CEITEC

Central European Institute of Technology
BRNO | CZECH REPUBLIC

ANNUAL REPORT **2013**

EUROPEAN UNION
EUROPEAN REGIONAL DEVELOPMENT FUND
INVESTING IN YOUR FUTURE

2007–13
OP Research and Development for Innovation

FOREWORD BY CEITEC EXECUTIVE DIRECTOR

Markus Dettenhofer

I would like to thank everyone who has helped us thus far to reach our goals. Although there is still much work to do, we have managed to overcome many challenges.

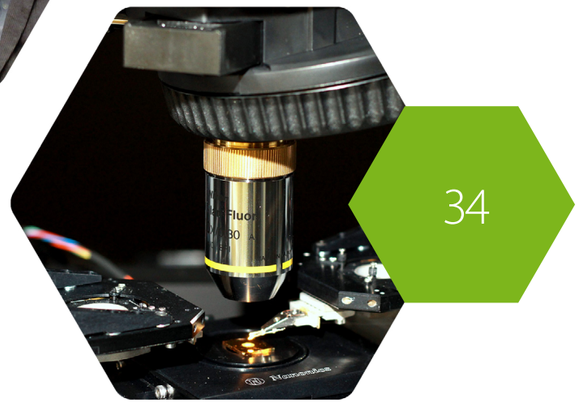
The events of 2013 underscored our drive to increase the scientific performance at CEITEC. The end of 2013 marked the first two full-years of operations of CEITEC as an organisation, and it has witnessed many advances and continued progress to build our foundation. The valuable and active engagement from both of our governing bodies, the Coordination Board and the International Scientific Advisory Board, have significantly supported measures to enable our successes.

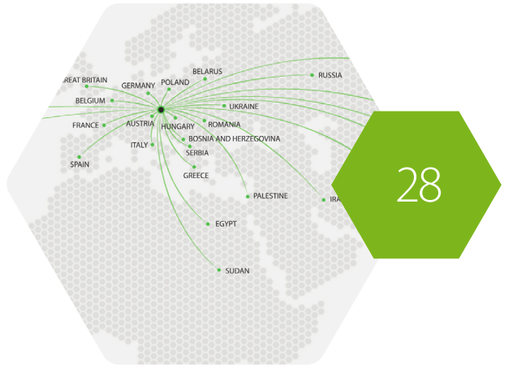
In 2013, our efforts to build our infrastructure has witnessed good progress in the form of establishing the core facilities housing high-end shared equipment, as well as the construction of buildings for new laboratories. Several of our core facilities are associated with the European Strategy Forum on Research Infrastructures (ESFRI), which will play an important role to ensure our connectivity with the broader international scientific community. During this period, we have also launched our International PhD programme, and we continued to recruit exceptional international scientists.

As the 2013 Annual Report shows, our scientific publications not only grew in total numbers over the last two years, but more importantly, the quality of the publications has significantly increased. Additionally, our scientists have an increasing number of international collaborators over the years, which had fostered a greater international network. Our participation in the EU-Life consortium, which started this year, is testament to CEITEC's increasing visibility within the European network of research institutes, but equally important is the commitment of EU-Life and CEITEC to standards of research excellence.

I would like to thank everyone who has helped us thus far to reach our goals. Although there is still much work to do, we have managed to overcome many challenges. We are committed to continue to build a reputation as an emerging institute for high-end, multi-disciplinary research in the Czech Republic that would have international impact. Please join us in celebrating our achievements thus far.

CONTENT



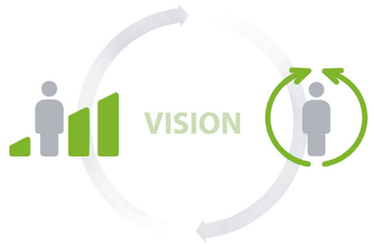


CENTRAL EUROPEAN INSTITUTE OF TECHNOLOGY

CEITEC is a scientific centre in the fields of the life sciences, advanced materials and technologies which aims to establish itself as a recognized centre for basic as well as applied research. CEITEC offers state-of-the-art infrastructure and excellent conditions for the employment of outstanding researchers. It is a consortium of partners that include the most prominent universities and research institutes in Brno, Czech Republic: Masaryk University, Brno University of Technology, Mendel University in Brno, Institute of Physics of Materials of the Academy of Sciences of the Czech Republic, University of Veterinary and Pharmaceutical Sciences Brno and the Veterinary Research Institute. CEITEC works closely with the Region of South Moravia and the City of Brno to help increase local innovative capacity.

01 VISION

CEITEC will lead on the path to global scientific recognition through science based on synergy and collaboration in order to achieve a regional knowledge-based economy.



02 MISSION

CEITEC was created to advance existing basic and applied research in South Moravia to new levels. Its purpose is not only to provide its researchers with the best equipment and new laboratory facilities, but also to engage in scientific discovery at a globally competitive level. To achieve this, CEITEC aims to retain and recruit talented people who can address important research questions. The training of PhD students and post-doctoral fellows for future careers in science or technologically demanding fields is important for the development of the region. By conducting research that bridges technological disciplines, CEITEC will see its greatest advances in enhancing the innovative environment of the region.

BASIC OVERVIEW

- 6 partners
- 7 research programmes
- 61 research groups
- 557 researchers (2015)
- 25 000 m² of new laboratories
- 10 core facilities
- Total budget of € 208 mil.
- Approval by the European Commission on 6th June 2011
- Start of research activities: Q1 2011

INTERDISCIPLINARY COOPERATION

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

INTERNATIONAL MANAGEMENT

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

COORDINATION BOARD

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

EVALUATION

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

INTERNATIONAL SCIENTIFIC ADVISORY BOARD

Members of ISAB are exclusively representatives of important international research institutes

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

PARTNER INSTITUTIONS

MASARYK UNIVERSITY
www.muni.cz

BRNO UNIVERSITY OF TECHNOLOGY
www.vutbr.cz

MENDEL UNIVERSITY IN BRNO
www.mendelu.cz

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

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

VETERINARY RESEARCH INSTITUTE
www.vri.cz

FINANCING

Total budget of € 208 mil.

Source of funding: The European Regional Development Fund to be financed through the Operational Programme Research and Development for Innovations, priority axis 1 – European Centres of Excellence, which is managed by the Ministry of Education, Youth and Sports of the Czech Republic.

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A YEAR IN THE LIFE OF CEITEC

January


1.1


1.2

February


2.1

March


3.1

CEITEC acquires the most powerful NMR spectrometer in Central Europe

As of January 2013 CEITEC has had the use of the most powerful nuclear magnetic resonance (NMR) spectrometer in Central and Eastern Europe. The NMR spectrometer is a part of the Josef Dadok National NMR Centre's equipment. The Centre was officially opened on 23 January 2013 and currently this state-of-the-art workplace has the use of six NMR spectrometers in total, with the most powerful NMR spectrometer working at a frequency of 950 MHz. There are only eight of these devices operating at this frequency in use worldwide.

City of Brno Award to Prof. Vrba

Prof. **Radimír Vrba**, director of CEITEC BUT, was honoured by the City of Brno for his activities in the field of technological development. He received the award from the Mayor of Brno on 22 January 2013 at a special ceremony in the council chambers of Brno City Hall. *"I was surprised by the award; I take it as a reward for my whole career. At the same time, I perceive it as recognition for the entire team of people around me because cooperation is a key aspect in science."*

CEITEC scientists discover a new method for the rapid diagnosis of methanol poisoning

Scientists from CEITEC MU led by Dr. **Petr Kubáň**, in cooperation with doctors from Havířov Hospital, have developed a unique method for the rapid diagnosis of methanol poisoning by determining levels of formic acid in blood serum. Formic acid is the final product when methanol is broken down. This new method can determine whether there are higher than normal levels of formic acid in the blood within 1-2 minutes, and thus whether treatment is needed. Rapidly determining levels of formic acid in serum is, therefore, more important than determining methanol levels when it comes to deciding to initiate treatment. The research results were published in the prestigious *Journal of Chromatography A* at the beginning of 2013.

CEITEC Workshop No. 1/2013

On 19 March, the regular CEITEC Workshop took place at amazing space of Brno Observatory and Planetarium. We introduced CEITEC news, enjoyed new sessions such as special students' brainstorming, had an interesting lecture about Horizon2020 and learned from our CEITEC colleagues about their research and possible cooperation across different research programmes.

April

4.1

CEITEC scientist Dalibor Blažek received a prestigious American grant for research into ovarian cancer

Dalibor Blažek, PhD, Inherited Diseases II – Transcriptional Regulation research group leader, has been granted a prestigious Pilot Study grant award from the Marsha Rivkin Foundation, Oregon, USA. The grant topic is linked to recently published work that identified the protein Cdk12 as a new tumour suppressor. This protein, practically unstudied to date, regulates the optimal levels of several other proteins in a cell playing key roles in the repair of damaged DNA. Thus, Cdk12 "protects" the cell against a tumour inception. The goal of future work is the identification of the precise molecular mechanism by which the deregulated protein Cdk12 contributes to the inception of ovarian cancer.

4.2

CEITEC kicked off its first PhD programme

CEITEC BUT officially opened its first inter-disciplinary PhD study programme in Advanced Materials and Nanosciences. This new PhD programme offers students the chance to draw on the expertise and experience of experts from three top scientific institutions concurrently. Students also have an exceptional chance to utilise the often unique instrumentation and technology available in CEITEC. The new PhD studies offer two areas, and these are Advanced Nanotechnologies and Microtechnologies, and Advanced Materials. CEITEC plans to open a further two interdisciplinary PhD study programmes. The first of these will focus only on the life sciences and the second has been conceived uniquely as a multidisciplinary programme on the borders of the life and material sciences.

May

5.1

CEITEC contributes to development of a new type of computer memory. Data will be saved much faster and without loss

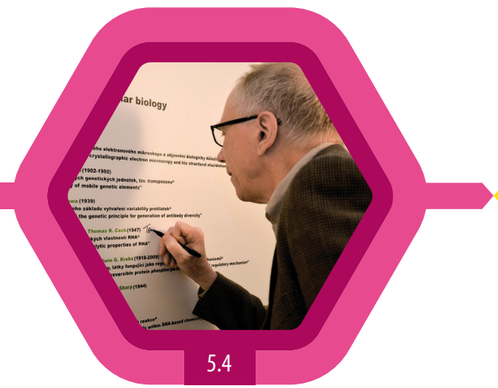
Young scientists from CEITEC BUT and the Institute of Physical Engineering BUT, **Vojtěch Uhlíř** and **Michal Urbánek**, have discovered new ways of controlling magnetic vortices, which can be used for example in the fabrication of a new kind of computer memory. The scientists have now managed to rapidly and in a controlled manner switch the spin circulation in magnetic vortices, which opens the door to a multitude of possible applications, especially in the field of IT. The Brno scientists worked on the experimental verification of the corresponding theory with their colleagues from the University of California in San Diego and the synchrotron laboratory in Berkeley. The results of their research have been published in the May edition of *Nature Nanotechnology*.

5.2

Scientists from CEITEC MU clarify the genome structure of the predecessor of present-day brassica

Young scientists from the CEITEC MU, **Terezie Mandáková** and **Martin A. Lysák**, in cooperation with colleagues from the Institute of Vegetables and Flowers in Beijing have reconstructed the ancestral genome structure of the present-day cabbages. The genus *Brassica* comprises several species and varieties of oil-producing plants, forage plants and vegetables, such as oilseed rape, broccoli, cauliflower and cabbage. The study answers the 80-plus-year-old question about a make-up of the ancestral genome of extant brassicas, and will facilitate sequencing and genome analysis of other economically important cruciferous crops. The research was published in the top-ranking journal *The Plant Cell* in May 2013.

May



EU-LIFE: A new alliance for European excellence and competitiveness in the life sciences

In May 2013, directors and staff from ten top European research institutes, including CEITEC, kicked off a new alliance, called EU-LIFE, which mission is to foster excellence, share knowledge, and influence policies in the life sciences. Partners in EU-LIFE are renowned research centres that operate with similar principles of excellence, external reviews, independence, competiveness, and internationality. During difficult economic times and within a highly competitive international research enviroment, we believe that we can join forces to better address complex questions, thereby contributing to pushing European science forward.

Nobel laureate, Thomas R. Cech, in Brno

Another lecture by a Nobel Prize winner took place in Brno under the auspices of CEITEC and Masaryk University. Professor **Thomas R. Cech**, Howard Hughes Medical Institute and University of Colorado, USA, gave a lecture entitled "*From the RNA World to the RNP World: Ribozymes, Telomerase and lncRNAs*". The lecture was devoted to the functions of Ribonucleic acid (RNA), for the discovery of which Cech was awarded. In 1981-1982 he found out that RNA is not just a passive carrier of genetic information but it can catalyze biochemical reactions like enzymes of protein character. In particular, it was discovered that RNA is able to cut itself without the participation of proteins – a process in which a part of its chain is cut out and remaining parts are reconnected. This discovery was a significant landmark in the study of the origins and development of life.

June

CEITEC PhD Competition 2013

The first CEITEC PhD Competition was held on 11 June 2013. This competition was attended by 20 young researchers: three PhD students from each of the CEITEC research programmes introduced their research topics. CEITEC experts from the International Scientific Advisory Board (ISAB) evaluated presenters according to the importance of their research question, the significance of their findings and their presentation skills. The first prize took **Petra Faltejsková** from the Molecular Medicine research programme, **Iva Tomalová** and **Petr Klenovský**, both from the Advanced Nanotechnologies and Microtechnologies research programme, placed second and third respectively.

The CEITEC PhD Competition was enriched by a lecture delivered by the esteemend scientist **Carl Djerassi**. Born in Vienna and educated in the US, Carl Djerassi is a writer and professor of chemistry emeritus at Stanford University. Author of over 1200 scientific publications and seven monographs, he is the only American chemist to have been awarded both the National Medal of Science (in 1973, for the first synthesis of a steroid oral contraceptive – "the Pill") and the National Medal of Technology (in 1991, for promoting new approaches to insect control).

June

6.2

CEITEC launches new web site

We have prepared a new web site for you, which should be more user-friendly and intuitive. Whether it is information about CEITEC in general that you are looking for, you are interested in research groups, or you would like to know about planned events and lectures, you can find all faster and well arranged in one place.

6.3

Six SoMoPro awards for CEITEC

Six researchers from abroad were supported in their integration in the scientific community of CEITEC through the SoMoPro (South Moravian Programme for Distinguished Researchers) initiative, jointly funded by the European Commission and the region of South Moravia. SoMoPro grants will allow the beneficiaries to establish their independent research agenda at CEITEC while they will bring along their knowledge, experience, and contact networks from (often multiple) prestigious institutions from around the world – countries such as Austria, Belgium, Germany, Russia, South Korea, the United Kingdom, or the United States.

July

7.1

Most prestigious European research grant goes to CEITEC

A young scientist, **Pavel Plevka** of CEITEC MU, has received the most prestigious European scientific grant awarded by the European Research Council (ERC). This makes him the only scientist working in the Czech Republic who has received financial support from the ERC in the category of "Starting Grants" in 2013. ERC awards "Starting Grants" to the most talented European researchers based on the scientific excellence of their innovative research proposal. Pavel Plevka has succeeded with his project entitled "*Structural Study of Human Picornaviruses*" and he is only the sixth ERC "Starting Grants" recipient in the Czech Republic since 2007 and the very first in Brno.

7.2

CEITEC supported the prestigious international conference MSMF7

CEITEC supported the Seventh International Conference on Materials Structure & Micromechanics of Fracture (MSMF7) which was held at the Faculty of Mechanical Engineering BUT on 1-3 July. This three-day scientific meeting was focused on fundamental relations between structural and mechanical characteristics of materials and attracted more than 250 participants from 32 countries. During the conference, world-leading experts in the field of fatigue and fracture delivered 6 plenary and 15 keynote lectures. A further 142 oral contributions and 67 posters were presented in 10 technical sections. Participants also enjoyed the rich accompanying social programme. The conference was truly successful and led to a deepening of existing cooperative relationships as well as to the establishment of new professional contacts.

August

8.1

CEITEC is developing a special bioactive replacement for jaw bone

Scientists from the Advanced Ceramic Materials research group at CEITEC BUT, lead by Prof. **Karel Maca** and Dr. **David Salamon**, are developing special ceramic materials to replace jaw bone. They are manufacturing ceramic granules which can be filled with a unique biopolymer and in the form of a solution use them as "ink" in 3D printers. These print ceramic implants of jaw bone to meet the specific requirements of individual patients. The research combines several technologies that are already in use and utilises them in medicine in line with current trends towards reducing treatment costs. For this research, scientists from Moravia's metropolis won an EU grant in cooperation with German, Swedish, Spanish and Chinese experts.

September

9.1

CEITEC acquires a unique device to research complex biological processes

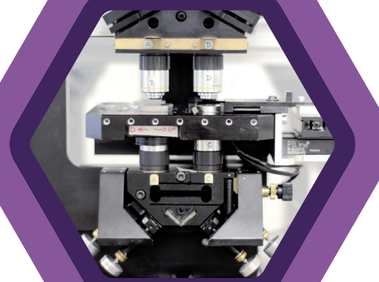
As of September, CEITEC has unique equipment at its disposal making it possible to explore the transcription of genetic information, among other things. The biological SAXS camera is part of the newly open X-ray Diffraction and Bio-SAXS core facility. This unique laboratory equipment will contribute to the study of complex biological processes and will foster a better understanding of the causes of cancerous proliferation and, thus, contribute to treatment. The X-ray Diffraction and Bio-SAXS Laboratory is one of the core facilities of the Structural Biology research programme focused on key technology using X-ray radiation for the study of molecular structures in crystals.

October

10.1

Scientific retreat

On 3–4 October, the first CEITEC Scientific Retreat took place, designed for all CEITEC research group leaders. The objective of this event was not only to meet each other and to discuss current issues within this broad plenum, but also to inform the research group leaders how other research centres and core facilities function and to let them know about the news in the Horizon 2020 grant programme.



10.2

The team of Prof. Chmelík from CEITEC BUT wins award for best cooperation of the year

On 22 October the Association for Foreign Investment – AFI, American Chamber of Commerce in the Czech Republic (AmCham) and the Technology Agency of the Czech Republic (TAČR) awarded projects of The Cooperation of the Year between the companies and research spheres. The first place was taken by the Czech company TESCAN and the Faculty of Mechanical Engineering at BUT Brno with a holographic camera microscope using 3D technology. The co-author of the patent is the CEITEC scientist **Radim Chmelík**, Experimental Biophotonics research group leader. This revolutionary prototype of a microscope based on camera recording enables researchers to measure accurately the localization and trajectory of very quickly changing objects of research – for example cells – in 3D. This device will be found useful in biological and technical fields as well.

November

11.1

Jiří Nantl becomes the Operational Director of CEITEC

On 18 November the former First Deputy Minister of Education **Jiří Nantl** became the new Operational Director of CEITEC. The competence of the Operational Director includes mainly financial and project management, quality, risk management and human resources management. This experienced manager was appointed to this position based on an open selection procedure. His main task is to consolidate the management of CEITEC as a consortium of six universities and research institutes and also to prepare the institute for the period following the completion of current funding from European resources in 2015.

11.2

Week of science and technology

The Institute of Physics of Material AS CR, v. v. i (IPM), the CEITEC partner institution, is annually involved in the Week of Science and Technology organized by Academy of Sciences of the Czech Republic. In this week celebrating science and technology IPM held an Open Day on 7 November. Visitors could visit lectures for the general public led by CEITEC staff and become familiar with research equipment. Researchers presented unique devices of CEITEC IPM together with practical demonstrations of the equipment's use. The most interesting equipment presented to the public was a system for measuring electric, magnetic and transport properties in the range of 4-300 K, an axial-torsion fatigue test system and creep machines enabling testing in a range up to 1400°C. Mainly secondary school students, university students, PhD students and also visitors from technological companies and other research institutions showed interest in the Open Day.

December

12.1

The scientist Karel Říha from CEITEC has received a prestigious EMBO Installation Grant

Dr. **Karel Říha** received an EMBO Installation Grant and is the only Czech scientist to have done so in 2013. EMBO – the European Molecular Biology Organization gives grants once a year and in 2013 has awarded it to six scientists from the Czech Republic, Poland, Portugal and Turkey. EMBO installation grants are direct support to young talented scientists who are returning to their country in order to set up their own laboratories there. As a result these grants contribute to averting the negative trend of a brain drain from countries working actively on the development of basic science.

12.2

Prof. Alexandra Šulcová wins the Milada Paulová Award for her lifelong contribution to science

On 5 December 2013 Prof. **Alexandra Šulcová**, the Experimental and Applied Neuropsychopharmacology research group leader at CEITEC MU, received the Milada Paulová Award, awarded to female scientists for their lifelong contribution. The purpose of the award is to draw attention to and appreciate the scientific work of important Czech female researchers and through their example to inspire female scientists or students at the start of their careers. Alexandra Šulcová has been involved in research in the field of experimental neuropsychopharmacology and ethopharmacology. The focus of her professional interest is the neuropsychological effects of substances contained in cannabis and generally research into the neurobiology of drug addiction and the effects of drugs on motoric skills, emotionality and cognition.

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 | X-ray Micro CT and Nano CT
RG leader: Jozef Kaiser

1-7 | Optoelectronic Characterisation of Nanostructures
RG leader: Lubomír Grmela

1-8 | Micro and Nanotribology
RG leader: Ivan Křupka

1-9 | Plasma Technologies
RG leader: Lenka Zajíčková

1-10 | Synthesis and Analysis of Nanostructures
RG leader: Jiří Pinkas

1-11 | Transport and Magnetic Properties
RG leader: Bohumil David

ADVANCED MATERIALS

2-1 | Advanced Ceramic Materials
RG leader: Jaroslav Cihlář

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

2-5 | Advanced Coatings
RG leader: Jiří Švejcar

STRUCTURAL BIOLOGY

3-1 | Bioinformatics
RG leader: Hedi Hegyi

3-2 | CD Spectroscopy of Nucleic Acids and Proteins
RG leader: Michaela Vorlíčková

3-3 | CryoEM
RG leader: Jürgen Plitzko

3-4 | Glycobiochemistry
RG leader: Michaela Wimmerová

3-5 | RNA Quality Control
RG leader: Štěpánka Vaňáčová

3-6 | Nanobiotechnology
RG leader: Petr Skládal

3-7 | Biomolecular NMR Spectroscopy
RG leader: Vladimír Sklenář

3-8 | RNA-based Regulation of Gene Expression
RG leader: Peter Lukavsky

3-9 | Structural Biology of Gene Regulation
RG leader: Richard Štefl

3-10 | Structural Virology
RG leader: Pavel Plevka

3-11 | Structure and Dynamics of Nucleic Acids
RG leader: Jiří Šponer

3-12 | Structure and Interaction of Biomolecules at Surfaces
RG leader: Miroslav Fojta

3-13 | Computational Chemistry
RG leader: Jaroslav Koča

GENOMICS AND PROTEOMICS OF PLANT SYSTEMS

4-1 | Bioanalytical Instrumentation
RG leader: František Foret

4-2 | Plant Cytogenomics
RG leader: Martin A. Lysák

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

4-4 | Hormonal Crosstalk in Plant Development
RG leader: Eva Benková

4-5 | Metabolomics
RG leader: Zdeněk Glatz

4-6 | Proteomics
RG leader: Zbyněk Zdráhal

4-7 | Developmental and Cell Biology of Plants
RG leader: Jiří Friml

4-8 | Chromatin Molecular Complexes
RG leader: Jiří Fajkus

4-9 | Developmental and Production Biology - - Omics Approaches
RG leader: Břetislav Brzobohatý

4-10 | Plant Stress Signalling and Adaptation
RG leader: Vanesa Tognetti

4-11 | Plant Molecular Biology
RG leader: Karel Říha

MOLECULAR MEDICINE

5-1 | Medical Genomics
RG leader: Šárka Pospíšilová

5-2 | Molecular Oncology I – Hematooncology
RG leader: Martin Trbušek

5-3 | Molecular Oncology II – Solid Cancer
RG leader: Ondřej Slabý

5-4 | Inherited Diseases I – Genetic Research
RG leader: Lenka Fajkusová

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

5-6 | Molecular Immunology and Microbiology
RG leader: Tomáš Freiberger

5-7 | Genome Dynamics
RG leader: Eduard Kejnovský

5-8 | Adaptive Immunity Group
RG leader: Dmitriy Chudakov

BRAIN AND MIND RESEARCH

6-1 | Cellular and Molecular Neurobiology
RG leader: Petr Dubový

6-2 | Multi-modal and Functional Neuroimaging
RG leader: Ivan Rektor

6-3 | Experimental and Applied Neuropsychopharmacology
RG leader: Alexandra Šulcová

6-4 | Behavioural and Social Neuroscience
RG leader: Milan Brázdil

6-5 | Applied Neuroscience
RG leader: Irena Rektorová

MOLECULAR VETERINARY MEDICINE

7-1 | Molecular Virology
RG leader: Vladimír Celer

7-2 | Molecular Bacteriology
RG leader: Alois Čížek

7-3 | Parasitology
RG leader: Břetislav Koudela

7-4 | Food Safety
RG leader: Iva Steinhauserová

7-5 | Orthopaedics and Surgery
RG leader: Alois Nečas

7-6 | Animal Immunogenomics
RG leader: Petr Hořín

7-7 | Animal Cytogenomics
RG leader: Jiří Rubeš

7-8 | Mammalian Reproduction
RG leader: Martin Anger

BOARDS OF CEITEC

Coordination Board

Coordination Board is the highest authority of the centre. It is composed of statutory representatives of partner institutions and external representatives from prominent Czech firms active in R&D and the best international research institutes. It has been operational since December 2009, from the end of 2010 it meets on a quarterly basis (March, June, September, and December). The Board approves the Governing Documents (including among others the budget of the Central Management Structure), Common Rules and Policies and makes other key decisions, such as the approval of nominations for the Executive and Scientific Director.

Nominated Members – statutory representatives*:

01 **Assoc. Prof. PhDr. Mikuláš Bek, Ph.D.**
Rector, Masaryk University

02 **Prof. Ing. Karel Rais, CSc., MBA**
Rector, Brno University of Technology

03 **Prof. Ing. Jaroslav Hlušek, CSc.**
Rector, Mendel University in Brno

04 **Prof. RNDr. Ludvík Kunz, CSc., dr. h. c.**
Director, Institute of Physics of Materials

05 **Prof. MVDr. Vladimír Večerek, CSc., MBA**
Rector, University of Veterinary and Pharmaceutical Sciences Brno

06 **Prof. MVDr. Břetislav Koudela, CSc.**
Director, Veterinary Research Institute

Expert Representatives*:

01 **Prof. Gustaaf Borghs**
IMEC Fellow, Full professor at Katholieke Universiteit Leuven, Belgium

02 **Prof. Stefan Maier**
Co-Director of Centre for Plasmonics & Metamaterials, Imperial College London, United Kingdom

03 **Ing. Jaroslav Doležal, CSc.**
National Executive, Honeywell, Czech Republic

Guests: Governor of the South Moravian region, Mayor of the City of Brno, Director of the South Moravian Innovation Centre

International Scientific Advisory Board

International Scientific Advisory Board is the highest scientific advisory body of the centre that meets twice a year, at least once physically in Brno. The Board plays a crucial role in the Common Evaluation of Scientific Excellence as sets the criteria, comments on the planned research activities and gives recommendations regarding strategic positioning of the centre. Members of ISAB are exclusively representatives of important international research institutes.

ISAB Members*:

01 **Prof. Andrés Aguilera**
Head of Molecular Biology Department and Scientific Vice-director, Andalusian Centre for Molecular Biology and Regenerative Medicine (CABIMER), Seville, Spain

02 **Prof. Dirk Inzé**
Scientific Director and Department of Plant Systems Biology Director, Flanders Institute for Biotechnology (VIB), Gent, Belgium

03 **Prof. Wolfgang Knoll *(Chairman)***
Managing Director, Austrian Institute of Technology, Vienna, Austria

04 **Prof. Christoph M. Michel**
Director, Functional Brain Mapping Laboratory, Department of Fundamental Neurosciences, University Medical School, Geneva, Switzerland

05 **Prof. Heiner Niemann**
Head of Institute, Head of Department Biotechnology, Friedrich-Loeffler-Institut, Insel Riems, Germany

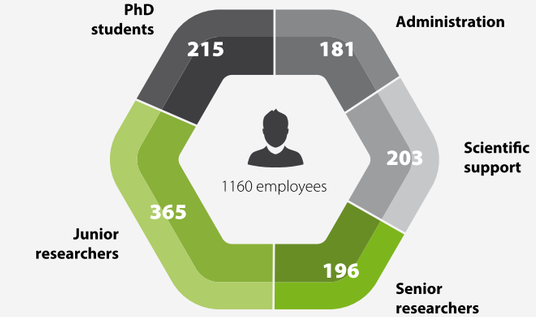
06 **Prof. Yoshio Nishi**
Director of Research, Center for Integrated Systems, Stanford University, Palo Alto, USA

07 **Prof. Michael Sattler**
Chair Biomolecular NMR-Spectroscopy, Department Chemie, Technische Universität München, Germany

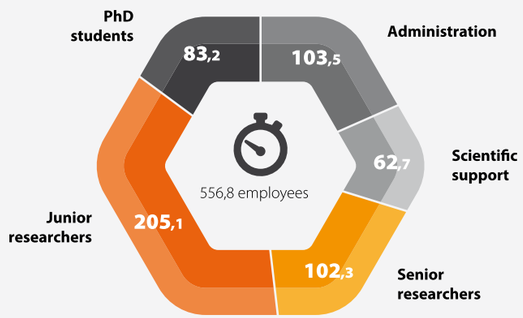
** As of 31st December 2013*

CEITEC EMPLOYEES

01 NUMBER OF EMPLOYEES (HEADCOUNT)



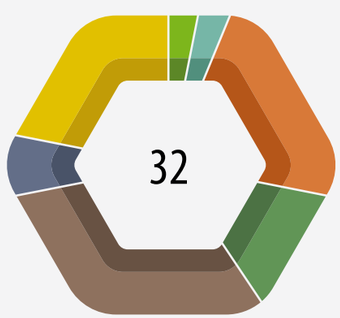
02 NUMBER OF EMPLOYEES (FTE)



Full-time equivalent (FTE) is a unit that indicates the workload of an employed person (or student) in a way that makes workloads comparable across various contexts. An FTE of 1.0 means that the person is equivalent to a full-time worker, while an FTE of 0.5 signals that the worker is only half-time.

03 CEITEC FOREIGN EMPLOYEES

04 NUMBER OF NEW FOREIGN EMPLOYEES IN 2013



Employees outside EU

Employees from EU

Excluding reintegrating Czech scientists and Slovaks

- Advanced Nanotechnologies and Microtechnologies
- Advanced Materials
- Structural Biology
- Genomics and Proteomics of Plant Systems
- Molecular Medicine
- Brain and Mind Research
- Central Management Structure

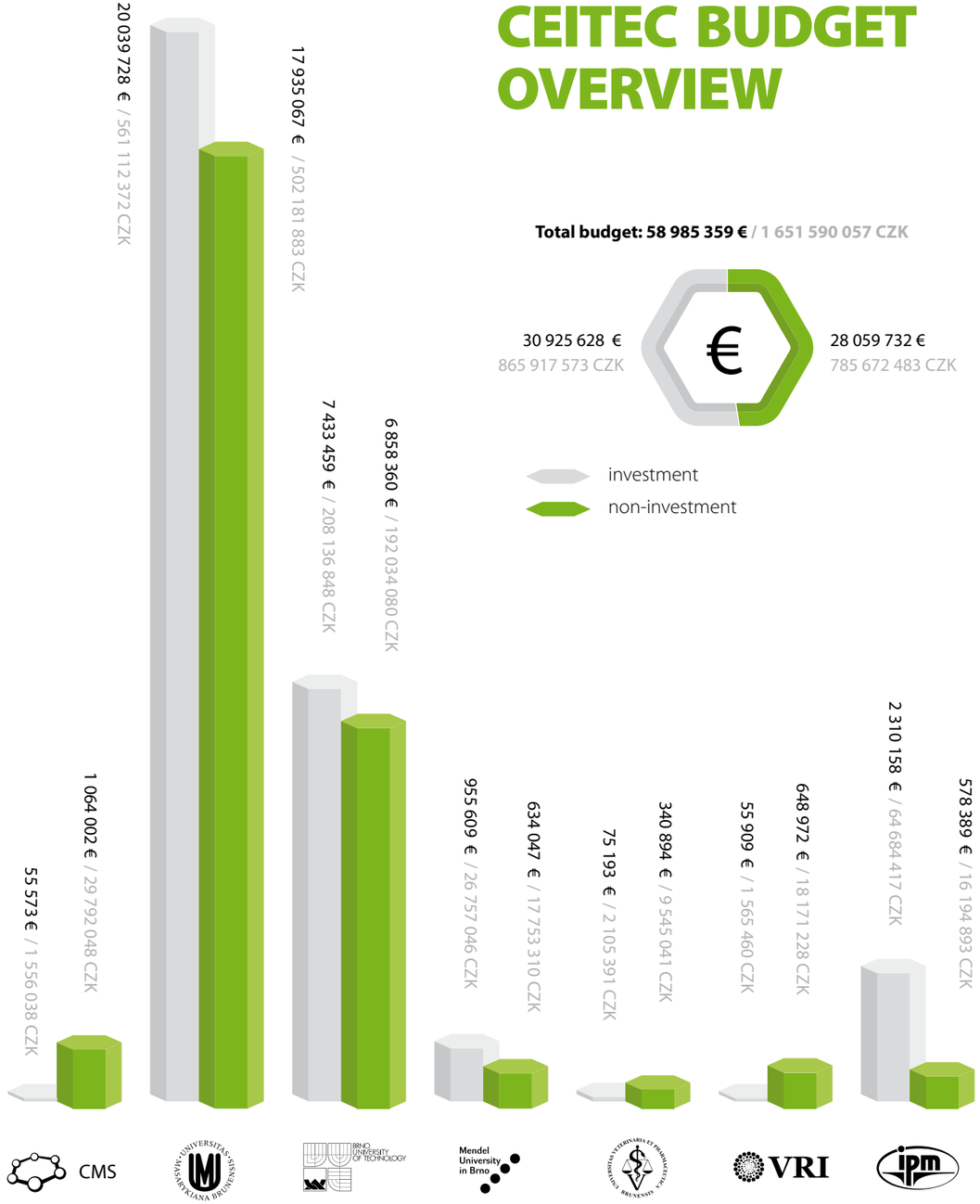
CEITEC BUDGET OVERVIEW

Total budget: 58 985 359 € / 1 651 590 057 CZK

30 925 628 €
865 917 573 CZK

28 059 732 €
785 672 483 CZK

investment
non-investment



Budget of CEITEC organisational units for 2013 in EUR

OU	Investment / Non - investment	Institutional support	Targeted support	International grants	Contract research	Structural funds (SF)		Contribution to educational activities	Other
						CEITEC - OP RDI	SF - other		
CMS	Investment	0	0	0	0	55 573	0	0	0
	Non-investment	0	0	25 551	0	665 931	265 871	0	106 648
MU	Investment	17 857	0	0	0	19 982 695	20 711	0	18 464
	Non-investment	1 751 470	3 083 299	1 820 947	118 536	2 511 024	3 972 104	72 484	4 605 203
BUT	Investment	0	0	0	0	7 433 459	0	0	0
	Non-investment	341 151	1 151 359	144 576	147 016	1 054 097	4 020 161	0	0
MENDELU	Investment	0	0	0	0	955 609	0	0	0
	Non-investment	107 500	83 445	0	5 177	99 085	338 840	0	0
VFU	Investment	0	0	0	0	75 193	0	0	0
	Non-investment	189 791	55 714	0	12 488	65 045	0	17 857	0
VRI	Investment	0	0	0	0	53 931	1 978	0	0
	Non-investment	58 529	256 500	17 071	6 230	58 144	252 499	0	0
IPM	Investment	0	0	0	0	2 310 158	0	0	0
	Non-investment	163 407	137 373	91 709	69 885	116 016	0	0	0
ALL	Investment	17 857	0	0	0	30 866 616	22 690	0	18 464
	Non - investment	2 611 847	4 767 689	2 099 855	359 331	4 569 342	8 849 475	90 341	4 711 851
TOTAL		2 629 704	4 767 689	2 099 855	359 331	35 435 959	8 872 165	90 341	4 730 316

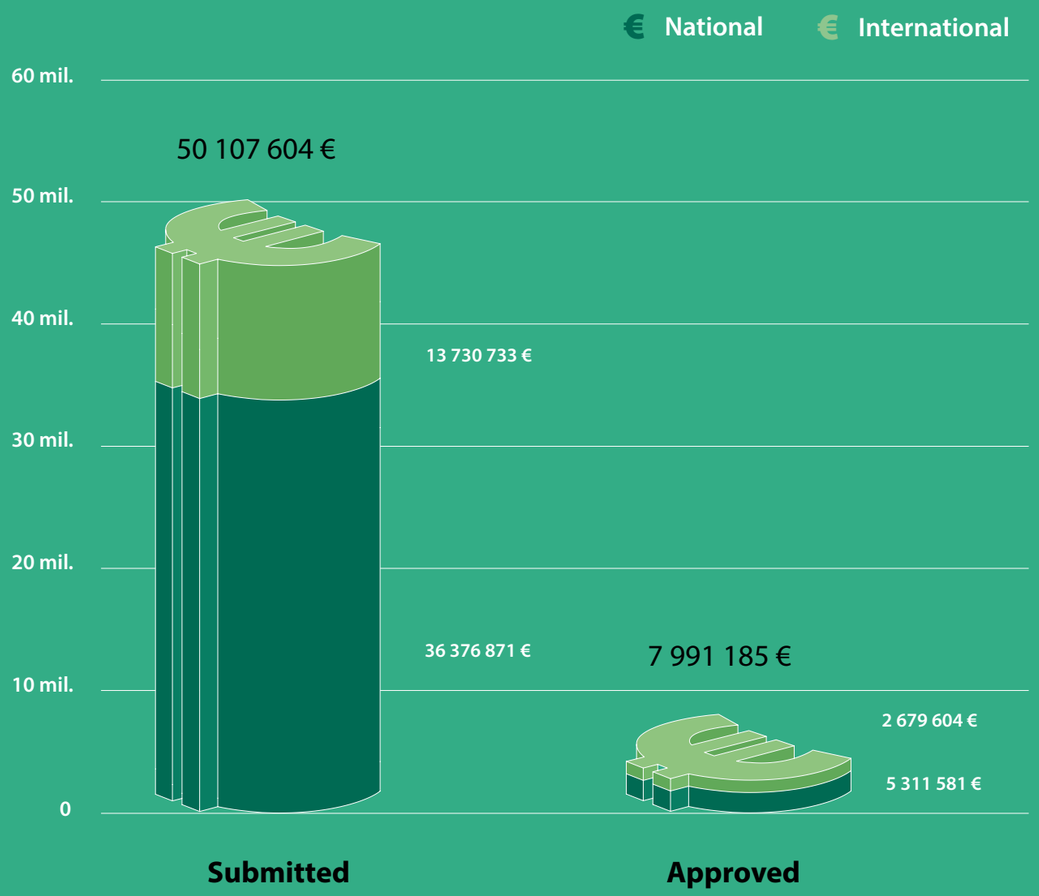
Budget of CEITEC organisational units for 2013 in CZK (exchange rate: 1EUR = 28 CZK)

OU	Investment / Non - investment	Institutional support	Targeted support	International grants	Contract research	Structural funds (SF)		Contribution to educational activities	Other
						CEITEC - OP RDI	SF - other		
CMS	Investment	0	0	0	0	1 556 038	0	0	0
	Non-investment	0	0	715 421	0	18 646 075	7 444 401	0	2 986 151
MU	Investment	500 000	0	0	0	559 515 455	579 917	0	517 000
	Non-investment	49 041 157	86 332 379	50 986 527	3 319 008	70 308 677	111 218 905	2 029 541	128 945 689
BUT	Investment	0	0	0	0	208 136 848	0	0	0
	Non-investment	9 552 222	32 238 044	4 048 135	4 116 453	29 514 705	112 564 521	0	0
MENDELU	Investment	0	0	0	0	26 757 046	0	0	0
	Non-investment	3 010 000	2 336 451	0	144 951	2 774 389	9 487 519	0	0
VFU	Investment	0	0	0	0	2 105 391	0	0	0
	Non-investment	5 314 139	1 560 000	0	349 656	1 821 246	0	500 000	0
VRI	Investment	0	0	0	0	1 510 065	55 395	0	0
	Non-investment	1 638 800	7 182 000	478 000	174 426	1 628 043	7 069 959	0	0
IPM	Investment	0	0	0	0	64 684 417	0	0	0
	Non-investment	4 575 396	3 846 430	2 567 854	1 956 766	3 248 447	0	0	0
ALL	Investment	500 000	0	0	0	864 265 261	635 312	0	517 000
	Non - investment	73 131 714	133 495 304	58 795 937	10 061 260	127 941 583	247 785 305	2 529 541	131 931 840
TOTAL		73 631 714	133 495 304	58 795 937	10 061 260	992 206 844	248 420 617	2 529 541	132 448 840

GRANT SUBMISSIONS

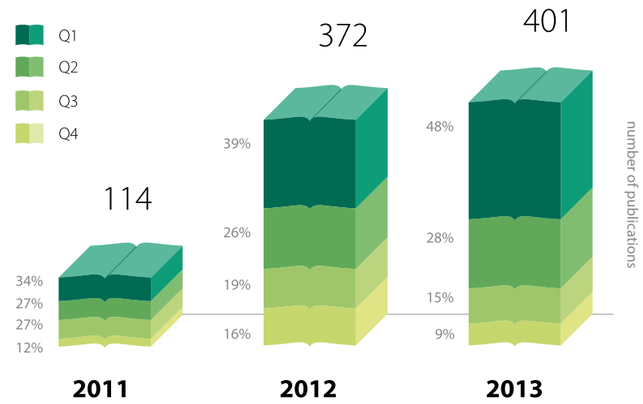
CEITEC has significantly increased the number of submitted project proposals. Although we are successful in attracting mainly national grants, the share of international grants and their financial volume are constantly increasing.

The figure shows the financial amount of grant submissions in 2013 and the amount of those approved as of 31 March 2014, distinguishing between national and international ones.



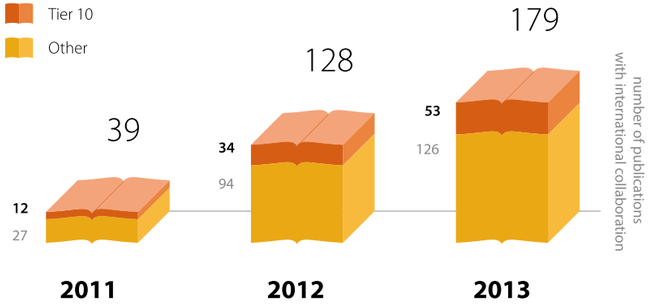
PUBLICATIONS

Number of publications divided according to their quartile rankings**



The number of CEITEC publications* has been steadily increasing since 2011 when the institute was established. The quantity and the quality is improving from year to year. In the first quartile** we have reached a great increase during the period – from 34 % of our publications in 2011 to 48 % in 2013. At the same time, the level of publications with lower impact decreased – from 39 % in 2011 to 24 % in last year in third and fourth quartile.

Number of publications with international collaboration



The data show that internationally collaborative publications, i.e. where CEITEC is not the only country of the affiliations in the author list, are more often in the best 10 % journals in their respective fields (Tier 10).

* Only the publications published at the Web of Science are included in the statistics.

** Quartile rankings are derived for each journal in each of its subject categories according to which quartile of the IF distribution the journal occupies for that subject category. Q1 denotes the top 25% of the IF distribution, Q2 for middle-high position (between top 50% and top 25%), Q3 middle-low position (top 75% to top 50%), and Q4 the lowest position (bottom 25% of the IF distribution).

CORE FACILITIES

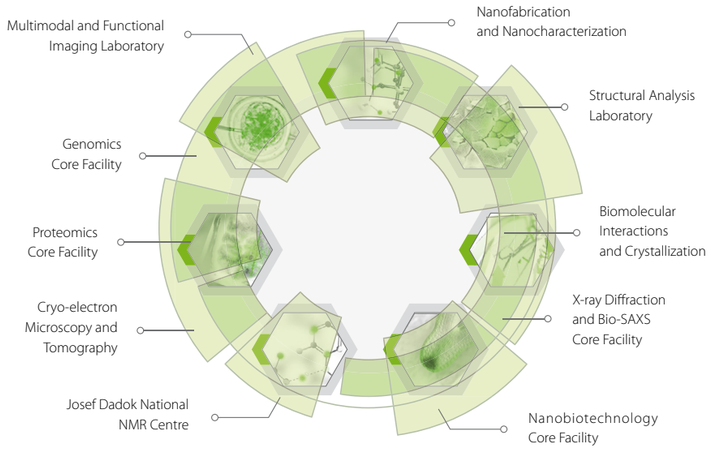
The CEITEC core facilities offer the research community access to cutting--edge equipment. Our goal is to be a central hub for shared resources that provide the academic and industrial scientific investigators the use of instrumentation and also technology development and services.

The core facilities are being established in two locations in Brno:

01 The campus of Masaryk University in Brno-Bohunice, the centre of life sciences and biomedicine, benefits from being near the Faculty Hospital and the INBIT Biotech incubator.

02 The Brno University of Technology campus in Brno Pod Palackého vrchem, the centre for material sciences and advanced technologies, neighbours the Czech Technology Park and INMEC innovation park.

CEITEC CORE FACILITY OVERVIEW



CEITEC OPEN ACCESS

All CEITEC core facilities are available to external users (academia and companies). Czech and international researchers from universities and research institutes interested in accessing core facilities can benefit from support of CEITEC – open access project funded by the Ministry of Education, Youth and Sports of the Czech Republic.

In 2013, **20 research projects** were implemented in frame of open access. In total, six projects were implemented by foreign researchers/institutions and 14 projects were implemented by Czech research institutions and universities. In terms of differentiating the type of users, 16 projects were implemented from the university environment and four projects from research centres. Total amount of 7 mil CZK was distributed to external users via open access.

CORE FACILITIES IN 2013

Nanofabrication and Nanocharacterization

David Škoda
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About facility

Core facility Nanofabrication and Nanocharacterization forms an essential part of the instrumental base for materials science and advanced technology research within CEITEC. To keep all related technologies and analysis methods close to each other, the equipment of the core facility is centralized into the one specially arranged laboratory. Depending on the fabrication and analyzis process the laboratories are separated into isolated rooms with appropriate cleanness (100 – 100 000).

News in 2013

New instruments were delivered, installed and are currently in operation:

01 UV Direct Write Laser system – Heidelberg Instruments DWL 66 FS

02 Scanning Electron Microscope/e-beam writer – Tescan Mira3 + Raith interferometric lithographic table

03 Wire Bonder TPT – HB16

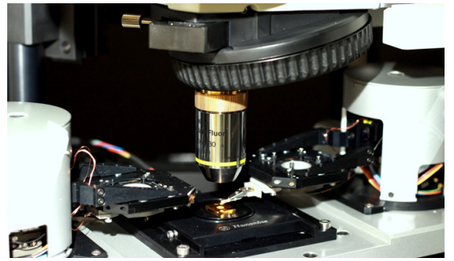
04 NIR/VIS/UV (VUV) Spectroscopic Ellipsometers – – J.A. Woolam IR-Vase, V-Vase

05 NIR/VIS/UV/(VUV) Optical spectrometry – Bruker

06 Scanning Probe Microscope + microRAMAN + + PhotoLuminiscence system - NT-MDT - NTegra Spectra, Solaris 3

07 Vacuum FTIR - Bruker - Vertex80v, Hyperion 3000

08 Scanning Near-Field Optical Microscope – – Nanonics – MV 4000



▲ Scanning Near-Field Optical Microscope - Nanonics - MV 4000

The core facility is equipped with the wide spectrum of instruments divided into three closely related parts: nano/micronanolithography processes, special nano/microfabrication processes and complex analysis of nano/microstructures (morphology, composition, structure and electrical, magnetic, and optical properties generally).

Structural Analysis Laboratory

Ondřej Man
Head of core facility
ondrej.man@ceitec.vutbr.cz

★ News in 2013

New instruments were delivered, installed and are currently in operation:

01 X-ray powder Diffractometer - Rigaku Innovative Technology – Rigaku SmartLab 3 kW

02 X-ray Diffractometer with rotating Cu anode - Rigaku Innovative Technology - Rigaku SmartLab 9 kW

About facility

The core facility of Structural Analysis Laboratory is equipped with top-class instruments for transmission and scanning microscopy, microanalysis, and X-ray diffraction analysis. Its priority is to focus on the study of the microstructure, submicrostructure and local chemical analysis of new advanced ceramic and polymer materials and composites based on those materials. Another research area is nanocrystalline thermal barrier coating prepared by thermal spray processing and materials with ultra-fine grain obtained via SPD (Severe Plastic Deformation), in particular by the ECAP method.

Biomolecular Interactions and Crystallization

Michaela Wimmerová
Head of core facility
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★ News in 2013

01 The analytical ultracentrifuge was upgraded by interference optics allowing analysis of a broader spectrum of samples.

02 The automatic system for isothermal titration calorimetry, Auto ITC200, became fully operational.

About facility

The core facility provides services leading to structure characterization of biomolecules and to study (bio)molecular interactions in a real time using mainly biosensor and calorimetry-based methods. It is equipped with the instrumentation to set up crystallization conditions of biomolecules and their complexes, basic characterization of physical properties of the molecules (analytical ultracentrifugation, dynamic light scattering, CD spectroscopy, differential scanning calorimetry), and to study thermodynamics and/or kinetics of interactions (isothermal titration calorimetry, surface plasmon resonance, CD spectroscopy, analytical ultracentrifugation).

The core facility is part of **Czech National Affiliated Centre of INSTRUCT.**

X-ray Diffraction and Bio-SAXS Core Facility

Jaromír Marek
Head of core facility
jaromir.marek@ceitec.muni.cz

★ News in 2013

The core facility was ceremonially opened on 13 September 2013. New instruments were delivered, installed and are currently in operation.:

01 Rigaku HighFlux HomeLab™ robotized macromolecular diffraction system with ACTOR sample changer optimized for work at Cu-K_α wavelength

02 Rigaku HighFlux HomeLab™ universal, dual wavelength (Mo-K_α and Cu-K_α) diffractometer

02 Rigaku BioSAXS-1000 SAXS camera for small angle X-ray scattering from solutions of biological macromolecules

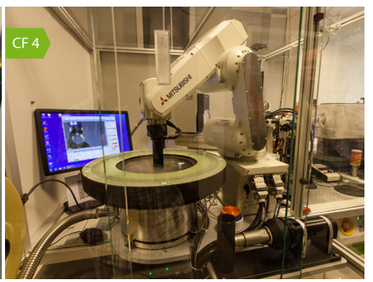
About facility

The core facility is equipped with top-class instruments for diffraction experiments with single crystal samples focused on determining the 3-D structure of (macro)molecules down to atomic resolution. Applicable molecular mass ranges from 10^2 up to 10^6, where the lower value covers molecules significant for nanotechnology, materials science or pharmacology and the upper limit covers biomacromolecules such as nucleic acids, proteins and their complexes. The core facility also provides for automated screening of crystallization conditions and optimisation of protein crystals growth.

The core facility is part of **Czech National Affiliated Centre of INSTRUCT.**

▲ **X-ray diffractometer** from Structural Analysis Laboratory

▲ **AutoITC** from Biomolecular Interactions and Crystallization core facility



▲ **Rigaku BioSAXS-1000** from X-ray Diffraction and Bio-SAXS core facility

Josef Dadok National NMR Centre

Radovan Fiala
Head of core facility
radovan.fiala@ceitec.muni.cz

★ News in 2013

01 On 23 January 2013, operations at the "Josef Dadok National NMR Centre" core facility were ceremonially launched.

02 NMR spectrometer for high-resolution spectroscopy in liquids with 850 MHz magnet and cryoprobe (AVANCE III TM 850 MHz) was delivered, installed and is currently in operation.

03 From 27 June 2013 is the core facility in full operation with all instrumentation.

About facility

The core facility provides for investigation of biomolecular structure and dynamics by NMR spectroscopy, and the development of novel methodologies for biomolecular NMR spectroscopy (the development of new pulse sequences with improved sensitivity and resolution, the development of methods providing additional structural restraints, the improvement of strategies for three-dimensional structure calculations and analysis of relaxation data in terms of biomolecular dynamics).

The Core Facility is part of **Czech National Affiliated Centre of INSTRUCT**.

▲ **NMR spectrometers** from Josef Dadok National NMR Centre

Cryo-electron Microscopy and Tomography

Jürgen Plitzko
Head of core facility
juergen.plitzko@ceitec.muni.cz

★ News in 2013

New instruments were purchased:

01 Transmission electron microscope 300 kV

02 Transmission electron microscope 200 kV

About facility

Modern electron microscopy in structural biology on a cellular and molecular level is performed by cryo-electron microscopy and cryo-electron tomography. Cryo-electron tomography (cryo-ET) is the only method to address pleiomorphic structures such as cells and organelles in a close to native state, while cryo-electron microscopy (cryo-EM) is applied to the study of single particles, primarily larger macromolecular complexes, which have been isolated and purified by biochemical methods. Both methodologies provide information on the cellular and molecular level and are therefore ideal for in-depth structural-functional analysis in combination with state of the art biochemical characterisation. The main activities of the core facility will be centred on the application of cryo-EM and cryo-ET, implementation of the required image processing capabilities, and exploration of suitable cryo-preparation techniques.

The Core Facility is part of **Czech National Affiliated Centre of INSTRUCT**.

▲ FEI Titan Krios (300 kV) with FEI Eagle CCD (top)
FEI Tecnai F20 (200 kV) with FEI Falcon DDD (bottom)

Proteomics Core Facility

Zbyněk Zdráhal
Head of core facility
zbynek.zdrahal@ceitec.muni.cz

News in 2013

01 New hybrid mass spectrometer Qtrap 6500 for targeted proteomics was installed in January

02 Joint proteomics meeting with colleagues from proteomic lab of Medical University of Vienna was organised in December

02 More than 4000 samples were processed in 2013

About facility

The core facility provides services in the field of mass spectrometry-based proteomics. Activities of the core facility cover all the steps of proteomic analysis – protein isolation, separation of protein mixtures, protein characterisation by mass spectrometry and bioinformatic data processing.
The core facility provides the academic community and other subjects with access to advanced proteomic technologies based on shared resources and highly trained staff.

The Core Facility is part of **Czech National Affiliated Centre of INSTRUCT**.

Genomics Core Facility

Boris Tichý
Head of core facility
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News in 2013

The core facility was ceremonially opened on 25 September 2013. New instruments were delivered, installed and have been put into operation.

01 Cell analysis system – Olympus Scan^R

02 Benchtop "next-gen" sequencers – Roche GS Junior and Illumina MiSeq

03 qPCR machines – Roche LC480

About facility

Main activities of the core facility include application of new high-throughput methods in basic and applied research, and the development and optimisation of methods for genomic analyses.
The core facility offers a combination of high-end equipment and expertise for the complete experimental workflow from advanced sample preparation to complex genome analysis. Precise sample preparation techniques (cell sorting, microdissection) followed by a combination of various complementary approaches in the analysis of the genome (massive parallel sequencing, microarrays, quantitative PCR) will make it possible to perform even very complex experimental designs, including single cell genomics or diseased vs. healthy cells genome and transcriptome analyses.

The Core Facility is part of **Czech National Affiliated Centre of INSTRUCT**.

Multimodal and Functional Imaging Laboratory

Ivan Rektor
Head of core facility
ivan.rektor@ceitec.muni.cz

News in 2013

01 Tenders for almost all equipment were started. Some of them were finished in the end of 2013 and at the beginning of 2014.

About facility

The core facility provides for methodologies for in vivo magnetic resonance imaging (MRI) and magnetic resonance spectroscopy (MRS) of human, animal and plant tissues with spatial resolution reaching to 0.25 mm, with the main application in functional (fMRI) and multimodal imaging (combination of electrophysiology with MRI) of the brain.

Basic as well as applied research in medicine (human and animal) including pharmacology, molecular and cell biology requires in vivo insight into live organs and tissues as a very important part of a multi-level and multidisciplinary approach. Modern MRI methods make it possible not only to visualise the anatomical structures of living things, but also to discover their functional organisation and the chemical mechanisms underlying health and disease. Currently, effort is being put into tracking their dynamics, to multimodal imaging (such as by combining MR with electrophysiology or transcranial magnetic stimulation), and to visualizing biological processes at the cellular and molecular levels using molecular MRI by employing targeted contrast agents, spectroscopic imaging, diffusometry or relaxometry. The intended infrastructure will be also used for technological and methodological research aiming to improve existing imaging methods or to develop new methods and data processing strategies for the study of animate as well as inanimate matter, thus establishing a bridge between the life and material sciences.

The core facility aspires as a node of **EuroBioImaging consortium**.

▲ **LC-MS/MS system with high resolution mass spectrometer Orbitrap Elite** from Proteomics core facility

▲ **Ilumina MiSeq** from Genomics core facility

▲ **EGI High Density EEG system** from Multimodal and Functional Imaging Laboratory

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