## Meeting with Group Leaders:

January 18, 2016

Zdenek Hostomsky

### Agenda

- Introduction for 2016
- Schedule of Mtgs w GLs for 2016
- Financing of Research-Service groups
- Operational program OP VVV Iva Pichová
- The CAS Evaluation of IOCB 2010-2014
- Pavel Hobza
- BI Update Luboš Rulíšek
- HR Update Aranka Rozinková
- ITS Update Jiří Polách
- New head of Waste Management Lukáš Rynda
- Next events
- Lazar Lab opening
- Discussion



### 2016 Meeting Schedule

- January 18
- February 15
- March 21
- April 25
- May 23

- June 27
- September 5
- October 10
- November 14
- December 12

More frequent than in previous years:

- 2013 6 mtgs
- 2014 8 mtgs
- 2015 8 mtgs

#### Research-Service Groups 2016



- NMR and Molecular Spectroscopy
- Mass Spectrometry
- Biochemical Pharmacology
- Virology
- Bioinformatics
- Medicinal Chemistry



(apply gradual reduction test - e.g. Temporary leave - does it need a substitute?)

## Research-Service groups - 2016



Group	Research	Service
NMR+Molecular Spectroscopy (David Šaman)	2.5	8.8 5.5 NMR 3.3 MolSpec
Mass Spectrometry (Josef Cvačka)	4.3	6.1
<b>Biochemical Pharmacology</b> (Helena Mertlíková Kaiserová)	5.4	4.0
<b>Virology</b> (Jan Weber)	4.1	4.2
<b>Bioinformatics</b> (Jiří Vondrášek)	1.5	2.3
Medicinal Chemistry (Pavel Majer)	4.0	<b>6.0</b> (+ 4.0 SWAT)
Total	21.8	53.2

## **Operational Program OP VVV**

#### Preparing a proposal for IOCB

Iva Pichová

### **Operational Program OP VVV**



- OP Research, Development and Education
- Strengthening of research excellence an opportunity for IOCB
- A single consolidated IOCB project: Chemical Biology Reaching Undruggable Targets for New Therapies
- January 31 deadline: submit a short proposal if you want to participate

Evaluation of the Research and Professional Activities of the Institutes of the Czech Academy of Sciences for 2010-2014

 Phase II - Final reports from 3 Commissions have been received and distributed

- January 22 deadline: comment back to the Commissions
  - Accept with no objections
  - Request a reconsideration of the report

#### Pavel Hobza

#### 2015 Highly Cited Researcher



The **Thomson Reuters** Highly Cited Researchers are selected based on their number of highly cited papers they produced over the 11 year period, 2003-2013, in each of some 21 broad fields used in Essential Science Indicators

Ranked among the top 1% of the most cited researchers in their specific field - Chemistry

(as one of only 4 scientists from the Czech Republic - the others are Petr Pyšek and Vojtěch Jarošík in Environment/Ecology) and Petr Widimský in Clinical Medicine)



# **IOCB Board Update**

2015 Annotated Results

Luboš Rulíšek

#### Why does sodium explode in water?



A dangerous but among school kids all-time favorite experiment demonstrating an explosive chemical reaction is throwing a piece of sodium in water. Every high school chemistry teacher knows that the explosion is due to release of electrons from the metal to water accompanied by formation of steam and molecular hydrogen, which can ignite during this exoergic process. The very same gases should, however, separate the reacting metal and water and thus quench the reaction. How come that the explosion occurs anyway? Using ultrafast cameras and molecular simulations researchers at the Institute of Organic Chemistry and Biochemistry of the Academy of Sciences in collaboration with colleagues at the Technical University Braunschweig discovered a hitherto unknown primary mechanism of the explosive behavior of alkali metals in water.

**Figure:** Snapshots from an ultrafast camera show the primary stages of the explosion of a sodium/potassium alloy drop in water.

**Reference:** Mason, P.; Uhlig, F.; Vanek, V.; Buttersack, T.; Bauerecker, S.; Jungwirth, P.: Coulomb Explosion during the Early Stages of the Reaction of Alkali Metals with Water. *Nature Chemistry* **2015**, *7*, 250.

# Triggering HIV polyprotein processing by light using rapid photodegradation of a tight-binding protease inhibitor



HIV protease is necessary for the maturation and infectivity of the virus. However, the molecular mechanism of its activation have not been analyzed in detail. In our paper we describe the development of a potent and specific inhibitor of HIV protease that can be degraded by light. We have prepared the virus in the presence of the inhibitor and showed the viral processing can be rapidly triggered by laser light. We can thus analyze the timing, regulation and spatial requirements of viral processing in real time.

**Reference:** Schimer, J., Pávová, M., Anders, M., Pachl, P., Šácha, P., Cígler, P., Weber, J., Majer, P., Řezáčová, P., Kräusslich, H.-G., Müller, B. and Konvalinka, J.: Triggering HIV polyprotein processing by light using rapid photodegradation of a tight-binding protease inhibitor. *Nature Commun.* **2015**, *6*, 6461.

#### An Ultimate Stereocontrol in Asymmetric Synthesis of Optically Pure Fully Aromatic Helicenes



Helicity plays an important role in various fields of science. Helicenes, as perfect examples of helical molecules, have been extremely difficult targets for stereoselective synthesis for more than half a century. Now, the researchers at IOCB ASCR have discovered how to prepare optically pure helicenes from simple starting materials combining bio- and transition metal catalysis. It opens a range of opportunities for developing helicene-based catalysts and materials.

**Reference:** M. Šámal, S. Chercheja, J. Rybáček, J. Vacek Chocholoušová, J. Vacek, L. Bednárová, D. Šaman, I. G. Stará, I. Starý: An Ultimate Stereocontrol in Asymmetric Synthesis of Optically Pure Fully Aromatic Helicenes *J. Am. Chem. Soc.* **2015**, *137*, 8469–8474.

#### Transfer of Chiral Information Mediated by a Silver Nanomaterial



Scientists from Universities of Manchester, Strathclyde, Chemistry and Technology Prague, and Institute of Organic Chemistry and Biochemistry AS CR in a joint report announce detection of ribose and tryptophan molecules through functionalized silver nanoparticles and Raman spectroscopy. The technique can recognized chiral molecules, i.e. those having the left- and right-hand symmetry, which opens a way for applications in analytical chemistry, biology, or medicine. For example, many teams work on a diagnosis of mutated tissues using spectroscopic methods, which is often faster and more reliable than classical examinations.

**Figure:** Functionalized silver particles can "report" chiral molecules in vicinity via spectroscopy of "Raman optical activity"

**Reference:** Pour, S. O.; Rocks, L.; Faulds, K.; Graham, D.; Parchansky, V.; Bour, P.; Blanch, E. W.: Through-space transfer of chiral information mediated by a plasmonic nanomaterial. *Nature Chemistry* **2015**, *7*, 591-596.

# A single amino acid change in a female moth enzyme is responsible for the production of new sex pheromones



**Figure:** Pupa of the tobacco hornworm moth *Manduca sexta*.

A new evolutionary mechanism of pheromone components of moths was discovered. A single amino acid residue in desaturases – enzymes that introduce double bonds - of the tobacco hornworm Manduca sexta switches the desaturase products from monoand di-unsaturated to tri-unsaturated sex pheromone precursors. The desaturase producing mono- and diunsaturated pferomone precursors is present also in related silkworm females (*Bombyx mori*); duplication and mutation of this desaturase could be responsible for the development of Manduca sexta from a common ancestor. The susceptibility of desaturases to major shifts in their specificities, due to minor mutations, may significantly contribute to the divergence in moth pheromone communication and so lead to the evolution of new insect species.

**Reference:** Buček A, Matoušková P, Vogel H, Šebesta P, Jahn U, Weißflog J, Svatoš A, Pichová I.: Evolution of moth sex pheromone composition by a single amino acid substitution in a fatty acid desaturase. *Proc. Natl. Acad. Sci. U. S. A.* **2015**, *112*, 12586.

# The Scope of Direct Alkylation of Gold Surface with Solutions of C1 - C4 *n*-Alkylstannanes



Treatment of cleaned gold surfaces with THF or  $CHCl_3$  solutions of tetraalkylstannanes (alkyl = methyl, ethyl, *n*-propyl, *n*-butyl) or *n*-Bu<sub>2</sub>SnOTs<sub>2</sub> under ambient conditions causes a selflimited growth of disordered monolayers consisting of alkyls and tin oxide. Extensive use of deuterium labeling showed that the alkyls originate from the stannane and not from ambient impurities. Methyl groups attached to the Sn atom are not transferred to the surface. Ethyl groups are transferred slowly, and propyl and butyl rapidly. In all cases, tin oxide is codeposited in submonolayer amounts.

**Reference:** Kaletová, E.; Kohutová, A.; Hajduch, J.; Kaleta, J.; Bastl, Z.; Pospíšil, L.; Stibor, I.; Magnera, T. F.; Michl, J.: The Scope of Direct Alkylation of Gold Surface with Solutions of C1 - C4 *n*-Alkylstannanes. *J. Am. Chem. Soc.* **2015**, *137*, 12086-12099.

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# Human Resources

Aranka Rozinková





#### Ph.D. Science Club

#### Job postings on <u>naturejobs.com</u>

#### • Ph.D. mailing list



## Ph.D. Science Club - we are ready to go!



Ph.D. Science Club IOCB Prague Wednesday's Seminars

WHEN 15:00 - 16:00

Wednesday- January 20st

WHERE Lecture Hall (A 2.01) Main building A

<b>PRESENTIONS</b> Těšina Petr	Structural studies of LEDGF/p75 interactions.
Rejšek Jan	Desorption atmospheric pressure photoionization- mass spectrometry: The journey from the planar to the non-planar surface analysis.
Tokarenko Anna	Synthesis of novel modified nucleosides with antiviral or cytostatic activity.
REFRESHMENT	

16:00 – 17:30 Café Organica (building A) EVERYONE IS WELCOME

#### SERIES Every 4th week

of the month (Wednesday)

WHERE Lecture Hall: A 2.01

REFRESHMENT Café Organica

PRESENTERS IOCB Ph.D. students

STRUCTURE Three 15 min blocks followed by 5 min discussion FIRST 3 seminars this WEDNESDAY

#### **EVERYONE is WELCOME**

PLEASE help us to support this aktivity by ensuring high attendance of Ph.D. students from your groups



## Job postings on naturejobs.com



We will be collecting your interest and estimated number of job postings for year 2016 (via email)

- Till this year postings were for FREE.
- Starting from year 2016, the job postings are charged with possible discount for bulk packages.
- Estimated price for one "Enhanced" job posting with discount (20 postings package) is 13 000 Kč

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## Ph.D. mailing list



Up-to-date Ph.D. mailing list is available to you by using: uochb\_phd@uochb.cas.cz

- Please use it for seminar invitations or important info which may be of interest for Ph.D. students
- Mail list is administered by Aranka Rozinková and Jaromír Zahrádka



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# ITS Update Information Technologies and Services

Jiří Polách

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#### Example:



2T engeneering s.r.o., Dostavba UOCHB Praha - Čtverec Source: (http://www.2te.cz/projektDetail.asp?p=17) Use of the picture is for educational purposes only

#### Ing. Lukáš Rynda





#### New Head of Waste Management

<u>Work Experience:</u> 2011-2015 IOCB

Member of the Waste Management Service Group

Education:

2006-2011 Jan Evangelista Purkyně University (UJEP), Ústí nad Labem - (Ing.)

#### Upcoming events

- PhD seminars in 2016
  - Every third (or fourth) Wednesday 3 presentations
- Lazar Lab opening January 22
- All hands meeting mid February 2016 in NTL
- Deadline for submission of IOCB most significant papers in 2015 - February 29
- Cross Campus race April 26
- IOCB retreat off-site conference May 24-27 in Srní, Šumava Mountains



# Josef Lazar

 Head, Laboratory of Cell Biology Institute of Microbiology AS CR, Nové Hrady



## Two-photon polarization microscopy

- a new technique to observe proteinprotein interactions, protein conformational changes in living cells and animals
- needs only a single fluorescent label (unlike FRET)
- many fluorescently labeled constructs already exist
- yields information on protein function, structure

# Josef Lazar

 Head, Laboratory of Cell Biology Institute of Microbiology AS CR, Nové Hrady



# Josef Lazar

 Junior group leader, Laboratory of Advanced Microscopy IOCB, Prague



# A new microscope at the IOCB



- Primarily for two-photon polarization microscopy and related techniques
- Versatile, equipped with a variety of light sources and detectors
- Staffed by people who understand microscopy (optical engineering, electronic engineering, programming, molecular biology)
- Should allow implementing a wide range of microscopy techniques (superresolution, Raman, TIRF,...)

## Official opening



#### When: Friday, Jan 22, 2:00 pm Where: Room A 01.78