

# CEITEC BUT Launched Full Operation of Laboratories



# CEITEC

Central European Institute of Technology  
BRNO | CZECH REPUBLIC

## NEWSLETTER AUTUMN 2016

Dear CEITEC friends,

The seeds that have been planted many years ago, are now maturing and bearing fruit. CEITEC which was built through a grant from the European Commission's Structural Funds, had to overcome an important hurdle faced by many such recent projects, which saw very expensive equipment not being utilized in the peripheral countries of Europe. The key next step on this trajectory is to give talented scientists the freedom to make discoveries, create an environment where ideas are exchanged, and having scientists with international experience help to shape a critical mass. CEITEC is now starting on the path towards reform of the internal scientific culture which should lead to further energize its science.

As a testament to our progress, the contents of this newsletter highlight many important achievements, such as the founding of our first spin-off company.

One of the original promises for the creation of CEITEC was to spur innovation in the region of South Moravia, and NenoVision is an example of this promise fulfilled. Further, we have made several high-level discoveries from across the spectrum of biology and physics, which have been published in this last period - congratulations goes to the authors. Additionally, EU-Life, of which we are proud to be a member, has taken a big step forward in being admitted to the European Open Science Policy Platform. This will allow the members of EU-Life, and by extension CEITEC, to have a voice in shaping the Open Science agenda.

Please enjoy this update, and thank you for your continued interest and support in making CEITEC a research organization for high-end science in the Czech Republic.

**Markus Dettenhofer**

*Executive director of CEITEC*

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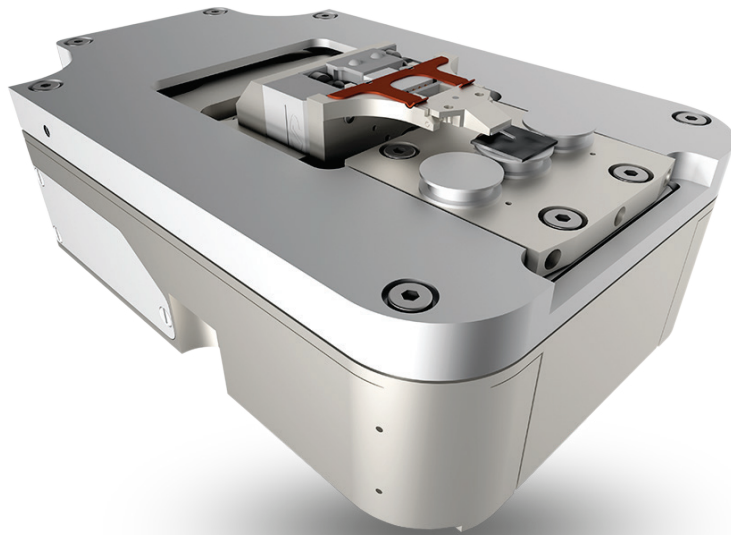
## CEITEC NEWS

### Scientists from CEITEC BUT have founded the first spin-off company. It offers an accessory for electron microscopes


Scientists and doctoral degree students from CEITEC BUT have set up the first spin-off company. Called NenoVision, it will offer an accessory for electron microscopes which, by using the principle of atomic-force microscopy, expands the possibilities of an electron microscope by 3D imaging with a depth analysis of the relief of a measured sample. The spin-off company NenoVision has signed

a licence contract with BUT for the use of the developed know-how and is thus prepared to negotiate with world players in the field of electron microscopy. This way CEITEC BUT has confirmed not only its strong position in basic research but also its ability to commercialize the outputs of research and development. 

More information [HERE](#)



### Genetic Testing for Fetal Health

Down syndrome is among the most common genetic disorders caused by an incorrect number of chromosomes. Standard tests performed between the first and the second trimester of pregnancy can result in false-positive results, causing many women to be worried about the health of their babies. Ceitec MU has recently been accredited to offer a new and non-invasive test of three fetal genetic disorders to those who are interested. 

More information [HERE](#)





## EU-LIFE nominated member of the European Open Science Policy Platform

EU-LIFE (where CEITEC is the only Eastern European member) nominated for the new Open Science Policy Platform at the European Commission. The Directorate-General for Research and Innovation at the European Commission established a Commission Advisory Group to provide advice about the development and implementation of open science policy in Europe. [↻](#)

More information [HERE](#)

## Pavel Bělobrádek, Czech Deputy Prime Minister for Science, discussed development of science at CEITEC

In the middle of June the Deputy Prime Minister for Science, Research and Innovation Pavel Bělobrádek discussed on the development of science and research support in the following years with representatives of universities, research institutes, scientists and representatives from industry in the premises of Ceitec Masaryk University. [↻](#)

More information [HERE](#)



## Great to live in Brno

Mid-year position of Brno in the [Quality of Life Index](#) 2016 shows that it is great to live here! Only 40 cities have a higher position worldwide. Brno is no. 1 among Czech cities (and 12th in Europe with plenty of fantastic cities behind). The Czech Republic is also the 6th safest country worldwide. [↻](#)

More information [HERE](#)



## RESEARCH

### Rare genetic disorder connected with pulmonary diseases in children

Scientists from the group Chromatin Molecular Complexes headed by Assoc. Prof. Jan Paleček have participated in a significant international study revealing a rare genetic disorder connected with pulmonary diseases in children.

An international team of scientists concentrated mainly at the University Medical Center in Utrecht (Belgium), University of Sussex (UK) and Baylor College of Medicine (USA) has revealed, based on a case of two families with two children, a rare syndrome of chromosome damage causing fatal pulmonary infections with children of about one year old. Children with this genetically conditioned syndrome have damaged proteins in their cells which slow down the normal process of chromosome repair. The group Chromatin Molecular Complexes from CEITEC

MU also participated in this long research. "We have managed to discover how protein damage influences its binding property," Assoc. Prof. Paleček describes the contribution of his team. "This way we helped our colleagues to explain what happened in the cells of the diseased children."

There is no prevention against this unique disease yet and the authors of the study hope that the publication of the material will help identify other patients, so that not only this syndrome can be explored further, but also other syndromes of chromosome damage in human cells in general. [↻](#)

*More information* [HERE](#)

### Team from X-ray computer micro and nanotomography laboratory helped to explain the formation of the face

3D models which help to explain the formation and mechanisms of the growth of the face, which have not been described in detail in literature as yet, were described by Swedish developmental biologists headed by Assoc. Prof. Igor Adameyko from Karolinska Institutet together with scientists from CEITEC BUT in their publication. The publication is the result of long-term and intensive cooperation. The final appearance of an adult face is influenced by mechanisms as early as during their embryonic development. Each abnormality in this phase influences not only the shape, but also functionality and possible pathological conditions. The research is being carried out mainly on mouse embryos. Scientists from the laboratory of X-ray computer micro and nanotomography are able to image in a non-destructive way by means of tomography not only cartilage, above which other skeletal elements are developed, but also other anatomical structures. Thanks to special methods, they are able to image soft tissue with the resolution of up to approximately one micrometre. Currently they are also cooperating with Swedish biologists on other interesting projects. [↻](#)

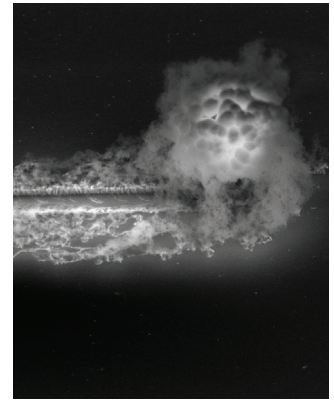


*More information* [HERE](#)

## Fruitful cooperation of CEITEC and FEI

CEITEC BUT and FEI, together with University of Technology Sydney explain why a wide range of morphologies is observed when silicon oxide nanowires are grown on silicon substrates using liquid gallium catalyst droplets. An article „Silicon oxide nanowire growth mechanisms revealed by real-time electron microscopy“ was published in a high impact peer reviewed journal *Nanoscale*. [📄](#)

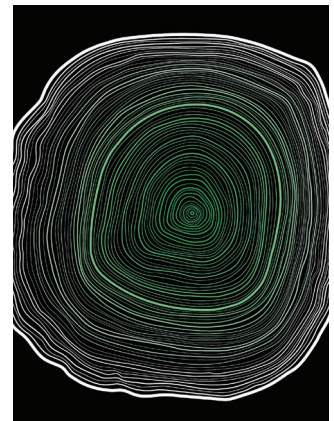
More information [HERE](#)



## NATURE published how mutations interact within a protein coding gene

A team of biologists from CEITEC Czech Republic (Dmitry M. Chudakov), Russia, Israel, USA, and Spain systematically measured how mutations interact within a protein coding gene. They studied tens of thousands of mutants of the green fluorescent protein from the jellyfish *Aequorea victoria*. The results, published in the journal *Nature*, uncover mechanisms of protein evolution and deepen our understanding of why effects of mutations are dependent on the genetic context in which they occur. [📄](#)

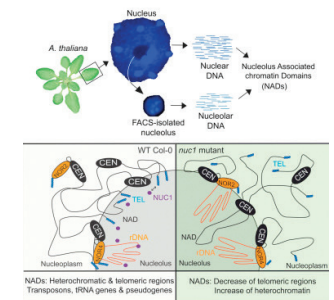
More information [HERE](#)



## The plant nucleolus arranges chromosomes

A team from CEITEC and Université Perpignan, France, recently published an open access article in *Cell Reports*. To evaluate the effect of the nucleolus in plant genome organization, Pontvianne et al. identify nucleolus-associated chromatin domains (NADs) in *A. thaliana* leaves. NADs are enriched in regions displaying heterochromatic signatures. The team with scientists from CEITEC find roles for Nucleolin 1 (NUC1) and the nucleolus in the spatial organization of chromosomes and also in telomere maintenance. [📄](#)

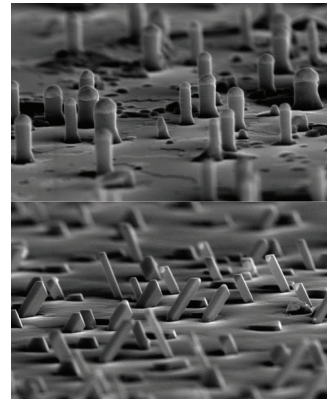
More information [HERE](#)



## Way for manipulating the growth direction of semiconducting nanowires

Nanostructures made of semiconducting materials are commonly prepared using two deposition techniques, either from the gas phase (called chemical vapor deposition, CVD) or solid phase (molecular beam epitaxy, MBE). The growth of semiconducting one-dimensional nanostructures (nanowires) was previously successfully demonstrated utilizing both approaches, however, yielding different results in terms of nanowire morphology and growth direction. In contribution of Miroslav Kolibal's team utilizing real time electron microscopy and spectroscopy experiments during growth, they show that the main difference between the two growth techniques is the presence of atomic hydrogen in the environment. Their results pave the way for manipulating the growth direction of semiconducting nanowires, which is a key step towards their implementation into future 3D nanoelectronics. [🔗](#)

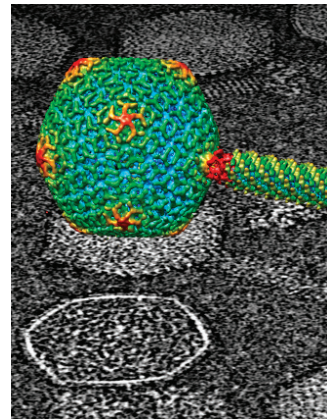
More information [HERE](#)



## Therapeutical use of bacteriophages

Resistance to antibiotics is widespread among pathogenic bacteria, including *Staphylococcus Aureus*, which cause serious human diseases. One of promising alternatives in such cases is phage therapy – therapeutical use of bacteriophages (the viruses of bacteria). The team of Pavel Plevka determined structure and the mechanism of genome delivery for polyvalent staphylococcal bacteriophage phi812K1-420 using cryo-electron microscopy. They show that binding of phage phi812 to the *S. Aureus* cell wall requires significant reorganization in its baseplate which include 210° rotation of its receptor-binding complexes. Moreover, they have for the first time described a two step mechanism controlling release of the phage DNA into the host cell which might be a common feature for other phages from the family *Myoviridae*. [🔗](#)

More information [HERE](#)



## INTERVIEW

### Edgar Benjamin Montufar is one of the six CEITEC SoMoPro project holders

Edgar Benjamin Montufar Jimenez is one of six researchers from CEITEC, who acquired a [SoMoPro](#) grants this year. The researcher of Mexico origin was awarded a grant until March 2019. SoMoPro programme aims to attract top-class scientists from abroad to the research institutions in the region of South Moravia and covers the research costs as well as personal expenses. Next call will open in autumn 2016.

#### *Edgar, please describe your route to CEITEC?*

In 2014, I met associate professor Ladislav Čelko (research group Materials Characterization and Advanced Coatings), when we visited a commune collaborator in Mexico City, Professor Sebastian Dias de la Torre. At that time I was looking for the possibility to attain an independent research position and coincidentally professor Čelko was planning to extend his research topics to biomaterials. That's why he invited me to be part of his research line. After a couple of visits, when I had the opportunity to see the career and research opportunities that we have at CEITEC and also to know the wonderful city of Brno (arts, sports, nature and the commodities of a city in one place), I decided to accept his offer.

#### *You was awarded a SoMoPro Grant. Why did you apply for this grant specifically?*

Because it was one of the most promising alternatives to achieve my objectives. SoMoPro grant specifically supports researchers to integrate in the South Moravian research institutions. Fortunately, I was awarded with the grant and I expect to consolidate my career within CEITEC with its support.

#### *Could you describe your project and explain its outcomes?*

The project of the grant, MatProcessing-4-Medicine, is focused in combine advanced materials with high technology processing methods to obtain structures that recover or regenerate the function of damaged bones. To be more specific, MatProcessing-4-Medicine involves two main research lines: 1) additive manufacturing of scaffolds for bone tissue engineering and 2) fabrication of ceramic-metallic biodegradable composites for orthopaedic implants.

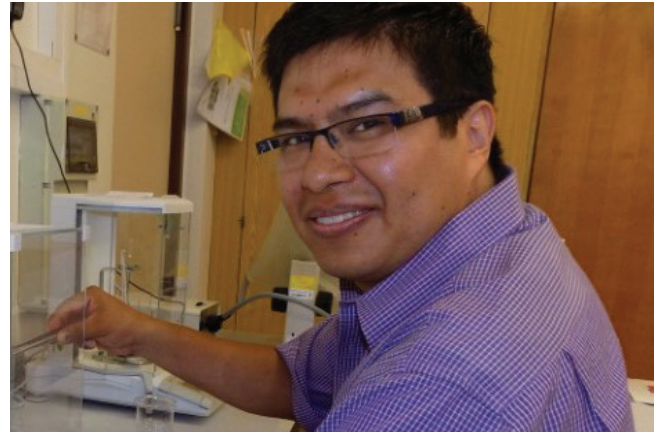
#### *SoMoPro grants promote the development of science and region. Does you project follow this direction as well?*

Of course, one of the aims of the project is to work in direct contact with the South Moravian industry and clinicians to open new prospects for existing and new biomedical devices.

Furthemore, I do prepare a future activities as free seminars and workshops for public. I invite everyone to visit the web page of the project (<https://www.ceitec.eu/matporcessing/>) where I include all necessary information.

This project (or This result/This equipment is part of the project that) has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie Action and it is co-financed by the South Moravian Region under grant agreement No. 665860.


This text reflects only the author's view and the EU is not responsible for any possible use of the information contained herein.

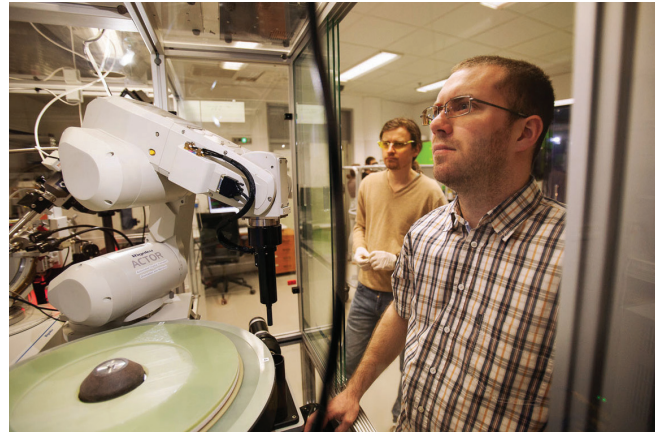




## INFRASTRUCTURE

### Intensifying cross border cooperation between core facilities from CEITEC and VBCF

Growing number of cross border users, visibility, new services, and training in specialist skills. These are goals of long term but also of the recently started project from Interreg CZ-AT programme. The first motivation for cooperation was missing high-end equipment one or the other side and complementarity of services provided. Direct access to national users and possibility to share contact and experiences and improved provided services are the most appreciated benefits of the project. All project partners, CEITEC, VBCF, ICRC and IST Austria, have 3 years to learn, to cooperate and to work hard to move core facilities closer to external users. 




### Get a granted access to CEITEC Core Facilities thanks to the open calls for measurement within the research infrastructure projects!

CEITEC is a part of 6 national research infrastructures which provides an open access to a wide range of technologies and expertise to all scientists from the Czech Republic and abroad:

ELIXIR-CZ; EATRIS-CZ; National Centre for Medical Genomics (NCMG); Czech-Biolmaging; Czech Infrastructure for Integrative Structural Biology (CIISB); CEITEC Nano

Call for scientific projects was already opened within the research infrastructure Czech-Biolmaging, which part is the Core Facility Multimodal and Functional Imaging Laboratory (MAFIL) and new emerging Core Facility Cellular Imaging.

Czech Infrastructure for Integrative Structural Biology (CIISB) covers Core Facilities of Structural Biology Research Programme (Josef Dado National NMR Centre, X-Ray Diffraction and Bio-SAXS, Biomolecular Interactions and Crystallization, Nanobiotechnology, Cryo-electron Microscopy and Tomography) and Proteomics. Call for proposal submission in 2016 is opened till 31<sup>st</sup> October 2016. 

### CEITEC Nano Core Facility new webpage

CEITEC Nano provides self-service open access to all academic users.

New users can register at any time at [www.nano.ceitec.cz](http://www.nano.ceitec.cz) 





## PAST EVENTS

### Brno has proved to be the leader in the area of electron microscopy. CEITEC has attracted the top European scientists

An international two-day meeting of researchers and companies involved in electron microscopy DACH FIB WORKSHOP was organised by CEITEC on 27<sup>th</sup> and 28<sup>th</sup> June 2016. It was the first time in eleven years that this event left the traditional DACH countries (Germany, Austria, Switzerland) and moved to Brno. About one hundred and twenty specialists, especially physicists, had a possibility to discuss particular topics leading to further development and the transfer of research and development results directly into practice. CEITEC and Brno proved to have a strong position among other international countries in the field of nanotechnologies. 



More information [HERE](#)



### Unique conference organised in Brno with a great success

Great success of the first of series of ERA Chair conference – Nucleic Acids and Immunity. During the first week of September the leaders in the field of Nucleic Acids and Immunity met in Brno, Czech Republic. This event was partly unique as scientist from these two specific areas meet rarely. You can get the feel of the conference from the photo gallery and can make a date for the next year 4<sup>th</sup>–6<sup>th</sup> June 2017.

Photo-gallery [HERE](#)





## UPCOMING EVENTS

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### Life Science Seminar Series

**WHEN:** Thursday, 16:00 (or 17:00 if organised in Mendel Museum)

**WHERE:** University campus Bohunice and Refectory of the Augustinian Abbey, Mendel Museum

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### Welcome & Info PhD Day

**WHEN:** September 21, 2016

**WHERE:** University Campus Bohunice

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### Seminar: Biofabrication

**WHEN:** November 25, 2016

**WHERE:** CEITEC-BUT, Purkynova 123, Brno

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### Workshop Auxin: Get Together in Brno

**WHEN:** November 10–12, 2016

**WHERE:** CEITEC MU, Kamenice 5, Brno

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## SELECTED RESENT PUBLICATIONS

### ADVANCED NANOTECHNOLOGIES AND MICROTECHNOLOGIES

**UHLIROVA, H.;** KILIÇ, K.; TIAN, P.; THUNEMANN, M.; DESJARDINS, M.; SAISAN, P.; SAKADZIC, S.; NESS, T.; MATEO, C.; CHENG, Q.; WELDY, K.; RAZOUX, F.; VANDENBERGHE, M.; CREMONESI, J.; FERRI, C.; NIZAR, K.; SRIDHAR, V.; STEED, T.; ABASHIN, M.; FAINMAN, Y.; MASLIAH, E.; DJUROVIC, S.; ANDREASSEN, O.; SILVA, G.; BOAS, D.; KLEINFELD, D.; BUXTON, R.; EINEVOLL, G.; DALE, A.; DEVOR, A. 2016: Cell type specificity of neurovascular coupling in cerebral cortex. *ELIFE* **5**, e14315

**SIMSIKOVA, M.;** **BARTOS, M.;** **CECHAL, J.;** **SIKOLA, T.**, 2016: Decolorization of organic dyes by gold nanoflowers prepared on reduced graphene oxide by tea polyphenols. *CATAL SCI TECHNOL* **6** (9), p. 3008-3017

### ADVANCED MATERIALS

**SPUSTA, T.;** SVOBODA, J.; **MACA, K.**, 2016: Study of pore closure during pressure- less sintering of advanced oxide ceramics. *ACTA MATERIALIA* **115** (1), p. 347-353

MYNAR, Z.; **VESELY, L.;** **VACLAVEK, P.**, 2016: PMSM Model Predictive Control with Field Weakening Implementation. *IEEE TRANSACTIONS ON INDUSTRIAL ELECTRONICS* **63** (8), p. 5156-5166

### STRUCTURAL BIOLOGY

**NOVACEK, J.;** **SIBOROVA, M.;** BENESIK, M.; PANTUCEK, R.; DOSKAR, J.; **PLEVKA, P.**, 2016: Structure and genome release of Twort-like Myoviridae phage with a double-layered baseplate. *P NATL ACAD SCI USA* **113** (33), p. 9351 - 6

### GENOMICS AND PROTEOMICS OF PLANT SYSTEMS

HAFIDH, S.; **POTESIL, D.;** FILA, J.; CAPKOVA, V.; **ZDRAHAL, Z.;** HONYS, D, 2016: Quantitative proteomics of the tobacco pollen tube secretome identifies novel pollen tube guidance proteins important for fertilization. *GENOME BIOL* **17**, 81

**PERNISOVA, M.;** **PRAT, T.;** GRONES, P.; HARUSTIAKOVA, D.; **MATONHOVA, M.;** SPICHAL, L.; **NODZYNSKI, T.;** FRIML, J.; **HEJATKO, J.**, 2016: Cytokinins influence root gravitropism via differential regulation of auxin transporter expression and localization in Arabidopsis. *NEW PHYTOL*. [Epub ahead of print]

### MOLECULAR MEDICINE

SARKISYAN, KS; BOLOTIN, DA; MEER, MV; USMANOVA, DR; MISHIN, AS; SHARONOV, GV; IVANKOV, DN; BOZHANOVA, NG; BARANOV, MS; SOYLEMEZ, O; BOGATYREVA, NS; VLASOV, PK; EGOROV, ES; LOGACHEVA, MD; KONDRASHOV, AS; **CHUDAKOV, DM.;** PUTINTSEVA, EV; MAMEDOV, IZ; TAWFIK, DS; LUKYANOV, KA; KONDRASHOV, FA, 2016: Local fitness landscape of the green fluorescent protein. *NATURE* **533** (7603), p. 397-401

**PAVLASOVA, G**; BORSKY, M; **SEDA, V**; **CERNA, K**; OSICKOVA, J; **DOUBEK, M**; **MAYER, J**; CALOGERO, R; TRBUSEK, M; **POSPISILOVA, S**; DAVIDS, MS; KIPPS, TJ; BROWN, JR; **MRAZ, M**, 2016: Ibrutinib inhibits CD20 up-regulation on CLL B cells mediated by the CXCR4/SDF-1 axis. *BLOOD*. [Epub ahead of print]

## BRAIN AND MIND RESEARCH

**REKTOR, I**; **DOLEZALOVA, I**; **CHRISTINA, J**; JURAK, P; HALAMEK, J; BALAZ, M; BRAZDIL, M, 2016: High-Frequency Oscillations in the Human Anterior Nucleus of the Thalamus. *BRAIN STIMUL* **9** (4), p. 629-631

**ZEMANKOVA, P**; LUNGU, O; HUTTLOVA, J; KERKOVSKY, M; ZUBOR, J; LIPOVA, P; **BARES, M**; **KASPAREKA, T**, 2016: Neuronal substrate and effective connectivity of abnormal movement sequencing in schizophrenia. *PROG NEURO-PSYCHOPH* **67**, p. 1-9

## MOLECULAR VETERINARY MEDICINE

**PLASIL, M**; MOHANDESAN, E; FITAK, RR; MUSILOVA, P; KUBICKOVA, S; BURGER, PA; **HORIN, P**, 2016: The major histocompatibility complex in Old World camelids and low polymorphism of its class II genes. *BMC GENOMICS* **17**, 167

CERVENA, B; BRANT, SV; FAIRET, E; SHIRLEY, MH; PETRZELKOVA, KJ; **MODRY, D**, 2016: Schistosoma mansoni in Gabon: Emerging or Ignored? *AM J TROP MED HYG*. [Epub ahead of print]



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