society at CEITEC

CEITEC is a centre focused on fundamental research often involving topics with high potential of future breakthrough application that contribute to the improvement of quality of life and human health. Here are some examples of cross-cutting themes where interdisciplinary research has social relevance:

## NATURE-INSPIRED MATERIALS AND NANOTECHNOLOGIES

Nature-inspired materials are synthetic materials whose structure, properties or function mimic those of natural materials or living matter. At CEITEC, researchers develop novel composite biomaterials that can induce the growth of connective tissue on the surface of implants and thus accelerate healing and improve the strength and biological stability of the implant tissue connection. An example is an invention of Lucy Vojtová's team, who have developed a unique degradable hydrogel that can effectively heal burns, can be used to fill the bones, or even help with the gradual release of drugs or chemotherapeutics and thus influence the treatment of cancerous growth.

## TECHNOLOGY INNOVATIONS IN BIOMEDICINE

Inventions in biomedicine can vastly improve healthcare worldwide. A unique method for the rapid diagnosis of methanol poisoning by determining levels of formic acid in blood serum, a new method which will help doctors to estimate how patients with chronic lymphocytic leukemia and B-cell lymphomas will react to the latest treatment or a new method for more precise surgical treatment of epilepsy based on very high-frequency oscillations. These are some of the innovations that have been launched by CEITEC researchers (teams of František Foret, Marek Mráz and Milan Brázdil respectively). And others are still to come. For example, the team of Petr Neugebauer is working on a revolutionary method of paramagnetic resonance, which could help complete the scanning of a patient and knowing the diagnosis in advance before the patient enters a surgery room.

## SUSTAINABLE AGRICULTURE AND HEALTHY FOOD

Mainly research programmes Genomics and Proteomics of Plant Systems and Molecular Veterinary Medicine aim to tackle the problem of food security in the face of climate change and other global changes. Research is focused, for example, on understanding the evolutionary-based strategies of plants. For instance, molecular mechanisms in plants are studied to identify the possibilities of crop engineering for better performance under limited nutrient and water availability. Other examples involve studies on causes, mechanisms and methods of spreading infectious animal diseases with a special focus on zoonoses, food-borne pathogens and hygiene and food safety of animal origin.

# Basic Overview

**6** partners

**7** research areas

**53** research groups

**25,000 m²** of modern laboratories

**12** core facilities

Member of
**EU–Life alliance**

## International Management

International mobility and a system of management are gained from experience of the best research institutes worldwide

### COORDINATION BOARD

The Coordination Board is composed of statutory representatives of partner institutions and external representatives from prominent Czech companies active in R&D and the best international research institutes

### INTERNATIONAL SCIENTIFIC ADVISORY BOARD

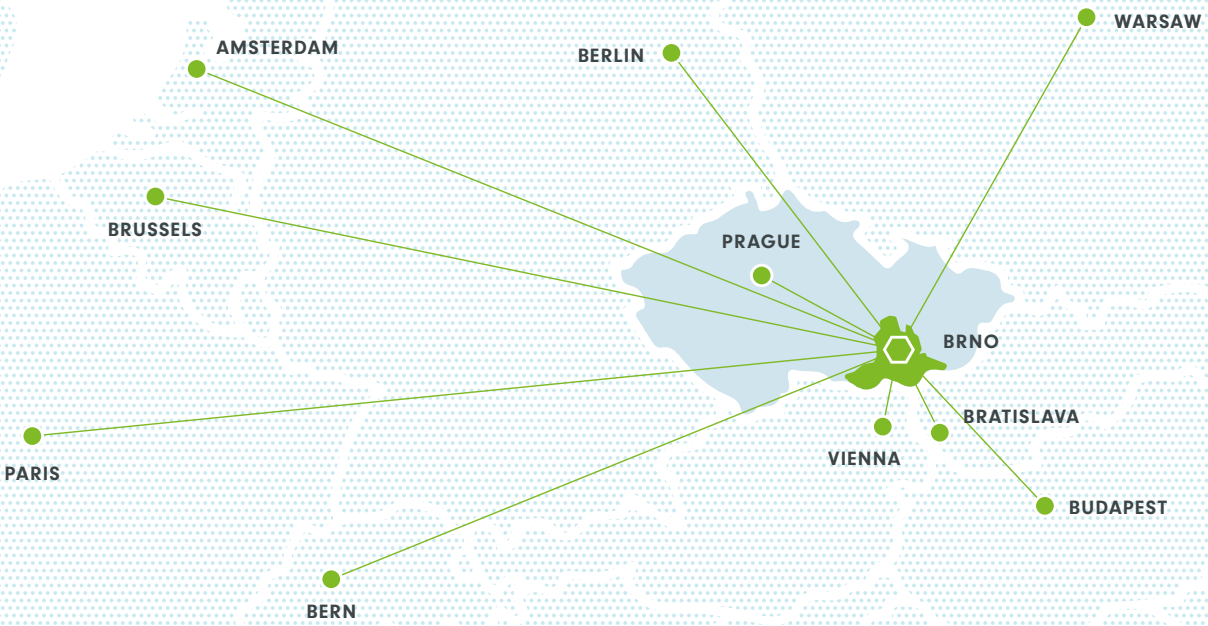
Members of ISAB are exclusively representatives of important international research institutes

### EVALUATION

Evaluations of the quality of research results are conducted by independent teams of prominent global experts in their respective fields

## Interdisciplinary cooperation

The combined knowledge and resources of the six participating institutions ensure the more efficient attainment of quality results and higher levels of involvement from the application sphere




# Benefits to the Region

- Improvement in student education – predominantly in graduate studies
- Research laboratories for nearly 600 scientists and more than 1200 students
- Creation of new innovative companies and attraction of domestic and international investors
- Creation of new jobs in the respective fields of research
- Attraction of foreign experts and respected Czech scientists to the area

**"CEITEC will signicantly contribute to a long-term increase in the competitiveness of Brno, the Region of South Moravia and the Czech Republic as a whole."**

**Markus Dettenhofer, Executive Director**

# Partner Institutions

MASARYK UNIVERSITY
www.muni.cz

MENDEL UNIVERSITY IN BRNO
www.mendelu.cz

UNIVERSITY OF VETERINARY AND PHARMACEUTICAL SCIENCES BRNO
www.vfu.cz

BRNO UNIVERSITY OF TECHNOLOGY
www.vutbr.cz

INSTITUTE OF PHYSICS OF MATERIALS AS CR
www.ipm.cz

VETERINARY RESEARCH INSTITUTE
www.vri.cz

# Financing

**Every institute has its own budget.**

**Total budget of consortium in 2017 was more than**

# € 45 mil.

# 2017 – A year in the life of CEITEC

## January

### SHARED TECHNOLOGIES AND INSTRUMENTATION AS A WAY TO JOINT SUCCESS / CEITEC MU AND VIENNA RESEARCH CENTRES OFFER JOINT SERVICES (RIAT-CZ)

The catalogue of services that will be jointly offered to corporations and academic institutions is being compiled by CEITEC Masaryk University in co-operation with the VBCF Research Institute of Vienna and three other partners. CEITEC MU has obtained financing for the pilot project that will enable more efficient use of the technological equipment, knowledge and experience in the field of life and materials sciences from Interreg AT-CZ, the programme supporting cross-border collaboration.

### CEITEC MU AND OTHER CZECH RESEARCH INSTITUTES HAVE JOINED A EUROPEAN INFRASTRUCTURE

The Czech Infrastructure for Integrative Structural Biology (CIISB) associating core facilities of research centres BIOCEV and CEITEC for the study of the structure of biomacromolecules became a full member of the European research infrastructure INSTRUCT in January. Thanks to this, CIISB has acquired direct access to users from the academic and industrial sphere of the European research area, to which they can now offer its services and expertise under the auspices of the European research infrastructure INSTRUCT.

JAN

## PROF. JAROSLAV POLÁK FROM CEITEC IPM AWARDED ERNST MACH MEDAL

Prof. Jaroslav Polák, member of Advanced Metallic Materials and Metal Based Composites Research Group, CEITEC IPM, was awarded the Ernst Mach Honorary Medal for merit in the physical sciences.
Prof. Jaroslav Polák is one of the leading scientists in the field of materials physics. His lifetime work has contributed significantly to the development of materials science, has influenced the world of science in this area and has achieved worldwide recognition in the field. His most important contribution to world of science material fatigue is experimental work and the development model illustrating the initiation of fatigue cracks in crystalline materials. On 19 January 2017 he received the Ernst Mach Honorary Medal for merit in the physical sciences from the President of the AS CR prof. Jiří Drahoš.

## CEITEC RESEARCHERS CONTRIBUTE TOIMI-FUNDED PROJECT FOR BETTER CARE OF PATIENTS WITH HEMATOLOGIC MALIGNANCIES

Prof. Sarka Pospisilova and her team from CEITEC-MU joined the public-private partnership with corporations such as NOVARTIS, CELGENE, AMGEN, JPNV– JANSSEN, BAYER, MENARINI and TAKEDA supported with an overall project budget of € 40 million.

# March

## HONORARY DEGREE FOR PROF. BAUMEISTER

German biochemist and expert on protein science and electron microscopy Wolfgang Baumeister, received an honorary doctorate from Masaryk University in March. The current director of the Max Planck Institute for Biochemistry in Martinsried accepted the award at the auditorium of the Faculty of Law from the hands of Karel Říha, deputy director for science of CEITEC MU.
Professor Baumeister received merit for the successful establishment of the laboratory of cryo-electron microscopy at CEITEC MU. This laboratory is a unique workplace with state-of-the-art technology in Central and Eastern Europe.

# April

## CEITEC MU RESEARCHERS AID SEARCH FOR SLEEPING SICKNESS CURE

The journal Science has published the results of a study examining new options for developing drugs against parasites of the Trypanosoma genus, which causes sleeping sickness and other diseases. Scientists from CEITEC MU were among the members of an international team to discover new ways of targeted treatment.

The protozoa of the Trypanosoma genus cause a number of serious diseases affecting both animals and humans including sleeping sickness and Chagas disease, which affect millions of people worldwide. The existing drugs have a number of serious side effects and often fail to kill all the parasites, thereby creating a risk of relapse. This is why new and more effective drugs are needed.

"Our part of the research consisted of understanding the structures and the minor differences between the trypanosomal and human homologous proteins by using NMR spectroscopy," says Konstantinos Tripsianes, the co-author of the study and leader of the Protein–DNA Interactions research group at CEITEC MU.

## SCIENTISTS FROM CEITEC BUT, IN COLLABORATION WITH KAROLINSKA INSTITUTET, CONTRIBUTED TO THE EXPLANATION OF THE MECHANISMS RESPONSIBLE FOR FACE FORMATION IN VERTEBRATES

With their expertise in X-ray computerized tomography, scientists from CEITEC BUT participated in common research with the Swedish Karolinska Institutet, which is involved in the development and formation of the face in vertebrates. The results of this long-term collaboration were published in the prestigious eLife magazine.

## ZLATY AMPER AWARD FOR LUDEK ZALUD'S ATEROS FROM CEITEC BUT

For the 25th year of the AMPER exhibition the traditional competition Zlatý Amper for the most beneficial exhibits of the fair.

29 competitive exhibits from 24 exhibiting companies were nominated for the competition. ATEROS – the autonomic robotic telepresence system, designed for the autonomous or human survey in inaccessible or dangerous areas represented by prof. Ludek Zalud from CEITEC BUT, was among the awarded projects.

# May

## MOJMÍR ŠOB FROM CEITEC MU WITH COLLEAGUES FROM THE INSTITUTE OF PHYSICS, CAS, NEWLY ASSESSED THE IMPACT OF IMPURITIES ON BRITTLENESS OF METALLIC MATERIALS

The team of scientists from CEITEC Masaryk University and from the Institute of Physics of the Academy of Science of the Czech Republic (AS CR) have completed an extensive critical overview of potential impacts of various impurities in iron, nickel and aluminium on material cohesion and its possible sudden failure. The article covering theoretical and experimental results of the Czech experts supplemented by available literature data was published in one of the most reputable journals in the field of materials science, Progress in Material Science.

## MAREK MRAZ AWARDED BY CZECH SOCIETY OF HAEMATOLOGY

Marek Mráz, an Associate Professor and CEITEC MU Group Leader, and his team have been recognized by the Czech Society of Haematology and awarded a special prize for a very significant discovery in haematology published by the team based in the Czech Republic.
The prize is for the best publication in 2016 which describes a method of regulating the level of an important therapeutic target in B cell malignancies, the so-called CD20 molecules (Pavlasova et al, Blood, 2016, IF:11).

MA

## 2nd ANNUAL USERS MEETING OF iNEXT ORGANISED BY CEITEC IN BRNO

The 2nd Annual iNEXT Users Meeting (AUM) was hosted by CEITEC MU, one of the 23 project partners, in Brno. The conference aimed to gather the iNEXT partners providing access to various techniques of integrative structural biology (NMR, EM, and X-ray crystallography) and scientists and users who have been using the equipment, technology, and expertise of the HORIZON 2020 funded iNEXT consortium. The meeting was organized by Prof. Vladimír Sklenář with a focus on strengthening contacts between iNEXT partners and users, both academic and industrial, and on facilitating European scientific collaboration on projects that target translational research.

## DIRECTOR OF CEITEC BUT SIGNED A DONATION AGREEMENT WITH RIGAKU, WHICH WILL ALLOW STUDY PLACEMENT OF CEITEC STUDENT IN JAPAN

Prof. Radim Vrba, Director of CEITEC BUT and Director of X-ray Research Laboratory, Dr. Kazuhiko Omote, signed a donation agreement to cover the cost of study placements of CEITEC BUT students at the Rigaku Company based in Tokyo, Japan. In 2017, 2018 and 2019, selected students will be able to engage in research and development of X-ray tomography and imaging software directly in Japan.

## June

### MARY O'CONNELL HAS BECOME A MEMBER OF EMBO

Recognised scientist Mary O'Connell, who has been working at CEITEC Masaryk University (MU) institute since November 2014, was recently elected a member of the European Molecular Biology Organization (EMBO). The organization includes more than 1700 of the best researchers in Europe and the world, and its aim is to support talented scientists as well as to improve the exchange of scientific information and to create a European research environment.

### NEUROLOGISTS FROM CEITEC MU EXAMINE SOME DISEASES AND THEIR CONNECTION WITH A NATIVE LANGUAGE

New possibilities for early detection and more accurate diagnoses of neurodegenerative diseases, such as Alzheimer's or Parkinson's disease, and verification of a tailor-made therapy are being examined by neurologists form CEITEC MU.

In cooperation with their colleagues from Hungary and the USA, using various methods of behavioural neurology, they examine brain activity in connection with speech and cognitive functions in various cultures, and the existence of the diseases in people speaking various languages. The research is being realised within the CoBeN project from H2020 programme.

### PROJECT AUTODRIVE, IN WHICH CEITEC BUT IS INVOLVED, HAS BEEN LAUNCHED

Project AutoDrive, financed by ECSEL Joint Undertaking under the Horizon 2020 research and innovation programme, launched its research activities. The aim of the project is the development of technologies for automated and automatic vehicles and their verification. Automated driving is a topic which increasingly interests the leading automotive industry companies. Moreover, in Europe, development and production in the automotive and electro-technical industries also have a leading competitive power. Prof. Pavel Václavek and his team at CEITEC BUT will focus mainly on the development of systems for the perception of the surroundings of the vehicle and the powertrain capable of driving even in the case of a defect.

## CEITEC BUT AND SOUTH KOREA'S GYEONGNAM TECHNOPARK SIGNED A MEMORANDUM TO DEVELOP FURTHER COOPERATION

Director of CEITEC BUT Radimir Vrba, and CEO of South Korea's Gyeongnam Technopark Lee Tae-sung, signed a Memorandum of Understanding on 27 July 2017 to ensure increased level of cooperation on advanced materials and nanotechnologies.

## CEITEC INTERNATIONAL CONFERENCE – NUCLEIC ACIDS AND IMMUNITY 2017

The second conference on Nucleic Acids and Immunity organised by Mary O'Connell and Liam Keegan was successfully organised for the second time in Brno. The conference hosted over one hundred participants with approximately twenty leading researchers from the field of RNA research and immunity. The highlight of the conference was the keynote talk by Shizuo Akira. He is the most cited living author in the field of biology. He actively participated in all three days of the conference and many of the attendees were delighted to have the opportunity to interact with such an eminent figure in science. The overall atmosphere was very positive, friendly and full of new ideas.

## MAREK MRAZ FROM CEITEC MU NAMED MEMBER OF EHA

Marek Mráz from CEITEC was named a member of Early Career Committee of European Hematology Association. The Committee is an advisory body of the most important professional hematological association in Europe, has six members and aims to promote the involvement of young scientists and hematologists in the European Hematology Association and its annual congress.

# August

## TWO NEW RESEARCH GROUPS WILL BRING INTERNATIONAL EXPERIENCE TO CEITEC MU

Two new research groups were established at CEITEC MU in July. They will deal with the research area leading to more accurate diagnosis and better focused therapy not only for neoplastic diseases but also for other illnesses. Both newly appointed leaders, **Michal Šmída** and **Robert Vácha**, are bringing to CEITEC long-standing experience from acknowledged European research institutes, and they both have been chosen on the grounds of their results so-far gained in their fields of research.

**Michal Šmída** came to CEITEC from the Centre of Molecular Medicine (CeMM) at the Austrian Academy of Science in Vienna. He explains his reasons why he preferred CEITEC to other institutes: "I had been planning my return to the Czech Republic and I got really impressed by CEITEC. I am happy that I can pursue my scientific career just in Brno and CEITEC offers excellent equipment and state-of-the-art conditions for my research".

**Robert Vácha**, who came to CEITEC from the University of Cambridge (England) and from the Lund University (Sweden), focuses on the interaction of proteins and lipid membranes. These interactions play a key role in cellular signalling, transport, and protection. Using computer modelling, **Robert Vácha** examines how the mutations of proteins and composition of membranes affect the behaviour of cells.

## CEITEC MU TO HELP RESEARCH OPEN UP TO SOCIETY IN NEW EU PROJECT

ORION is a new collaborative European project to explore ways in which research and funding organizations in life sciences and biomedicine can open up the way they fund, organize and do research. CEITEC is one of the nine partners in the project.

Open science is a core strategy of the European Commission that involves widening participation and collaboration as well as sharing research processes and outcomes to improve research and innovation. All European Union members recognise the benefits of open science, but the transition to "openness" is challenging.

Project webpage: www.orion-openscience.eu

## PROFESSOR VOJTECH ADAM IS THE NEW HOLDER OF THE ERC GRANT AT CEITEC BUT

Vojtech Adam, with an ERC Grant support of 1.3 million euros, will focus with his research team on the research of a protein called metallothionein, which has the ability to bind metals. He believes that this protein is one of the key factors in preventing the emergence of resistance to cancer treatment with metal-based medicines. Confirmation of this fact could contribute to the more effective treatment of cancer in the future.

## DAVID SALAMON FROM CEITEC BUT RECEIVED THE ECERS YOUNG SCIENTISTS AWARD

The European Ceramics Society (ECerS) is a non-profit federation of national ceramic companies associating their individual members. Every two years, the Young Scientist Award is awarded to scientists under the age of 40 who have made significant contributions to ceramics research. The condition for inclusion in the competition is, among other things, membership in a national ceramic organization that has been affiliated with the European Ceramic Society for at least two years.

## THE NEWLY DISCOVERED FUNCTION OF HAKAI PROTEIN IN PLANTS CAN HELP WITH CANCER RESEARCH

Kamil Ruzicka and his team from CEITEC MU have found that the protein complex is evolutionarily very well conserved in a variety of organisms – from unicellular to human, suggesting that it has great importance for the functioning of organisms.

# September

## ONDŘEJ JURČEK AWARDED ALFRED BADER PRIZE

Ondřej Jurček from CEITEC MU has been awarded the Alfred Bader Prize for an outstanding contribution to the development of Organic Chemistry.
Prizes for young Czech Organic and Bio-organic chemists are established by A. Bader. Alfred Bader, well-known chemist, self-made millionaire, founder of Aldrich, philanthropist and collector of Flemish masters.

## JOINT RETREAT OF YOUNG SCIENTISTS FROM CEITEC, IC AND IP

A joint retreat of young scientists from CEITEC, Institut Curie and Institut Pasteur took place in Brno in September. Enjoy a few photos from this great event, which brought together more than 100 young scientists.

## A YOUNG TECHNICIAN FROM CEITEC BUT WON THE INTERNATIONAL POSTER COMPETITION

Markéta Tesařová is still studying a Master's degree in Physical Engineering and at the BUT, but is already gaining success in the scientific field. At the beginning of September in Varenna, Italy, she managed to succeed at the "International Workshop of Imaging" in the competition of more than 80 participants and 30 posters. "The poster presented the X-ray computed tomography method as a suitable tool for imaging biological samples in 3D with a focus on quantitative cellular analysis," said Tesarova, who is already working as a microscopy technician at CEITEC.

# October

## CEITEC MU SCIENTISTS HAVE DISCOVERED HOW CELLS RECOGNISE THE END OF THE GENES

Scientists from CEITEC Masaryk University (MU) studied how the cell recognises the end of the genes during transcription of genetic information. The scientists have discovered what structure of the molecules is responsible for finding the right end of the genes. Thanks to this discovery, they can better understand the functioning of the transcription of the genetic information as well as the influence of this process on e.g. the development of some diseases. Their findings have been published in Proceedings of the National Academy of Sciences. This research was financed in part through a European Research Council (ERC) grant received by Richard Štefl two years ago.

## IVAN REKTOR AWARDED THE TITLE AMBASSADOR FOR EPILEPSY

Ivan Rektor from CEITEC MU was awarded with the title Ambassador for Epilepsy, the highest award of the International League Against Epilepsy. The ILAE is the world's preeminent association of physicians and other health professionals working in the field of epilepsy. The ILAE was founded in 1909, it is a federation of 114 national epilepsy organizations representing a vast majority of the world's population. Ivan Rektor is the third Czech holder of the highest award of the ILAE since the establishment of the Czech League Against Epilepsy in 1938.

## TEAM OF SCIENTISTS FROM BRNO, LED BY MILAN BRAZDIL FROM CEITEC MU, DEVELOPED A NEW METHOD FOR MORE PRECISE SURGICAL TREATMENT OF EPILEPSY

In some instances, drug-resistant epilepsy can be treated surgically. This requires precise identification of the seizure onset zone, so that the surgery is effective and the surrounding brain structures are left intact. Localisation is often done using electrophysiological data (widely known as EEG) from electrodes placed on the head surface and for better resolution, even implanted deeply into the brain – a method called stereo-EEG, which records activity in the deep brain structures.
The international team analyzed frequencies of the biosignals recorded from stereo-EEG in-between epileptic seizures. Using more sensitive recordings and a novel analysis, they identified very high-frequency oscillations (frequencies higher than 1kH), which are more specific to the epileptogenic zone than relatively widely-used high frequency oscillations. This finding may lead to better identification of the origin of epileptic discharges and in turn to better surgery outcomes in patients with drug-resistant epilepsy. The team of Milan Brazdil published these results in the journal Annals of Neurology 2017.

## MEETING OF ISAB IN 2017

The ISAB meeting in 2017 took place on 24th and 25th October. During Tuesday morning, ISAB members were given an overview of news, successes and challenges of CEITEC as a whole, as well as of each Research Area and the Core Facilities. A detailed description of the CEITEC PhD School followed. Then the ISAB members had the opportunity to talk to Group Leaders, Postdocs and PhD students, and to visit the Core Facilities in the afternoon during the on-site visits. Furthermore, the ISAB members helped to evaluate five junior Group Leaders at CEITEC MU and to identify top candidates for the position of Junior Group Leaders at CEITEC BUT.

On Wednesday, the ISAB members had a joint meeting with the Coordination Board where they reported their views on the progress CEITEC has undergone since last year.

The report from this year's ISAB meeting should help CEITEC to prepare for Common Evaluation of Scientific Excellence 2018.

## INTERNATIONAL SCIENTIFIC ADVISORY BOARD (ISAB)

The ISAB is the highest scientific advisory body which helps CEITEC with regard to improvement of our scientific impact, conditions for performing research, and training the next generation of scientists. The ISAB meets in Brno every year.

**MEMBERS**

**Prof. Gustaaf Borghs** – IMEC, Katholieke Universiteit Leuven, Belgium – for Research Area (RA) Advanced Nano and Microtechnologies

**Prof. Robert Liska** – Institute of Applied Synthetic Chemistry, TU Wien, Austria – for RA Advanced Materials

**Prof. Michael Sattler** – Technische Universität München, Germany – for RA Structural Biology

**Prof. Dirk Inzé** – Flanders Institute for Biotechnology, Gent, Belgium – for RA Genomics and Proteomics of Plant Systems

**Prof. Christoph M. Michel** – University Medical School, Geneva, Switzerland – or RA Molecular Medicine

**Prof. Witold Filipowicz** – Friedrich Miescher Institute for Biomedical Research, Basel, Switzerland – for RA Brain and Mind Research

**Prof. Heiner Niemann** – Friedrich-Loeffler Institute, Greifswald, Germany – for RA Molecular Veterinary Medicine

## November

### ZDENĚK FARKA FIRST PHD GRADUATE FROM CEITEC LIFE SCIENCES PHD SCHOOL

Zdeněk Farka is the very first PhD GRADUAATE from the CEITEC Life Sciences PhD School. Zdeněk defended the thesis "Bioelectronic interfaces studied with scanning probe microscopy" and recently in the call of the Technology Agency of Czech Republic under the ZETA programme and became the main investigator of the project "Immunoassay for rapid diagnostics of European foulbrood" for the period from September 2017 till March 2019. After completing this project, he plans to travel abroad for postdoc.

NOV

# Research Groups

## ADVANCED NANOTECHNOLOGIES AND MICROTECHNOLOGIES

**1-1 Functional Properties of Nanostructures**
RG leader: Josef Humlíček

**1-2 Smart Nanodevices**
RG leader: Jaromír Hubálek

**1-3 Experimental Biophotonics**
RG leader: Radim Chmelík

**1-4 Fabrication and Characterisation of Nanostructures**
RG leader: Tomáš Šikola

**1-5 Development of Methods for Analysis and Measuring**
RG leader: Petr Klapetek

**1-6 Materials Characterization and Advanced Coatings**
RG leader: Jozef Kaiser

**1-7 Plasma Technologies**
RG leader: Lenka Zajíčková

**1-8 Synthesis and Analysis of Nanostructures**
RG leader: Jiří Pinkas

**1-9 Multiscale Modelling and Measurements of Physical Properties**
RG leader: Roman Gröger

## ADVANCED MATERIALS

**2-1 Advanced Ceramic Materials**

RG leader: Martin Trunec

**2-2 Cybernetics in Material Science**

RG leader: Pavel Václavek

**2-3 Advanced Polymers and Composites**

RG leader: Josef Jančář

**2-4 Advanced Metallic Materials and Metal Based Composites**

RG leader: Jan Klusák

## STRUCTURAL BIOLOGY

**3-1 Glycobiochemistry**
RG leader: Michaela Wimmerová

**3-2 RNA Quality Control**
RG leader: Štěpánka Vaňáčová

**3-3 Nanobiotechnology**
RG leader: Petr Skládal

**3-4 RNA-based Regulation of Gene Expression**
RG leader: Peter Lukavsky

**3-5 Structural Biology of Gene Regulation**
RG leader: Richard Štefl

**3-6 Structural Virology**
RG leader: Pavel Plevka

**3-7 Structure and Dynamics of Nucleic Acids**
RG leader: Jiří Šponer

**3-8 Structure and Interaction of Biomolecules at Surfaces**
RG leader: Miroslav Fojta

**3-9 Computational Chemistry**
RG leader: Jaroslav Koča

**3-10 Structure of Biosystems and Molecular Materials**
RG leader: Radek Marek

**3-11 Non-Coding Genome**
RG leader: Lukáš Trantírek

**3-12 Protein Structure and Dynamics**
RG leader: Lukáš Žídek

**3-13 Protein-DNA Interactions**
RG leader: Konstantinos Tripsianes

**3-14 Interaction Protein-Protein and Protein-Membrane**
RG leader: Robert Vácha

# GENOMICS AND PROTEOMICS OF PLANT SYSTEMS

**4-1 Bioanalytical Instrumentation**
RG leader: František Foret

**4-2 Plant Cytogenomics**
RG leader: Martin Lysák

**4-3 Functional Genomics and Proteomics of Plants**
RG leader: Jan Hejátko

**4-4 Hormonal Crosstalk in Plant Development**
RG leader: Hélene Robert Boisivon

**4-5 Proteomics**
RG leader: Zbyněk Zdráhal

**4-6 Developmental and Cell Biology of Plants**
RG leader: Tomasz Nodzynski

**4-7 Chromatin Molecular Complexes**
RG leader: Jiří Fajkus

**4-8 Developmental and Production Biology – Omics Approaches**
RG leader: Břetislav Brzobohatý

**4-9 Plant Stress Signalling and Adaptation**
RG leader: Vanesa Beatriz Tognetti

**4-10 Plant Molecular Biology**
RG leader: Karel Říha

## MOLECULAR MEDICINE

**5-1 Medical Genomics**
RG leader: Šárka Pospíšilová

**5-2 Molecular Oncology II – Solid Cancer**
RG leader: Ondřej Slabý

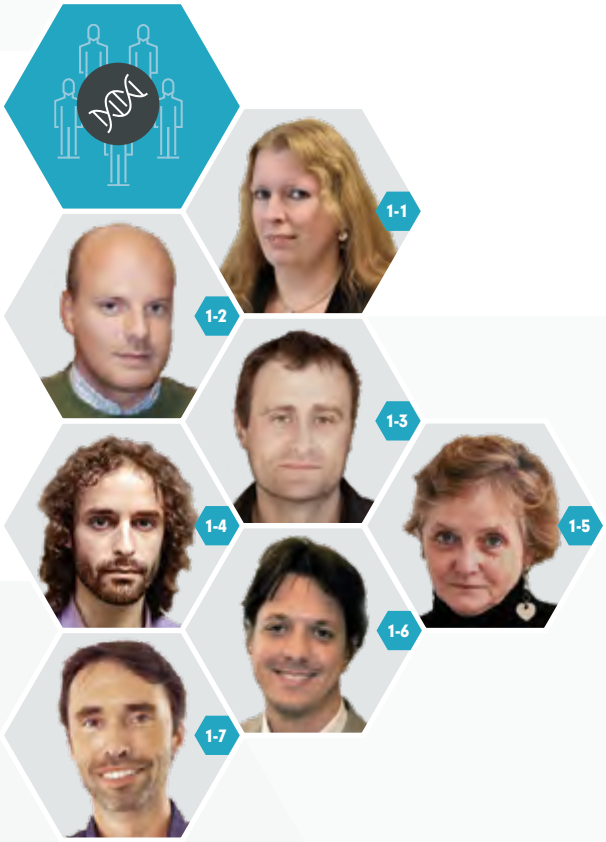
**5-3 Inherited Diseases II – Transcriptional Regulation**
RG leader: Dalibor Blažek

**5-4 Adaptive Immunity Group**
RG leader: Dmitriy Chudakov

**5-5 ERA Chair – RNA and Immunity**
RG leader: Mary O'Connell

**5-6 Microenvironment of Immune Cells**
RG leader: Marek Mráz

**5-7 Functional Genomics**
RG leader: Michal Šmída



## BRAIN AND MIND RESEARCH

**6-1 Multi-modal and Functional Neuroimaging**
RG leader: Ivan Rektor

**6-2 Behavioural and Social Neuroscience**
RG leader: Milan Brázdil

**6-3 Applied Neuroscience**
RG leader: Irena Rektorová


## MOLECULAR VETERINARY MEDICINE

**7-1 Molecular Microbiology**
RG leader: Alois Čížek

**7-2 Zoonoses**
RG leader: Břetislav Koudela

**7-3 Orthopaedics and Surgery**
RG leader: Pavel Proks

**7-4 Animal Immunogenomics**
RG leader: Petr Hořín

**7-5 Animal Cytogenomics**
RG leader: Jiří Rubeš

**7-6 Mammalian Reproduction**
RG leader: Martin Anger

# Selected data about CEITEC Employees

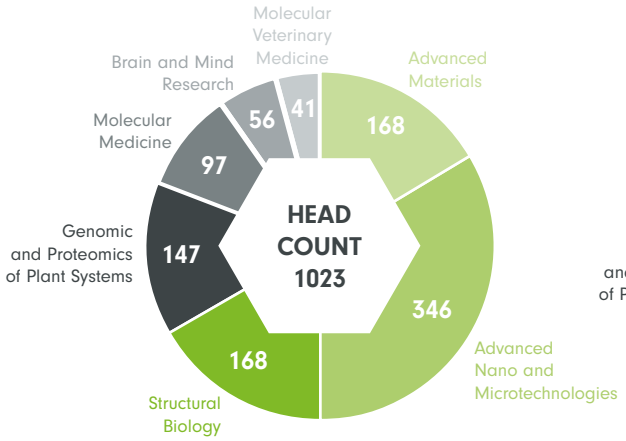
## CEITEC GROWTH AND INTERNATIONALIZATION

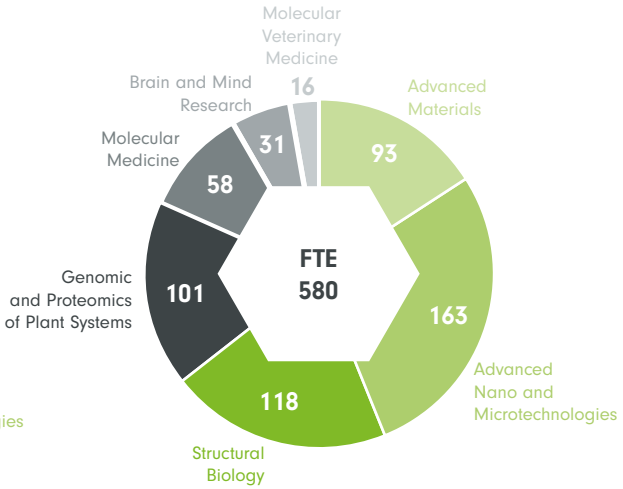
### NUMBERS OF RESEARCH STAFF ACCORDING TO RESEARCH AREA*

| RESEARCH AREA | HEAD COUNT | FTE | WOMEN HC | MEN HC |
|---|---|---|---|---|
| Advanced Materials | 168 | 93 | 30 | 138 |
| Advanced Nano and Microtechnologies | 346 | 163 | 89 | 255 |
| Structural Biology | 168 | 118 | 63 | 105 |
| Genomic and Proteomics of Plant Systems | 147 | 101 | 72 | 75 |
| Molecular Medicine | 97 | 58 | 46 | 52 |
| Brain and Mind Research | 56 | 31 | 28 | 28 |
| Molecular Veterinary Medicine | 41 | 16 | 19 | 23 |

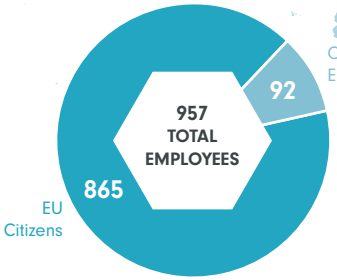
* Recalculated data valid for 2017

HC Head Count FTE Full-time Equivalent



## RESEARCH POSITIONS AND NATIONALITY*

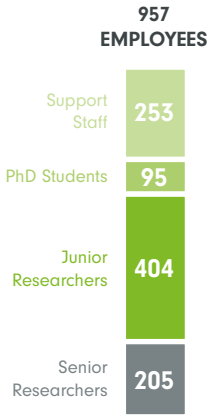


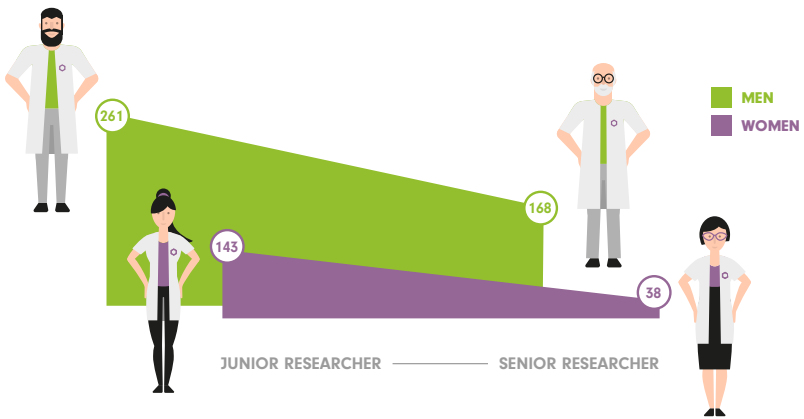




* Data valid as of June 30, 2017

## RESEARCH POSITIONS AND GENDER*




* Data valid as of June 30, 2017

# New People in 2017

An international call for the position of head of a bioinformatics group was opened on the basis of the CEITEC MU strategic decision. The junior scientist Panagiotis Alexiou, from University of Pennsylvania, will start work for CEITEC MU, in 2018. This group is focused on research in the field of New Generation Sequencing and is closely linked to the emergence of a new shared lab that will provide this flagship technology inside and outside the institute, which has a significant integration potential for Life Sciences for both CEITEC and Masaryk University.

Two additional research groups were formed at CEITEC MU, through an open call for new Group Leaders from the current staff of CEITEC MU. Michal Smida and Rober Vacha were selected as the new heads of research groups.

## MICHAL ŠMÍDA – NEW LEADER OF FUNCTIONAL GENOMICS RESEARCH GROUP

**Michal Šmída** came to CEITEC from the Centre of Molecular Medicine (CeMM) at the Austrian Academy of Science in Vienna. He explains his reasons why he preferred CEITEC to other institutes: "I had been planning my return to the Czech Republic and I got really impressed by CEITEC. I am happy that I can pursue my scientific career just in Brno and CEITEC offers excellent equipment and state-of-the-art conditions for my research". At CEITEC, Michal Šmída will deal with the identification of new possibilities focusing on the therapy of neoplastic diseases, primarily B-cell malignities such as Chronic Lymphotic Leukemia (CLL). Nowadays, CLL represents in western countries the most frequent neoplastic disease of white corpuscles (B-lymphocytes) which are accumulated in blood, bone marrow, lymph nodes and other organs. The research group, led by Michal Šmída, will also develop new cell models which might be used in clinical practice and lead to personalised medicine tailored to specific needs of individual patients with a particular mutation.

## ROBERT VÁCHA – LEADER OF INTERACTION PROTEIN-PROTEIN AND PROTEIN-MEMBRANE RESEARCH GROUP

**Robert Vácha**, who came to CEITEC from the University of Cambridge (England) and from the Lund University (Sweden), focuses on the interaction of proteins and lipid membranes. These interactions play a key role in cellular signalling, transport, and protection. Using computer modelling, Robert Vácha examines how the mutations of proteins and composition of membranes affect the behaviour of cells. Changes in this behaviour cause many diseases ranging from cancer and Alzheimer's disease to aging and poor diet. Robert Vácha, explains: "Molecular understanding of protein-membrane interactions will help us to develop new peptides suitable for treatment of these serious diseases".

During opening new job positions, CEITEC MU management focuses on the topic of personalised medicine and sustainable agriculture to increase competitiveness on a European scale.
The management plans to open an international selection procedure for one junior research group every year. Jiří Nantl, Director of CEITEC MU, explains the procedure: "The management focuses on candidates with good prospects standing at the outset of their own scientific career. After 4 years, these new group leaders will be evaluated based on their scientific performance to determine whether further support will be continued and expanded."

## NEW TECHNOLOGY TRANSFER MANAGER AT CEITEC MU

**Pavel Kerchev** joined CEITEC MU in the middle of September as a Technology Transfer Manager anchored in the Strategy and Science Department. It is a newly established position within CEITEC MU to support technology transfer activities with a special focus on industry cooperation. Pavel's main role is to monitor and identify research results with a potential for commercialization and/or of interests for industrial partners. Pavel has spent the last five years as a postdoc at VIB Center for Plant Systems Biology, Belgium.

## NEW DEPUTY DIRECTOR FOR INNOVATION STRATEGY AT CEITEC BUT

**Dr. Jiří Očadlík** joined CEITEC BUT in October 2017 as Deputy Director for Innovation Strategy.

In the past he held leading positions in companies such as Tesla Brno s., Delmi s.r.o. and Philips Electron Optics CR s.r.o. Since 2000 he has been CEO of the Brno branch of FEI Czech Republic s.r.o. (now Thermo Fisher Scientific).

## NEW RESEARCH GROUP LEADERS AT CEITEC BUT

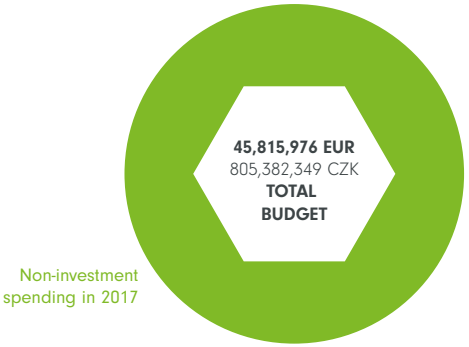
In the second half of the year there was an international selection procedure for new Research Group Leaders at CEITEC BUT. Under this procedure and ISAB Recommendation four research groups were created. One new Research Group Leader is, for example, holder of ERC Grant **Peter Neugebauer**, and the aim of the Magneto-Optical and THz Spectroscopy is to establish the first modern group in Central Europe with a focus on the development of this method and its applications in the material and living sciences and also to develop a universal broadband spectrometer.

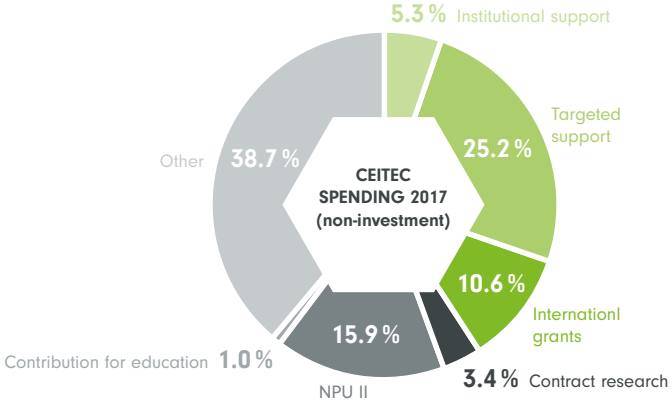
**Vojtěch Uhlíř**'s Nanomagnetism and Spintronics Group aims to clarify the influence of spatial constraints on magnetic and electronic phase transitions in nanomagnets and heterostructures of functional materials, the study of dynamic behaviour of magnetic nanostructures induced by a magnetic field, electric field, electric current, controlled deformation, and temperature gradient. Molecular nanostructures at surfaces will be dealt with by **Jan Čechal** and his team. The scientific focus of the group combines two topical themes: molecular self-organization and graphene.

**Jan Macák**, who is also an ERC holder, is working with his Advanced Low-Dimensional Nanomaterials Group on research into the synthesis of new low-dimensional structures such as nanotubes, nanolayers, nanofibers, in various ways. It also includes the necessary investigation of the relationship between the structure and the properties of these materials.

CEITEC BUT also have the first research groups with international group leaders. **Hermann Detz** – Functional Layers and Nanostructures and **Andreas W. Schell** – Quantum Optical Technology.

# Budget Overview



## CEITEC SPENDING 2017 (NON-INVESTMENT) IN CZK (EXCHANGE RATE: 1 EUR = 25 CZK)

| PARTNER | CMS | MU | BUT | MENDELU | VFU | VRI | IPM | TOTAL |
|---|---|---|---|---|---|---|---|---|
| Institutional support | 4,500,000 | 28,682,510 | 19,621,463 | 2,847,591 | 2,824,718 | 2,615,986 | 0 | **61,092,268** |
| Targeted support | 0 | 168,346,992 | 108,162,208 | 2,132,235 | 0 | 7,174,003 | 2,785,000 | **288,600,438** |
| Internationl grants | 345,824 | 78,012,030 | 29,901,030 | 6,689,633 | 0 | 2,796,330 | 3,315,000 | **121,059,847** |
| Contract research | 0 | 8,571,881 | 23,505,900 | 51,300 | 4,288,598 | 219,985 | 1,800,000 | **38,437,664** |
| NPU II | 5,898,817 | 105,567,564 | 57,084,405 | 5,332,407 | 1,561,452 | 2,069,846 | 4,100,000 | **181,614,491** |
| Contribution for education | 840,000 | 0 | 8,919,334 | 0 | 2,016,216 | 0 | 0 | **11,775,550** |
| Other | 3,480,429 | 82,133,237 | 14,167,377 | 1,972,321 | 1,048,727 | 0 | 0 | **102,802,091** |
| **Total** | **15,065,070** | **471,314,214** | **261,361,717** | **19,025,487** | **11,739,711** | **14,876,150** | **12,000,000** | **805,382,349** |

## CEITEC SPENDING 2017 (NON-INVESTMENT) IN EUR

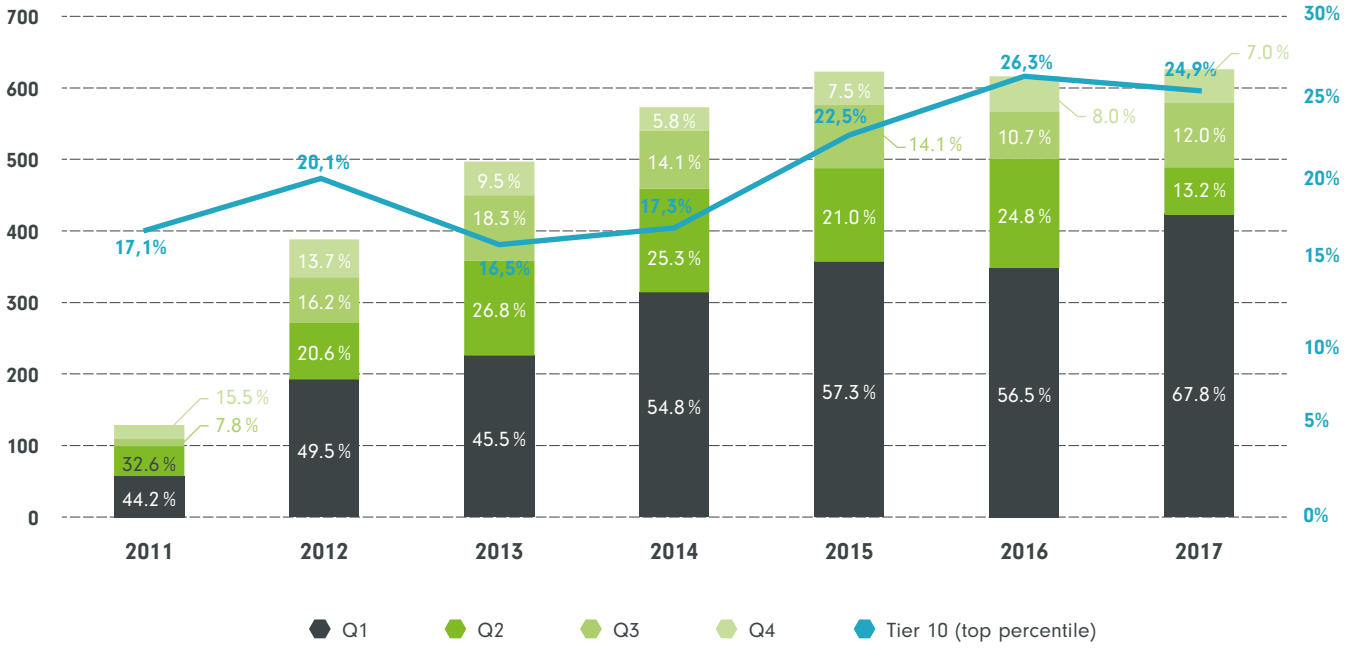
| PARTNER | CMS | MU | BUT | MENDELU | VFU | VRI | IPM | TOTAL |
|---|---|---|---|---|---|---|---|---|
| Institutional support | 180,000 | 1,147,300 | 784,859 | 113,904 | 112,989 | 104,639 | 0 | **2,443,691** |
| Targeted support | 0 | 6,733,880 | 4,326,488 | 85,289 | 0 | 286,960 | 111,400 | **11,544,018** |
| Internationl grants | 13,833 | 3,120,481 | 1,196,041 | 267,585 | 0 | 111,853 | 132,600 | **4,842,394** |
| Contract research | 0 | 342,875 | 940,236 | 2,052 | 171,544 | 8,799 | 72,000 | **1,537,507** |
| NPU II | 235,953 | 4,222,703 | 2,283,376 | 213,296 | 62,458 | 82,794 | 164,000 | **7,264,580** |
| Contribution for education | 33,600 | 0 | 356,773 | 0 | 80,649 | 0 | 0 | **471,022** |
| Other | 139,217 | 3,285,329 | 566,695 | 78,893 | 41,949 | 0 | 0 | **4,112,084** |
| **Total** | **602,603** | **18,852,569** | **10,454,469** | **761,019** | **469,588** | **595,046** | **480,000** | **32,245,294** |

# Publications

CEITEC researchers manage to produce a stable amount of publications per year with an increasing share of them in the top 25 % of journals in the field according to their Journal Impact Factor (Q1).

In 2017 CEITEC scientists produced 615 publications in journals with a Journal Impact Factor, 417 of them in Q1 and 153 in Tier 10 (in top 10 % journals in the field according to their Journal Impact Factor).

## NUMBER OF PUBLICATIONS DIVIDED ACCORDING TO THEIR QUARTILE RANKINGS (ACCORDING TO THE BEST JIF PERCENTILE OF JOURNAL)




* Only publications published in the Web of Science in journals with Journal Impact Factor are included in the statistics.

** The highest JIF quartile ranking (when a journal comes under more subject categories, the highest quartile ranking is counted).

**6 CEITEC papers were published in the top 1 % of journals in the field (rank according to the Journal Impact Factor). Three of them with the corresponding authors from CEITEC.**

**Farka, Z., Jurik, T., Kovar, D., Trnkova, L. and Skladal, P.: Nanoparticle-Based Immunochemical Biosensors and Assays: Recent Advances and Challenges, CHEMICAL REVIEWS, 2017, 117: 9973–10042.**

This comprehensive review summarizes the application of nanomaterials in immunochemical biosensors. The paper describes the synthesis and properties of individual kinds of nanoparticles, the transducers used in biosensing applications, and their applications in clinical analysis (markers, pharmaceuticals and tumor cells) and in the detection of pathogenic microorganisms, toxic agents, and pesticides in the environmental field and food products.

**Sehnal, D., Deshpande, M., Varekova, R. S., Mir, S., Berka, K., Midlik, A., Pravda, L., Velankar, S, Koca, J.: LiteMol suite: interactive web-based visualization of large-scale macromolecular structure data, NATURE METHODS, 2017, 14: 1121–1122.**

A new software application called Lite Mol suite that works as a virtual microscope for molecules and molecular complexes was developed by David Sehnal from Jaroslav Koča's research group at CEITEC MU and

NCBR of the Faculty of Science. It enables users to study molecules in detail – for example examine how drugs bind to receptors, or show an individual iron atom in haemoglobin.

**Bolotin, D. A., Poslavsky, S., Davydov, A. N., Frenkel, F. E., Fanchi, L., Zolotareva, O. I., Hemmers, S., Putintseva, E.V., Obraztsova, A.S., Shugay, M., Ataullakhanov, R.I., Rudensky, A.Y., Schumacher, T.N., Chudakov, D.M.: Antigen receptor repertoire profiling from RNA-seq data, NATURE BIOTECHNOLOGY, 2017, 35 (10): 908–911.**

High-throughput profiling of immune receptors has become an important tool for studies of adaptive immunity and for the development of diagnostics, vaccines, and immunotherapies. There are efficient molecular and software tools for the targeted sequencing of T-cell receptors and immunoglobulin repertoires. However, a sufficient amount and quality of tissue or extracted RNA or DNA is not always available for analysis. For the cases where the available tissue is limited the team of Dmitriy Čhudakov developed a software tool that enables the accurate and efficient extraction of immune repertoires from RNA sequencing.

**Lejcek, P., Sob, M. and Paidar, V.: Interfacial segregation and grain boundary embrittlement: An overview and critical assessment of experimental data and calculated results, PROGRESS IN MATERIALS SCIENCE, 2017, 87: 83–139.**

One of the most dangerous technical failures of materials is intergranular brittle fracture (temper embrittlement) as it proceeds very quickly and its appearance is often hardly predictable. This comprehensive review summarizes the available data on interfacial segregation and embrittlement of various solutes in nickel and bcc iron and critically discusses their reliability, assessing also the limitations of individual approaches employed to determine the values of segregation and strengthening/embrittling energies.

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Tan, M. H., Li, Q., Shanmugam, R., Piskol, R., Kohler, J., Young, A. N., Liu, K. I., Zhang, R., Amaswami, G.R., Ariyoshi, K., Gupte, A., Keegan, L.P., George, C.X., Amu, A.R., Huang, N., Pollina, E.A., Leeman, D.S., Ustighi, A.R., Goh, Y.P.S., Hawla, A.C., Del Sal, G., Peltz, G., Runet, A.B., Onrad, D.F.C., Samuel, C.E., O'Connell, M.A., Walkley, C.R., Nishikura, K., Li, J.B.: Dynamic landscape and regulation of RNA editing in mammals, NATURE, 2017, 550 (7675): 249–+.

# Other important papers in top journals with CEITEC corresponding authors

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Bystry, V., Reigl, T., Krejci, A., Demko, M., Hanakova, B., Grioni, A., Knecht, H., Schlitt, M., Dreger, P., Sellner, L., Herrmann, D., Pingeon, M., Boudjoghra, M., Rijntjes, J., Pott, C., Langerak, A. W., Groenen, P., Davi, F., Bruggemann, M., Darzentas, N. and EuroClonality, N. G. S.: ARResT/Interrogate: an interactive immunoprofiler for IG/TR NGS data. BIOINFORMATICS, 2017, 33: 435–437.

Chlup, Z., Zizka, R., Kania, J. and Pribyl, M.: Fracture behaviour of teeth with conventional and mini-invasive access cavity designs. JOURNAL OF THE EUROPEAN CERAMIC SOCIETY, 2017, 37: 4423–4429.

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Dub, P., Sikola, T., Shen, Z. J., Salamon, D. and Maca, K.: Rapid heating of zirconia nanoparticle-powder compacts by infrared radiation heat transfer. JOURNAL OF THE EUROPEAN CERAMIC SOCIETY, 2017, 37: 1067–1072.

Kastyl, J., Chlup, Z., Clemen, F. and Trunec, M.: Mechanical properties of zirconia core-shell rods with porous core and dense shell prepared by thermoplastic co-extrusion. JOURNAL OF THE EUROPEAN CERAMIC SOCIETY, 2017, 37: 2439–2447.

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# Contractual Research

## CEVA ANIMAL HEALTH DEVELOP LONG-STANDING COLLABORATION WITH RESEARCH GROUP OF BŘETISLAV KOUDELA (ZOONOSES)

The group of Břetislav Koudela at CEITEC VFU have been researching the biology of Cystoisospora suis for several years. This parasite is a major cause of diarrhoea and delayed development in piglets worldwide, and induces substantial economic losses in the pig breeding industry. Ceva Animal Health contracted the Koudela group to establish not only the porcine neonatal coccidiosis model for testing the efficacy of new forms of anti-coccidial, but also a second model in cattle. Cryptosporidiosis is the most common parasitic zoonotic disease affecting a wide variety of mammals including humans, with the most important zoonotic reservoir of cryptosporidia being cattle. The preparation of the bovine cryptosporidiosis model for testing of new therapeutic compounds has been particularly rewarding, as few laboratories have managed to conduct experimental studies focused on cryptosporidiosis in calves. The contractual work with CEVA is an example of a very fruitful long-term relationship with the industry. Ceva Animal Health engages in the research, development, production, and marketing of pharmaceutical products and vaccines for companion and farm animals, and operates in several locations globally. Currently, it is the sixth largest animal health company in the world.

# Grants

## PETR NEUGEBAUER RETURNS TO BRNO WITH A SCIENTIFIC GRANT OF EUR 2 MIL

Another ERC grant, awarded by the European Commission, will be resolved at CEITEC BUT. Petr Neugebauer, with a support of ERC Grant EUR 2 million, will develop a revolutionary method of paramagnetic resonance, which would mean a significant shift in a wide range of disciplines such as physics, chemistry or medicine.

## PROFESSOR VOJTECH ADAM IS THE NEW HOLDER OF THE ERC GRANT

Professor Vojtech Adam succeeded in the category Starting Grants of the prestigious ERC grant from the European Research Council. Vojtech Adam, with support of the ERC Grant of EUR 1.3 million, will focus with his research team on the research of a protein called metallothionein, which has the ability to bind metals. He believes that this protein is one of the key factors in preventing the emergence of resistance to cancer treatment with metal-based medicines.

## CEITEC MU TEAMS UP WITH FLEMISH INSTITUTE VIB TO STRENGTHEN EUROPEAN PLANT RESEARCH

CEITEC Masaryk University and VIB-UGent Center for Plant Systems Biology (Belgium) announced the kick-off of the PASSAGE research project, funded by the EU's research and innovation programme Horizon 2020. This project solidifies the long-standing collaboration between the two plant research centres and aims to further advance plant science in Europe. Through shared research projects new insights and technologies will be applied to address topical challenges facing agricultural production in a sustainable manner.

## FETOPEN

Highly original, visionary, essential for society's needs and development. These are the conditions which must be met by the project submitted to the prestigious Future Emerging Technology (FET) research project category. The team from CEITEC BUT in this category, with a 2 to 3 percent chance of success, not only succeeded, but also for the first time in Czech history will be its coordinators. With a budget of 2.89 million euros it will focus on the unique innovation of electron paramagnetic resonance. This method is based on similar principles as broadly renowned nuclear magnetic resonance, which can be found used in many scientific disciplines such as medicine, chemistry, physics, and so on.

The uniqueness of the project is due to two related factors. First, we should increase the frequency of electromagnetic radiation used in the EPR spectrometers one level higher. And secondly, by inserting antennas made of gold or graphene into the beam of this radiation, it will increase the sensitivity of the method by up to four levels.

The importance of the participation of the Czech research team is enhanced by the fact that this is the first time the Czech team in this prestigious project acts as a project coordinator and is thus the main "player" of the project team.

## CEITEC MU FORMS ALLIANCE

Alliance4Life aims at addressing the existing gap in health research and innovation performance between EU15 and EU13. This new initiative has been supported by the European Commission in the frame of Horizon 2020 Health Working Programme as it is expected that outcomes and recommendations of the Alliance4Life could bring useful suggestions for science policy at both European and Member States level.

Despite heavy investments and other funding coming in past decade from the EU, a substantial gap in research performance and innovation potential persists between the East and the West of the EU. Member institutions of the Alliance4Life believe that to a large extent the solution to this problem is to be found in improved governance and managerial practices as well as development of institutional culture at research institutions.

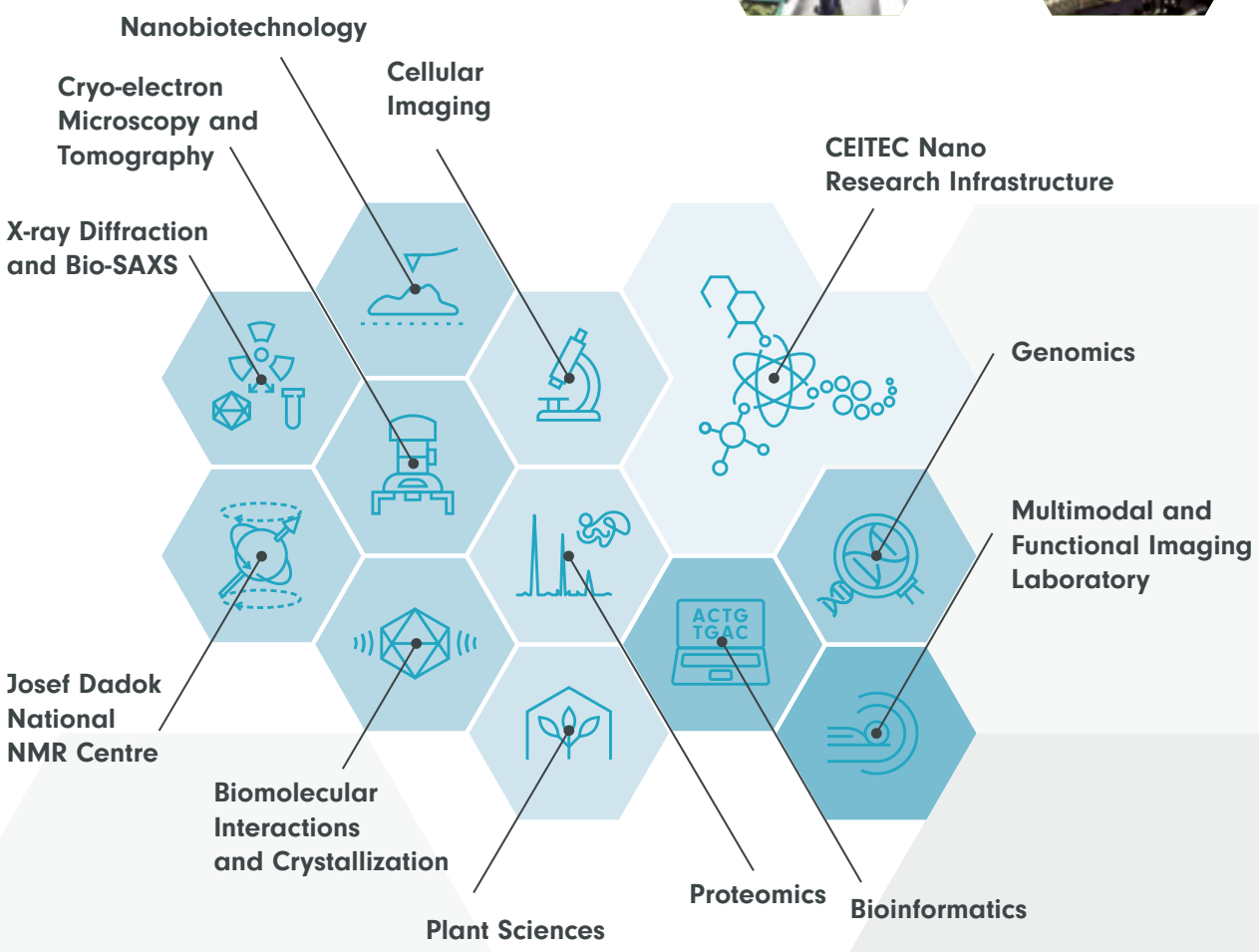
## BACK4FUTURE

The merger of the top Austrian technical universities and the CEITEC institute should result in the improvement of nanotechnology and biotechnology research at the Brno research centre. The project should deepen the already existing partnership with the Vienna Technical University (TU Wien) and the University of Natural Resources and Life Sciences (BOKU) and support the further development of the Center of Scientific Excellence CEITEC.

## RICAIP

Is a joint project of four founding partners: two institutes of leading Czech technical universities, CIIRC-CVUT and CEITEC-BUT, and two leading German research organizations DFKI and ZeMA. The aim of the project is to develop a strong cooperation at international level evolving the concept of Industry 4.0. RICAIP will virtually connect the testbed facilities in the Czech Republic and Germany and integrate them into a new Czech-German research infrastructure in advanced distributed industrial production. Moreover, our intention is to develop RICAIP as a European research infrastructure, the first of its kind in Europe.
http://ricaip.eu/

# Core Facilities

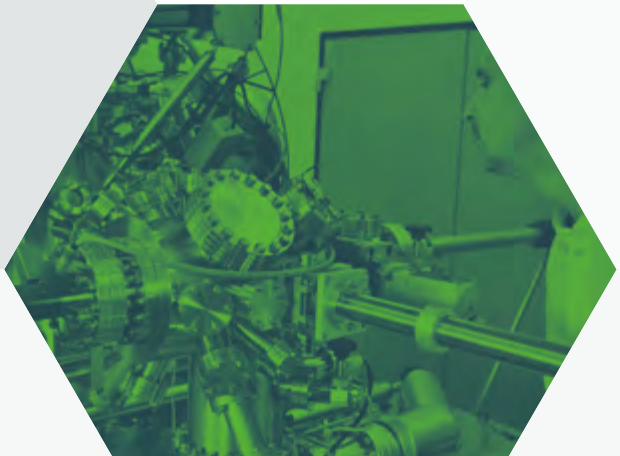


The CEITEC core facilities offer the research community access to cutting-edge equipment. Our goal is to be a central hub for shared resources that provides academic and industrial scientific investigators the use of instrumentation and also technology development and services.

| CORE FACILITY | CF HEAD | START OF OPERATION |
|---|---|---|
| Bioinformatics | Panagiotis Alexiou | *2018 |
| Biomolecular Interaction and Crystalization | Michaela Wimmerová | 2013 |
| Cellular Imaging | Martin Anger | 2016 |
| CEITEC Nano | Michal Urbánek | 2016 |
| Cryo-Electron Microscopy and Tomography | Jiří Nováček | 2014 |
| Genomics | Boris Tichý | 2013 |
| Josef Dadok National NMR Centre | Radovan Fiala | 2012 |
| Multimodal and Functional Imaging Laboratory | Michal Mikl | 2014 |
| Nanobiotechnology | Petr Skládal | 2013 |
| Plant Sciences | Natallia Madzia Valasevich | 2017 |
| Proteomics | Zbyněk Zdráhal | 2012 |
| X-Ray Diffraction and Bio-SAXS | Jaromír Marek | 2013 |

# Core Facilities at CEITEC MU

In 2017, Plant Sciences Core facility started its operation with a ceremonial opening held on 11th April 2017. This Core Facility was established with the aim to effectively use the existing infrastructure of greenhouses and phytotrons which were historically shared by Research groups of Mendel Centre. New Core Facility Head, **Natallia Madzia Valasevich,** was appointed. During 2017, the implementation phase of Bioinformatics Core facility also started to define the needs of the CEITEC scientific community and create the team of existing experts in bioinformatics. The Core Facility is officially established with the coming of the new Head, **Panagiotis Alexiou**, hired from January 2018.



The year 2017 is the first year of major investments in the infrastructure after the end of the start-up project OP VaVpI (ended 2015). Thanks to seven OP VVV projects, 62.3 mil. CZK incl. VAT was invested into the new instrumentation. Key instrumentation was purchased for Cryo-electron Microscopy and Tomography Core Facility (upgrade of Titan Krios for the amount of 37.8 mil. CZK for new phase plate, microscope controlling unit, Falcon 3EC and GIF), Cellular Imaging Core Facility (new Microscope Zeiss LSM 880 for the amount of 18 mil. CZK), Multimodal and Functional Imaging Laboratory (new sequences and software for the total amount of 4.5 mil. CZK), Biomolecular Interactions and Crystallization (nanoDSF upgrade for the amount of 1.1 mil. CZK) and Plant Sceinces Core Facility (LED upgrade for the amount of 1.8 mil. CZK).

A major source for the finance operational costs of CEITEC MU Core Facilities are the projects of Large Research Infrastructures for Research, Experimental Development and Innovations listed on the Roadmap of the Czech Republic for the years 2016–2022.

# CEITEC Nano

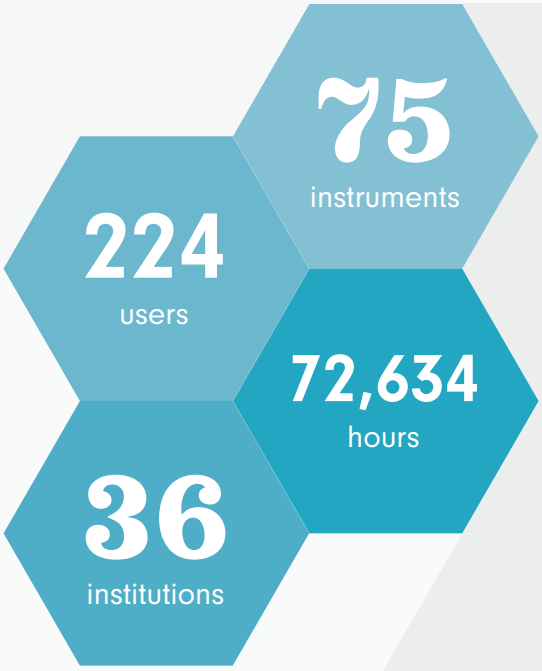
The CEITEC Nanolaboratories continued their activities, officially launched in 2016. During 2017, CEITEC Nano organized three important events for users.

More than 100 users of CEITEC Nano participated during the 2nd CEITEC Nano User Meeting held on 30th November 2017. The event included two invited lectures, a poster session, panel discussion with a user committee election and an award ceremony for best poster and best image.

CEITEC Nano, in cooperation with mt-m, organized Nanoindentation & AFM Workshops (11.–15. 9. 2017) for academic users with live demonstrations in the lab.

CEITEC Nano Open day (held on 28th March) was organized for new academic users. Within the open day the laboratory staff explained how to get access to the infrastructure, demonstrated its equipment and explained available services for nonlocal users.

## CEITEC NANO 2017 IN NUMBERS



# CEITEC PhD School

Interest in the CEITEC PhD School is growing steadily. For the academic year 2017/2018, more than 130 potential applicants showed their interest in the CEITEC PhD program (the number increased 2.5 times compared to the previous year), and 82 of them submitted applications. A general criterion for the selection of students is the admission from outside; so-called "inbreeding" is not supported and is allowed only in the cases of exceptionally talented students. A total number of 36 students were accepted.

| APPLICATIONS 2017 | LIFE SCIENCES | ADVANCED MATERIALS AND NANOMATERIALS | CEITEC PHD SCHOOL |
|---|---|---|---|
| Submitted applications | 57 | 25 | 82 |
| Accepted candidates | 15 | 21 | 36 |

In the academic year 2017/2018, the number of students in the Life Sciences program reached 31.

Regarding nationality, the composition was considerably varied, which supports the internationalization of the PhD School. The composition was as follows: Czech Republic, Belarus, India, Slovakia, Egypt, Ukraine, Italy, China, Ethiopia, Philippines, Lithuania, Greece, and Columbia.

The first Life Sciences program candidate MSc. Zdenek Farka successfully passed the state doctoral exam and defended his Ph.D. thesis "Bioelectronic interfaces studied with scanning probe microscopy" in November 2017. He also succeeded in the call of the Technology Agency of Czech Republic under the ZETA program and became the main investigator of the project "Immunoassay for rapid diagnostics of European foulbrood" for the period from September 2017 till March 2019.

# Selected events for PhD students

## PHD DAYS

Annual student meetings with the members of the PhD committee.

/ February, March

## MEETING WITH...

Meetings with representatives of companies who present different career possibilities after the completion of the doctoral study.

/ June – guest Dr. Panzarová of the company Photon Systems Instruments

/ October – guest Dr. Plisová of the company Medicem

## WELCOME & INFO PHD DAY

The first meeting of the new students and a brief introduction to the "day-to-day" life of a research centre.

## SCIENCE MIXER

Friendly informal meeting, the introductory presentation of one research group's current work is followed by networking and a poster presentation.

/ April, September, November

## CEITEC PHD RETREAT

A meeting of PhD students of life sciences, material sciences, chemistry and physics, presentations, poster sessions, networking.

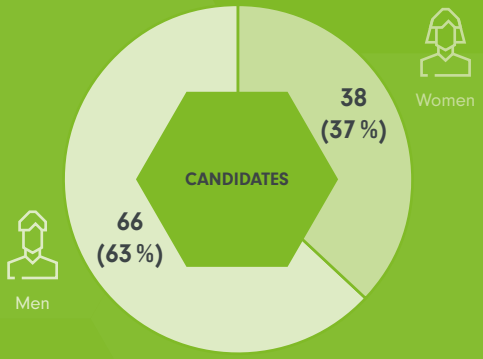
/ Telč, April

## PASTEUR, CURIE & CEITEC JOINT RETREAT

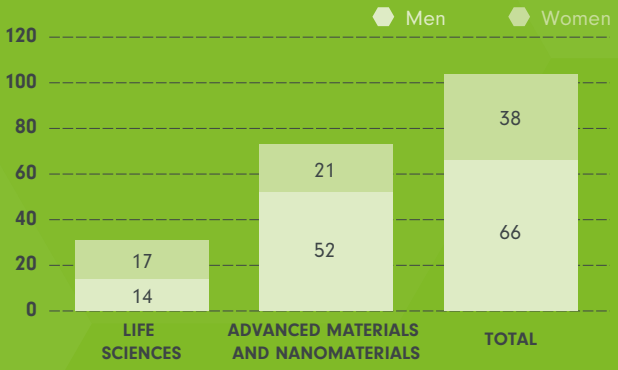
Joint retreat of CEITEC students with students of 2 prestigious French research institutes – Institute Pasteur and Institute Curie.

/ September

## GENDER COMPOSITION OF CANDIDATES




## CEITEC PHD SCHOOL IN 2017/2018



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