

## Optogenetics workshop

4 day course from 20<sup>th</sup>-23<sup>th</sup> April 2015

Organizers: Stefan Herlitze, Olivia A. Masseck, Ilka Diester  
Location: Rub-Bochum, Department of General Zoology and Neurobiology

**A minimum of 12 students is required in order to conduct the workshop!!!  
The deadline of registration is 15<sup>th</sup> February 2015**

Hands-on training (in groups of 2-3 students, maximal 6 groups = 18 students):

1. Optogenetic patch clamp experiments in heterologous expression systems (Masseck)
  - Expression of different vertebrate opsins in human embryonic kidney cells (HEK)
  - Biophysical characterization of vertebrate opsins using patch clamp recordings
2. Stereotactic viral injections in mice (Mark)
  - Preparation of anaesthetized mice
  - Stereotactic injection into the cerebellum and raphe nuclei
3. Building and using optrodes (Spoida and Diester)
  - Multi step optrode building
  - Implantation of optrodes in anaesthetized mice
  - Optical stimulation and neural recordings in motor cortex of an anesthetized Thy1-mouse
4. Optogenetic control of motor behavior (Diester)
  - Optical stimulation in premotor cortex of a Thy1-mouse
5. Extracellular recordings and optogenetic modulation of cerebellar Purkinje cells in anesthetized mice (Kruse)
  - Acute insertion of multiple electrodes and a light fiber by use of a multi electrode system.
  - Targeted activation of Purkinje cells expressing ChR2 in Pcp2/L7-cre mice.
  - Detection of simple and complex spikes from Purkinje cells.
6. Analyzing optogenetic experiments (Alexey Ponomarenko)
  - Analyzing neural data, which have been recorded in combination with optogenetic stimulation

Lectures:

1. Control of GPCR signaling pathways by light (Olivia Masseck, Spoida, Herlitze)
2. Voltage sensitive dye imaging (Dirk Jancke)
3. Opsin properties and new opsins (Peter Hegemann)
4. Setting up an optogenetic experiment (steps, controls etc.) (Ilka Diester)  
Application *in vivo* in behaving animals (Ilka Diester)
5. Optoelectronic devices (Patrik Ruther)
6. 2P imaging (Johannes Letzkus)
7. Viral vectors (Christian Buchholz)
8. Data analysis: *in vivo* electrophysiology and optogenetics (Alexey Ponomarenko)

Seminar:

Students explain their planned optogenetic projects (please prepare 5 slides in advance), discuss in the group, and get feedback from the experts

People involved in the organization of the experiments in the Herlitze Lab:

Dr. Olivia Maseck  
Dr. Katharina Spoida  
Dr. Melanie Mark  
Dr. Wolfgang Kruse

People involved in the organization of the experiments in the Diester Lab:

Prof. Dr. Ilka Diester  
Edith Doering (TA)

People involved in the organization of the experiments in the Ponomarenko Lab:

Marta Carus (PhD student)  
Maria Gorbati (PhD student)

## Time schedule

time	Monday 20 <sup>th</sup>	time	Tuesday 21 <sup>th</sup>	time	Wednesday 22 <sup>th</sup>	time	Thursday 23 <sup>th</sup>
		9.00 -10.00	Lecture "Setting up an optogenetic experiment" (Diester)	9.00 -10.00	Lecture "Virus" (Buchholz)	9.00 -10.00	Lecture "Analyzing optogenetic experiments" (Ponomarenko)
		10.00 -13.00	Hands on training (2-3 students) *	10.00 -13.00	Hands on training (2-3 students) *	10.00 -13.00	Hands on training (2-3 students) *
	<i>Arrival</i>	13.00-14.30	<i>Lunch Break</i>	13.00-14.30	<i>Lunch Break</i>	13.00-14.30	<i>Lunch Beckmannshof</i>
15.30	Presentation of the program	14.30 -17.30	Hands on training (2-3 students) *	14.30 -17.30	Hands on training (2-3 students) *	15.00 -18.00	Hands on training (2-3 students) * and/or Bergbaumuseum
16.00	Lecture " Opsin properties and new opsins" (Hegemann)	18.00-19.00	Lecture " Control of GPCR signaling by light" (Herlitze, Masseck)	18.00-19.00	Lecture " Optoelectronic devices" (Ruther)	19.30	<i>Departure and/or Dinner Living Room</i>
17.00	Lecture " 2-Photon Imaging" (Letzkus)	19.30	<i>Dinner Yamaz</i>	19.30	<i>Dinner Chlochard oder QWest</i>		
19.00	<i>Dinner Aubergine</i>						

\* Hands on training: Patch clamp, Stereotactic injections, Optrode building, Optogenetic control of motor behavior, Extracellular recordings and optogenetic modulation of cerebellar Purkinje cells in anesthetized mice, Analyzing optogenetic experiments