

## GGNB Methods Courses 2012 - Overview Mar-Aug 2012

### Short Methods Courses & Method Seminars; Extended Methods Course

#### Mar-Aug 2012 (A)

\* Course will also be offered in the next course announcement (Sep 2012 - Feb 2013)

Department/Group	Supervisor(s)	ID	* Title of Course	Credits	Date A
<b>Biochemistry</b>					
Höbartner, Claudia	Höbartner, Claudia	A 32	* Chemical synthesis and enzymatic ligation of RNA and DNA oligonucleotides	1.0	23-24 May 2012
Schmitt, Hans Dieter	Schröter, Saskia	A 34	* BiFC (bimolecular fluorescence complementation) in yeast	1.0	Apr 2012
Jahn, Reinhard	Chua, John / Binotti, Beyenech / Boyken, Janina	A 35	* Co-immunoprecipitation as a technique to study protein-protein interactions	1.0	20-21 Mar 2012
Jahn, Reinhard	Kühnel, Karin	A 36	* Protein purification and characterization	1.0	7-8 May 2012
Rehling, Peter	Reinhold, Robert	A 53	* Blue-native PAGE analysis of membrane protein complexes	1.0	Mar 2012 (week 11 or 12)
Urlaub, Henning	Atanassov, Ilian / Hofele, Romina / Karaca, Samir / Qamar, Saadia / Mandat, Sunit	A 65	* Sequence analysis of proteins and their post-translational modifications by MALDI-ToF and electrospray ionization (ESI) mass spectrometry	1.0	14-16 March 2012
Walter, Lutz	Walter, Lutz / NN	A 66	* Isolation of recombinant proteins by affinity chromatography and binding studies	1.0	6-7 Jun 2012
Tittmann, Kai	Sitte, Astrid	A 71	* Thermodynamic characterization of biomolecular interactions by isothermal titration calorimetry	1.0	4-5 Apr 2012
Rodnina, Marina	Milon, Pohl	A 81	* Introduction to transient kinetic methods	1.0	3-4 Jul 2012
Lührmann, Reinhard	Hartmuth, Klaus	A 82	Affinity purification methods for the isolation of large heterogeneous macromolecular assemblies	1.0	24-26 Apr 2012
Rehling, Peter	Vukotic, Milena	A 91	* Activity measurements of respiratory chain enzymes	0.5	10 May 2012
Rehling, Peter	Deckers, Markus	A 92	* Subcellular fractionation	0.5	4-8 Jun 2012
Wintermeyer, Wolfgang	Draycheva, Albena	A 105	Equilibrium studies of protein-ligand interactions using fluorescence techniques	1.0	Two days in May
Tittmann, Kai	Tittmann, Kai / Schröder-Tittmann, Kathrin	A 124	Fed-batch fermentation of an <i>E. coli</i> strain in a fully automated bioreactor	1.5	19-21 Mar 2012

Department/Group	Supervisor(s)	ID	*	Title of Course	Credits	Date A
<b>Biophysics, Bioinformatics and Statistics</b>						
Grubmüller, Helmut	Peters, Jan Henning	A 24	*	Introduction to molecular dynamic simulation	1.0	SoSe 2012
Grubmüller, Helmut / Schmidt, Christoph F.	Grubmüller, Helmut / Schmidt, Christoph F.	A 25	*	Current Topics in Biophysics – Lecture Series	1.0	Fridays, SoSe 2012
Steinem, Claudia / Janshoff, Andreas	Mey, Ingo / Saßen, Christoph	A 62	*	Scanning Ion Conductance Microscopy, a versatile tool to study surfaces and surface properties	1.0	12-13 Apr 2012
Walter, Lutz	Brameier, Markus	A 67	*	Introduction to Bioinformatics Methods	1.0	Apr 2012
Steinem, Claudia / Janshoff, Andreas	Behn, Daniela	A 72	*	Using biosensors to study analyte-ligand interactions: basic principles and applications	1.0	23-24 Apr 2012
Hoff, Katharina	Hoff, Katharina	A 94	*	Introductory biostatistics with R	1.0	24-26 May 2012
Mitkovski, Mišo	Mitkovski, Mišo	A 98	*	Introduction to image processing in biology with ImageJ	1.0	26-27 Apr 2012
Friede, Tim	Konietsche, Frank / Lange, Katharina	A 100	*	Basic statistics for graduate students in the life sciences	1.0	10/11/12/13 Apr 2012
Enderlein, Jörg	Pieper, Christoph	A 111		Introduction to LabVIEW	1.5	2-5 Apr 2012
Kollmar, Martin	Hammesfahr, Börn	A 116	*	Protein family analysis as basis for experiments and experimental data interpretation	1.0	1-2 Mar 2012
Köster, Sarah	Dammann, Christian	A 117		Microfluidics	1.0	Jun/Jul 2012
Flórez Weidinger, Juan Daniel / Gabrielaitis, Mantas / Chou, Wen-Chuang / Casadiego Bastidas, José Luis	Flórez Weidinger, Juan Daniel / Gabrielaitis, Mantas / Chou, Wen-Chuang / Casadiego Bastidas, José Luis	A 119		Introduction to MATLAB	1.0	16-18 Apr 2012
Burg, Thomas P.	Burg, Thomas P.	A 121		Micropatterning and Microfluidics	1.5	11-13 Apr 2012
Hoffmann, David / Mittner, Matthias / Jahnke, Sven	Hoffmann, David / Mittner, Matthias / Jahnke, Sven	A 123		Python programming introductory course	2.0	11-13 & 26-27 Apr 2012
<b>Cell Biology &amp; Microbiology, Imaging</b>						
Nave, Klaus-Armin	Möbius, Wiebke	A 44	*	Subcellular localization of proteins by immunoelectron microscopy of cryosections	1.0	7-8 May 2012
Olympus / Bodenschatz	Tarantola, Marco	A 46/I	*	Theory and basics of fluorescence microscopy and imaging / Introduction to life science research applications FRET, FRAP, FLIM,	1.0	Aug 2012
Olympus / Bodenschatz	Tarantola, Marco	A 46/II	*	Theory and basics of fluorescence microscopy and imaging / Introduction to life science research applications FRET, FRAP, FLIM,	1.0	Aug 2012

Department/Group	Supervisor(s)	ID	*	Title of Course	Credits	Date A
<b>Developmental Biology, Anatomy &amp; Histology</b>						
Eichele, Gregor	Miletic, Helena / van den Boogart, Christine	A 13	*	Mouse histology & <i>in situ</i> expression analyses	1.0	5-6 Mar 2012
Hahn, Heidi	Nitzki, Frauke / Becker, Marco	A 28	*	<i>In situ</i> hybridization of paraffin embedded tissue sections	1.0	Jul 2012
Oster, Henrik	Oster, Henrik	A 47		Real-time luminescence recording and imaging	1.0	tba
Shcherbata, Halyna	Shcherbata, Halyna	A 56		Introduction to basic histology techniques	1.0	27 Feb 24 Mar 2012 or 16 Apr 5 May 2012
Stadelmann-Nessler, Christine	Stadelmann-Nessler, Christine	A 60	*	Non-radioactive <i>in situ</i> hybridization	1.0	16-18 Apr 2012
Wimmer, Ernst / Bucher, Gregor	Wimmer, Ernst / Bucher, Gregor	A 108	*	Homologs and Paralogs – how they evolve and how to distinguish them	0.5	16 Mar 2012
<b>Molecular &amp; Cellular Neuroscience, Electrophysiology</b>						
Nave, Klaus-Armin	Roßner, Moritz	A 45	*	Microdissection combined with RNA analysis in the brain	1.0	21-23 Mar 2012
Stühmer, Walter	Pardo, Luis	A 63	*	Patch clamp	1.0	19-21 Mar 2012
Fiala, André / Göpfert, Martin	Fiala, André / Göpfert, Martin	A 83	*	Drosophila Neurogenetics	1.0	13-15 Mar 2012
Rizzoli, Silvio	Wilhelm, Benjamin / Denker, Annette	A 89		High resolution microscopy in synapses	1.0	10-11 Apr 2012
Rhee, JeongSeop	Rhee, JeongSeop	A 96	*	Nerve cell culture and patch-clamp recordings from nerve cells	1.0	19-20 Mar 2012
Luther, Stefan	Raad, Nour	A 120		Introduction to cardiac electrophysiology and heart optical mapping	1.0	9-10 May 2012
Moser, Tobias	Oshima-Takago, Tomoko / Mendoza Schulz, Alejandro	A 122		Basics of electrophysiological measurements in slice preparations	1.0	8-9 Mar 2012
<b>Molecular Biology &amp; Genetics</b>						
Dobbelstein, Matthias	Schmidt, Franziska / Jagannathan, Veena	A 10	*	Assessing promoter activity by luciferase assays	1.0	Apr 2012
Jakobs, Stefan	Grotjohann, Tim	A 37	*	PCR based mutagenesis strategies to evolve (photoswitchable) fluorescent proteins	1.0	20-21 Mar 2012
Walter, Lutz	Gruber, Jens	A 68	*	Mechanisms of RNA silencing	1.0	7-8 Jun 2012
Brenig, Bertram	Schütz, Ekkehard	A 113		NGS and HTP SNP typing	1.0	tba

Department/Group	Supervisor(s)	ID	*	Title of Course	Credits	Date A
<b>Structural Biology</b>						
Bennati, Marina	Türke, Maria Teresa / Tkach, Igor / Argirevic, Tomislav	A 03	*	EPR-Spectroscopy	1.5	2-4 Apr 2012
Stark, Holger	Platzmann, Florian	A 61	*	3D structure determination of macromolecular complexes by single particle cryo-EM	1.0	tba
Pena, Vlad	Schmitzova, Jana / Steuerwald, Ulrich / De, Inessa	A 102	*	Crystallization of biological macromolecules	1.0	11-12 Jun 2012
Ficner, Ralf	Neumann, Piotr	A 103		X-ray crystallography	2.5	5-9 Mar 2012
Grüne, Tim	Grüne, Tim	A 106		Advanced Macromolecular crystal structure determination	2.0	19-23 Mar 2012
Griesinger, Christian / Zweckstetter, Markus	Griesinger, Christian / Zweckstetter, Markus	A 118		NMR-based structural biology	tba	tba
<b>Theoretical, Systems &amp; Behavioral Neuroscience</b>						
Ehrenreich, Hannelore	Begemann, Martin / Bartels, Claudia	A 12	*	Translational Neuroscience: <b>(A) Schizophrenia</b> , (B) Multiple Sclerosis	2.0 / module	15-17 Jun 2012 (A)
Gail, Alexander / Treue, Stefan	Gail, Alexander / Treue, Stefan	A 18	*	Non-invasive probing of brain function – Advanced Methods Course in Psychophysics	1.0	9-11 May 2012
Geisel, Theo / Timme, Marc / Wolf, Fred	Geisel, Theo / Timme, Marc / Wolf, Fred	A 22		Theoretical and Computational Neuroscience: Collective Dynamics Biological Neural Networks II	1.0	SoSe 2012
Antal, Andrea	Strenzke, Nicola / Hoch, Gerhard	A 41	*	Auditory and visual evoked potentials	1.0	Apr 2012
Gail, Alexander	Glaser, Beatrix	A 73		Introduction to Matlab in Systems Neuroscience	1.0	13/20/27 Apr 2012
<b>Vertebrate Animal Models</b>						
Bähr, Mathias	Lingor, Paul	A 01	*	Introduction to animal experiments	0.5	17 Apr 2012
Bayer, Thomas A.	Wirhns, Oliver	A 02	*	Alzheimer's disease: Behavioural and neuropathological analysis of transgenic mouse models	1.0	17 - 18 Jun 2012
Brembeck, Felix	Bunzendahl, Jens	A 107	*	Tissue processing and immunohistochemistry on tissue sections of genetically engineered mouse models	1.0	Apr/May 2012
<b>Extended Methods Courses</b>						
Tittmann, Kai	Kühnel, Karin / Urlaub, Henning / NN	E 02		Bioanalytics	4,0	late Sep 2012
Stühmer, Walter / Hörner, Michael / Schlüter, Oliver	Stühmer, Walter / Hörner, Michael / Schlüter, Oliver	E 03		ENI Electrophysiology Training (ENI-ELECTRAIN)	4,0	7-18 May 2012

UniVZ No.:  Credits:  Date:

Title of Course:   
(Course ID):

Group Leader / Supervisor(s):

Place:

Participants:

Duration:  Time on Day 1:

Preparatory Meeting:

**Course description:**

Animal models are widely used in the life sciences, medical research and especially neuroscience. They are used to study the etiology of various diseases as well as experimental treatment methods. In this course we will give an overview on what is considered an animal experiment and why animal experiments are necessary. We will discuss the strict prerequisites preceding experiments on life animals and study the possibilities to reduce harm to research animals.

In the second part, students will have the possibility to follow a surgical intervention on animals within an ongoing research project depending on the current research activity in our lab. Special emphasis will be given to proper anaesthesia of the animal. We will demonstrate interventions on the optic nerve in Wistar rats, such as axotomy, optic nerve crush or intravitreal injections. Students will be able to watch brain injections according to stereotactic coordinates. We will also demonstrate behavioral tests, such as the rotarod examination.

Contact 1:

Contact 2:

Comments:

UniVz No.:  Credits:  Date:

Title of Course (Course ID):

Group Leader / Supervisor(s):

Place:

Participants:

Duration:  Time on Day 1:

Preparatory Meeting:

**Course description:**

Transgenic mouse models have been proven to be valuable research tools to facilitate our understanding of the pathological alterations in Alzheimer's disease (AD) and are indispensable in the development of new therapeutic treatment strategies.

Students will be introduced to different AD mouse models, will prepare brain tissue for histochemical analyses and will carry out immunostainings for relevant neuropathological markers. In addition, they will be introduced into mouse behavioural experiments and will learn to conduct simple motor and learning performance tasks.

Contact 1:

Contact 2:

Comments:

**UniVZ No.:**       **Credits:**       **Date:**

**Title of Course (Course ID):**

**Group Leader / Supervisor(s):**

**Place:**

**Participants:**

**Duration:**       **Time on Day 1:**

**Preparatory Meeting:**

**Course description:**

Investigation of protein structure by EPR spectroscopy and site directed spin labeling.

**Contact 1:**

**Contact 2:**

**Comments:**

UniVZ No.:  Credits:  Date:

Title of Course:   
(Course ID):

Group Leader / Supervisor(s):

Place:

Participants:

Duration:  Time on Day 1:

Preparatory Meeting:

**Course description:**

Reporter assays are commonly used to determine the activity of a promoter and in particular its response to specific transcription factors. Luciferase reporters provide a particularly wide linear range and can therefore be used to quantify the activity of weak and strong promoters with accuracy. The use of different luciferase species allows the determination of two different promoter activities simultaneously, e. g. to provide an internal control.

On the first day, we will discuss the opportunities and limitations of transient reporter assays, and we are going to transfect cells with combinations of reporter plasmids and expression plasmids for transcription activators. On the second day, we are going to determine luciferase activities (firefly and renilla) using a dual assay, by semi-automated luminometry. The results will be discussed and different modes of measurement will be explained. Participants are welcome to bring their own promoter constructs if desired, but a brief discussion in advance would be helpful.

Contact 1:

Contact 2:

Comments:

<b>UniVZ No.:</b>	340137	<b>Credits:</b>	2.0 / module*	<b>Date:</b>	15-17 Jun 2012
<b>Title of Course (Course ID):</b>	Translational Neuroscience: <b>Schizophrenia</b> (A 12)				
<b>Group Leader / Supervisor(s):</b>	Hannelore Ehrenreich, Martin Begemann				
<b>Place:</b>	MPI for Experimental Medicine, Division of Clinical Neuroscience				
<b>Participants:</b>	min: 6	max: 18			
<b>Duration:</b>	2 x 3 days*	<b>Time on Day 1:</b>	08:00 h		
<b>Preparatory Meeting:</b>	No				

**Course description:**

Target Group: Interdisciplinary approach, addressing medical students in the clinical part of their studies as well as students of biology and psychology at a progressed state of their studies (at least semester 5); all lectures will be in English.

General Outline: A total of 78 hours will be provided, covering translational neuroscience, presented in 2 blocks á 26 hours. Each block comprises a large area of translational neuroscience under the umbrella of one specific disease, thereby delivering an exemplary guideline for teachers and students: (1) Schizophrenia as an example of diseases affecting higher brain functions; (2) Multiple Sclerosis as an example of an inflammatory degenerative disease of the nervous system.

**Content Block 1: Schizophrenia:** Introduction to the disease, historical aspects, epidemiology, patient presentation (including videos), DSM criteria for the diagnosis, frequent comorbidities, including drug abuse and associated problems, important differential diagnoses, neuroimaging, neuropsychology, psychopathology, instruments for clinical rating of disease severity and follow-up (PANSS etc), established treatments, dopamine hypothesis of schizophrenia, novel approaches targeting the glutamate system and neuroprotection, genetics of schizophrenia, environmental risk factors, animal models (previous, present and future), behavioral battery focusing on testing higher brain functions in mice, magnetic resonance imaging (MRI), histology, and drug-challenge tests in experimental animals, long-term potentiation and short-term potentiation in the hippocampus, short-term plasticity, multi-electrode array (MEA) recordings, autaptic neuron preparation, multivariate covariance analysis as statistical means for evaluation of proof-of-concept trials.

Content Block 2: Multiple Sclerosis: Introduction to the disease, historical aspects, epidemiology, patient presentation (including videos), diagnostic criteria for disease classification including subtypes, imaging, neurophysiology, CSF diagnostics, neuropsychology, differential diagnoses and frequent comorbidities including psychopathology, pathophysiology including mediators of inflammation, mechanisms of axonal loss, demyelination, immunology including auto-immunity, basics of the functioning of the blood-brain-barrier and the brain immune system, genetics, environmental risk factors, animal models of multiple sclerosis and animal neuroimaging, mouse test battery for measuring motor function, fine motor performance and ataxia, therapeutic targets, established and experimental therapeutic approaches including symptomatic/supportive measures, the drug development process (clinical trials) and its challenges in multiple sclerosis.

<b>Contact:</b>	Prof. Dr. Dr. H. Ehrenreich	<a href="mailto:timner@em.mpg.de">timner@em.mpg.de</a>	Tel. 0551-3899 615
<b>Comments:</b>	* 2 blocks of 3 days each in June and November, Friday through Sunday Written test (multiple choice) at the end of each block. The lecture series comprises also <i>practical parts</i> (short lab visits), e.g. psychopathology rating, neuropsychology testing, imaging, diagnostics, cell culture work, behavioral studies etc.		

UniVZ No.:  Credits:  Date:

Title of Course:   
(Course ID):

Group Leader / Supervisor(s):

Place:

Participants:

Duration:  Time on Day 1:

Preparatory Meeting:

**Course description:**

The histological analysis of gene and protein expression in tissue sections has become a widely used tool for studying biological processes *in vivo*. In the course we will stage mouse embryos, prepare histological sections of embryo and adult brain tissues from mice and analyze histology using standard staining procedures. If students are interested, the second part of the course will focus on expression analyses on sections using immunohistochemistry and *in situ* hybridization approaches. Applied techniques will be: embryo preparation and staging, tissue sectioning, histological staining, chromogenic *in situ* hybridization and immunohistochemistry

Contact 1:

Contact 2:

Comments:

<b>UniVz No.:</b>	340052	<b>Credits:</b>	1.0	<b>Date:</b>	9-11 May 2012
<b>Title of Course:</b>	Non-invasive probing of brain function – Advanced methods course in psychophysics (A 18)				
<b>Group Leader / Supervisor(s):</b>	Prof. Stefan Treue, Dr. Alexander Gail, Dr. Clíodhna Quigley				
<b>Place:</b>	Cognitive Neuroscience Lab, Hans-Adolf-Krebs Weg 7, German Primate Center				
<b>Participants:</b>	min: 3	max: 6			
<b>Duration:</b>	2.0	<b>Time on Day 1:</b>	13:00 h		
<b>Preparatory Meeting:</b>	No				

**Course description:**

This course introduces the methodological concepts for quantifying perception and behavior with psychophysical methods in humans and non-human primates. The course includes a short introductory lecture on the theoretical backgrounds (first day). In small groups each participant will have the opportunity to conduct and perform different exemplary psychophysical experiments on visual perception and sensorimotor integration in practice. We will introduce the concepts of perceptual thresholds, sensory and sensorimotor adaptation, reaction-time measurements, non-invasive behavioral eye- and hand-movement registrations, and advanced methods for behavioral data analysis. Based on the collected data the strength, limitations, and potential pitfalls of psychophysical measurements will be discussed.

<b>Contact 1:</b>	Prof. Stefan Treue	<a href="mailto:treue@gwdg.de">treue@gwdg.de</a>	0551-3851 118
<b>Contact 2:</b>	Beatrix Glaser	<a href="mailto:bglaser@gwdg.de">bglaser@gwdg.de</a>	0551-3851 118
<b>Comments:</b>	Previous experience with MATLAB or the participation in the GGNB Short Method Course Introduction to Matlab in Systems Neuroscience (A 73) is helpful for participants.		

UniVZ No.:  Credits:  Date:

Title of Course (Course ID):

Group Leader / Supervisor(s):

Place:

Participants:

Duration:  Time on Day 1:

Preparatory Meeting:

#### Course description:

This lecture course offers an introduction to advanced modeling strategies for biological neural networks. After a short introduction to the biophysics of single cells and an overview of their basic firing patterns, we explain fundamental properties of networks models of neurons, starting from simple uniform connectivity and progressing to spatially extended and to arbitrarily complex interaction networks. These network models explain and predict key dynamical aspects of neural circuits, including irregular activity of cortical dynamics, feature selectivity, self-organization of neural maps, and the coordination of precisely timed spikes across networks.

Contact 1:

Contact 2:

Comments:

UniVZ No.:  Credits:  Date:

Title of Course (Course ID):

Group Leader / Supervisor(s):

Place:

Participants:

Duration:  Time on Day 1:

Preparatory Meeting:

**Course description:**

Molecular Dynamics (MD) simulations are a method to calculate the atomistic dynamic of biomolecules. The movements of all atoms are calculated based on their respective interactions to all other atoms.

The goal of this practical course is to learn the basic handling of this method. Starting with the examination of thermodynamic properties of a simple gas system, the concepts of MD simulations are shown. Later on, the build-up and simulation of a complete protein system is performed. In that part, also various analytical methods for MD simulations are considered.

Contact 1:

Contact 2:

**Comments:**

UniVZ No.:  Credits:  Date:

Title of Course (Course ID):

Group Leader / Supervisor(s):

Place:

Participants:

Duration:  Time: from:  to:

Preparatory Meeting:

**Course description:**

Rotation course that offers a broad overview of the methods actively used in the program "Physics of Biological and Complex Systems (from experimental to theoretical, from spectroscopy to whole-cell manipulations, from microscopy and nanoscopy to the simulation of complex systems). This "methods in a nutshell" course provides a unique opportunity to get acquainted with several techniques, both theoretical and experimental, as taught by the experts.

Contact 1:

Comments:

UniVZ No.:  Credits:  Date:

Title of Course (Course ID):

Group Leader / Supervisor(s):

Place:

Participants:

Duration:  Time on Day 1:

Preparatory Meeting:

**Course description:**

Students will learn how to perform the mRNA expression analysis on sections of paraffin-embedded tissues. The hybridisation itself will take 3 days (the final reaction will be completed after additional 1 – 2 days).

The exact course date will be fixed with the participants. So far any week in July is possible. The course will start on a Monday.

Contact 1:

Contact 2:

**Comments:**

UniVZ No.:  Credits:  Date:

Title of Course:   
(Course ID):

Group Leader / Supervisor(s):

Place:

Participants:

Duration:  Time on Day 1:

Preparatory Meeting:

**Course description:**

The course covers methods for the automated solid-phase synthesis of chemically modified oligonucleotides by phosphoramidite chemistry, purification of synthetic RNA and DNA by anion exchange and reversed-phase HPLC and by preparative denaturing PAGE, and strategies for the enzymatic ligation of RNA fragments by protein enzymes and deoxyribozymes.

Contact 1:

Contact 2:

Comments:

UniVZ No.:  Credits:  Date:

Title of Course:   
 (Course ID):

Group Leader / Supervisor(s):

Place:

Participants:

Duration:  Time on Day 1:

Preparatory Meeting:

#### Course description:

Bimolecular fluorescence complementation (BiFC) is used to visualize protein-protein interactions *in vivo*, using protein tags on the putative interaction partners. For this, the two fragments of a “split up” fluorescent protein (in our case YFP) are introduced at N- or C-terminus of the proteins of interest. These fragments do not associate unless the proteins carrying the tag bind each other. Fluorescence is only emitted from the reconstituted YFP, not from its fragments.

This BiFC technique allows visualization of transient interactions since the assembly of GFP from its fragments is very likely irreversible. However, this may cause artifacts, as BiFC actually represents a “YFP fragment assembly trap”. In fact, some BiFC combinations have negative effects on growth probably due to this phenomenon.

Our group studies the interaction between vesicle coats and tethering complexes at the ER of yeast cells. In the course we will examine some different split-YFP combinations as well as examples where the BiFC signal correlates with effects on growth and viability of certain strains.

We want to show, how time lapse images can be obtained with our BiFC strains. We will introduce the CellProfiler software which we use to quantify fluorescence signals from wild type and mutant strains. If students are interested we can demonstrate how we introduce tags downstream of genes in yeast.

#### Recommended reading:

Zink S, Wenzel D, Wurm C. and Schmitt HD. (2009). A link between ER tethering and COP-I vesicle uncoating. **Dev. Cell** 17:403-416.

Contact 1:

Contact 2:

Comments:

UniVZ No.:  Credits:  Date: Title of Course (Course ID): Group Leader / Supervisor(s): Place: Participants:  Duration:  Time on Day 1: Preparatory Meeting: **Course description:**

Physical interactions between biological molecules are pivotal to the workings of many biological processes. Identification of molecules binding to an individual protein not only sheds light on its function but also provides valuable information on the cellular process or pathways with which it is associated.

While many approaches are available to identify or verify protein-protein interactions, co-immunoprecipitation remains a valuable *in vitro* method for this purpose. Nevertheless, the technique should be carefully implemented in order that the results may be reliably interpreted.

Contact 1:   Contact 2:   Comments:

UniVZ No.:  Credits:  Date:

Title of Course (Course ID):

Group Leader / Supervisor(s):

Place:

Participants:

Duration:  Time on Day 1:

Preparatory Meeting:

**Course description:**

This course is meant for students who have so far little or no experiences in protein purification. We will purify proteins from *E.coli* extracts using high affinity, ion exchange and size exclusion chromatography with an Äkta-FPLC system. The purity of proteins will be analyzed by SDS-PAGE. You will also learn how to determine protein concentrations, how to dialyze proteins and how to concentrate them.

Contact 1:

Contact 2:

Comments:

UniVZ No.:  Credits:  Date:

Title of Course (Course ID):

Group Leader / Supervisor(s):

Place:

Participants:

Duration:  Time on Day 1:

Preparatory Meeting:

**Course description:**

GFP-like fluorescent proteins are powerful tools to study protein dynamics in living cells. The actual properties of the fluorescent proteins may be dramatically altered by slight changes in their amino acid sequences. This practical course will cover several basic methods for targeted and random mutagenesis based on PCR. We will use the coding sequences of switchable fluorescent proteins as templates. The mutagenized proteins will be screened for variants exhibiting different properties.

Contact 1:

Contact 2:

Comments:

UniVZ No.:  Credits:  Date:

Title of Course  
(Course ID):

Group Leader /  
Supervisor(s):

Place:

Participants:

Duration:  Time on Day 1:

Preparatory Meeting:

**Course description:**

Summary:

Potentials arising from neuronal population responses to sensory stimuli such as light flashes and tone bursts offer a affordable and quantitative test of peripheral and central sensory processing. Analysis of sensory function has become an essential part of mouse phenotyping. In this 2 days practical course we will cover the biological basis, technical implementation, practical realization and data analysis of auditory and visual evoked potentials in the mouse.

Covered Topics and Methods:

*Auditory Physiology:* otoacoustic emissions, auditory evoked potentials: click and tone burst auditory brainstem responses, auditory steady state responses.

*Visual Physiology:* Scotopic and photopic electroretinogram (ERG), visual evoked cortical potentials (VEP), visual cognitive evoked potentials.

Contact 1:

Contact 2:

Comments:

UniVZ No.:  Credits:  Date:

Title of Course:   
(Course ID):

Group Leader / Supervisor(s):

Place:

Participants:

Duration:  Time on Day 1:

Preparatory Meeting:

**Course description:**

Immunoelectron microscopy (IEM) is an important method to study the intracellular distribution of a protein of interest at high resolution. By IEM, the precise localization of a protein can be studied directly in its cellular environment, which is identified by morphological criteria. Here, we use chemically fixed tissue for ultrathin cryosectioning that was cryoprotected with 2.3 M sucrose and frozen in liquid nitrogen. Sections are labelled with antibodies and protein-A coupled to colloidal gold and viewed in the electron microscope.

Day 1: Introduction and cryosectioning

Day 2: Immunolabeling and electron microscopy

Contact 1:

Contact 2:

Comments:

UniVZ No.:  Credits:  Date:

Title of Course:  
(Course ID):

Group Leader /  
Supervisor(s):

Place:

Participants:

Duration:  Time on Day 1:

Preparatory Meeting:

**Course description:**

Day 1: Introduction, Comparison of Technical Platforms, Planning of Experimental Setup

Day 3: Cryosectioning and staining of mouse brain on glass and membrane slides, microdissection, collection of samples RNA preparation

Day3: Quality control using the Agilent Bioanalyzer, Discussion of Results

Contact 1:

Contact 2:

Comments:

UniVZ No.:  Credits:  Date:

Title of Course (Course ID):

Group Leader / Supervisor(s):

Place:

Participants:

Duration:  Time on Day 1:

Preparatory Meeting:

#### Course description:

This course will show how:

- to set up a microscope and camera for fluorescence observation with different illuminations settings and their correct alignment.
- to find the appropriate filter combination for a given fluorochrome and application.
- to describe the benefit of different possible filter combinations.
- to describe the benefit of different light sources.
- to create digital images of fluorescence specimen.
- to describe the special needs for microscope, camera and software according to main applications.

Furthermore the course gives an introduction to life science research applications:

- Principles of confocal microscopy; TIRF confocal microscopy
- FRET, FRAP, FLIM, caging – uncaging, GFP
- Fluorescence microscopy of living cells
- Types of applications (e.g. ion sensitive dyes, GFP)

Exact dates *tba*

marco.tarantola@ds.mpg.de

Contact 1:

Contact 2:

Comments:

UniVZ No.:  Credits:  Date:

Title of Course (Course ID):

Group Leader / Supervisor(s):

Place:

Participants:

Duration:  Time on Day 1:

Preparatory Meeting:

#### Course description:

The transcriptional events that organize 24hr ("circadian") rhythms of physiology and behavior are controlled by a set of clock genes that are rhythmically expressed in many tissues of the mammalian body.

In the course we will prepare cultures from liver slices of PER2::LUC transgenic mice and of different reporter cell lines. We will monitor both circadian rhythms and acutely induced expression of luciferase using PMT and luciferase imaging techniques.

On the second day luminescence traces and images will be quantified and compared between different setups. Applied techniques will include: tissue isolation, preparation of slices and culturing, cell culture synchronisation, transfection, luminescence recordings and imaging.

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UniVZ No.:  Credits:  Date:

Title of Course (Course ID):

Group Leader / Supervisor(s):

Place:

Participants:

Duration:  Time on Day 1:

Preparatory Meeting:

**Course description:**

By using a specialized native gel system, referred to as Blue-Native PAGE, membrane protein complexes of up to 1.5 MDa can be separated. Here we will focus on the analysis of mitochondrial membrane protein complexes such as the respiratory chain complexes. Upon solubilization the complexes can be separated and their higher oligomeric states, so called supercomplexes, can be visualized.

Contact 1:

Contact 2:

**Comments:**

# GGNB Short Methods Courses: March – August 2012

<b>UniVZ No.:</b>	<input type="text" value="340085"/>	<b>Credits:</b>	<input type="text" value="1.0"/>	<b>Date:</b>	<input type="text" value="27 Feb-24 Mar 2012&lt;br/&gt;or 16 Apr- 5 May 2012"/>
<b>Title of Course (Course ID):</b>	<input type="text" value="Introduction to basic histology techniques (A 56)"/>				
<b>Group Leader / Supervisor(s):</b>	<input type="text" value="Halyna R. Shcherbata"/>				
<b>Place:</b>	<input type="text" value="Max-Planck Institute for Biophysical Chemistry, Tower 6, 2&lt;sup&gt;nd&lt;/sup&gt; floor"/>				
<b>Participants:</b>	<input type="text" value="min: 2"/>	<input type="text" value="max: 6"/>			
<b>Duration:</b>	<input type="text" value="2 days"/>	<b>Time on Day 1:</b>	<input type="text" value="10:00 h"/>		
<b>Preparatory Meeting:</b>	<input type="text" value="No"/>				

## Course description:

Although histological methods are one of the oldest methods in biology, in a modern world they are still widely used to investigate disease etiology, progression, and manifestation in humans and in animal models and for the newest tissue engineering methods.

This laboratory course is designed to introduce graduate students to the fundamentals of histological analysis. Students will gain practical experience with fixation, paraffin embedding, microtome sectioning, H&E and immunofluorescent antibody staining and basics of histological analysis. We will use *Drosophila* as a model for muscular dystrophy, since we have previously shown that *Drosophila* mutants show age-dependents muscle degeneration. Various animal models have been widely used in the life sciences and medical research with hope to be eventually used to study disease prevention and treatment. Analysis in *Drosophila* helps us to better understand the origin of muscular dystrophy and mechanisms of muscle degeneration.

Students will analyze and compare at the fluorescent microscope level the physical appearance of the normal versus abnormal degenerated tissue and evaluate the levels of muscle degeneration.

<b>Contact 1:</b>	<input type="text" value="Dr. Halyna Shcherbata"/>	<input type="text" value="hshcher@gwdg.de"/>	<input type="text" value="Tel. 0551-201 1656"/>
<b>Contact 2:</b>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<b>Comments:</b>	<input type="text"/>		

UniVZ No.:  Credits:  Date:

Title of Course (Course ID):

Group Leader / Supervisor(s):

Place:

Participants:

Duration:  Time on Day 1:

Preparatory Meeting:

#### Course description:

- Non-radioactive *in situ* hybridization: The students will perform non-radioactive *in situ*-hybridization for myelin proteins on brain sections of mice and rats.
- Immunohistochemistry for light microscopy. The students will perform immunohistochemistry for myelin proteins on brain and spinal cord tissue from mice with experimental autoimmune encephalomyelitis.

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UniVZ No.:  Credits:  Date:

Title of Course:   
(Course ID):

Group Leader / Supervisor(s):

Place:

Participants:

Duration:  Time on Day 1:

Preparatory Meeting:

**Course description:**

The course covers sample preparation procedures for studying large macromolecular complexes by electron cryo-microscopy. Macromolecules will be imaged in the electron microscope. A set of noisy two-dimensional projection images is obtained which can be used to compute the 3D reconstruction of the macromolecular complex making use of advanced computational image processing strategies.

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UniVZ No.:  Credits:  Date:

Title of Course (Course ID):

Group Leader / Supervisor(s):

Place:

Participants:

Duration:  Time on Day 1:

Preparatory Meeting:

**Course description:**

The basic principles of Scanning Ion Conductance Microscopy will be taught. The participants will have the chance to operate the instrument and, if they are interested, image samples they are bringing. In the end the participants will be able to operate a SICM by themselves.

Contact 1:   Tel. 0551-39 3095

Contact 2:   Tel: 0551-39 3208

Comments:

**UniVZ No.:**       **Credits:**       **Date:**

**Title of Course:  
(Course ID):**

**Group Leader /  
Supervisor(s):**

**Place:**

**Participants:**

**Duration:**       **Time on Day 1:**

**Preparatory Meeting:**

**Course description:**

General introduction to the patch clamp technique with emphasis on whole cell recording of potassium voltage gated and ligand gated P2X ion channels.

**Contact 1:**

**Contact 2:**

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UniVZ No.:  Credits:  Date:

Title of Course:   
(Course ID):

Group Leader / Supervisor(s):

Place:

Participants:

Duration:  Time on Day 1:

Preparatory Meeting:

**Course description:**

*Day 1:* Theory: Mass spectrometry (MALDI vs. ESI) and Proteomics. Practical work: In-gel-digestion of phosphorylated and non-phosphorylated proteins.

*Day 2:* Extraction of peptides, Peptide mass fingerprint analysis in MALDI-ToF, Nano sequencing of peptides in ESI mass spectrometer.

*Day 2 and 3:* Nano sequencing of peptides in ESI mass spectrometer. Identification of phosphorylation sites in MALDI and ESI mass spectrometers.

The PhD students will not obtain any information what kind of protein they have to analyze and where the modification site is located. It will be their task to identify the protein and its modification site. SDS gels with already stained proteins will be provided.

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UniVZ No.:  Credits:  Date:

Title of Course:  
(Course ID):

Group Leader /  
Supervisor(s):

Place:

Participants:

Duration:  Time on Day 1:

Preparatory Meeting:

**Course description:**

We will prepare eukaryotic fusion proteins consisting of killer cell immunoglobulin-like receptors (KIR) of natural killer cells and the Fc portion of human IgG1. Fc-KIR fusion proteins will be collected from supernatant of transiently or stably transfected cells and isolated by affinity chromatography using protein A sepharose columns. Fc-KIR proteins are then multimerised and fluorescently labeled and will be used to test specific interactions with MHC class I molecules by FACS analysis.

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UniVZ No.:  Credits:  Date:

Title of Course (Course ID):

Group Leader / Supervisor(s):

Place:

March Participants:

Duration:  Time on Day 1:

Preparatory Meeting:

**Course description:**

The course is designed for graduate or undergraduate students. The first part (on day 1) will introduce into basic computational methods and databases in bioinformatics with a focus on genome analysis. This will be communicated by practical exercises, besides seminar discussions. In the second part (on day 2) the participants will be introduced into basic script programming (in Perl).

There is no need to bring your own computer. There will be two desktop computers available so that two students each are supposed to share one computer and work together.

Contact 1:

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Comments:

UniVZ No.:  Credits:  Date:

Title of Course (Course ID):

Group Leader / Supervisor(s):

Place:

Participants:

Duration:  Time on Day 1:

Preparatory Meeting:

**Course description:**

The course is designed for graduate students and addresses fundamental questions in the field of RNA interference (RNAi). RNA silencing will be discussed as (I) an endogenous mechanism for gene regulation via microRNAs and (II) as a tool for efficient functional gene characterization in reverse genetics approaches.

The practical part of the course will cover RNAi techniques such as siRNA transfection and gene knockdown detection as well as miRNA expression analysis via multi-reporter gene constructs.

After having completed the course the participants should be able to plan and perform simple RNAi experiments, including functional genetics and miRNA analysis

Contact 1:

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Comments:

UniVZ No.:  Credits:  Date:

Title of Course (Course ID):

Group Leader / Supervisor(s):

Place:

Participants:

Duration:  Time on Day 1:

Preparatory Meeting:

**Course description:**

Isothermal titration calorimetry (ITC) has emerged as one of the most sensitive and powerful techniques for a rigorous thermodynamic characterization of biomolecular interactions such as protein-protein or protein-ligand interactions. Thus far, ITC is the only technique that determines directly the key thermodynamic parameters of a given interaction including the dissociation constant  $K_D$ , the Gibbs free energy of binding  $\Delta G$  and its individual enthalpic ( $\Delta H$ ) and entropic contributions ( $\Delta S$ ), the stoichiometry  $n$  and the heat capacity  $\Delta c_p$ .

This course is aimed to provide the theoretical background of microcalorimetry as well as practical training for planning and performing ITC experiments. The binding interaction of several binding partners as well as steady state-kinetics will be thermodynamically studied by the participants using the most advanced isothermal titration microcalorimeter iTC200 manufactured by Microcal.

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UniVZ No.:  Credits:  Date:

Title of Course:   
(Course ID):

Group Leader / Supervisor(s):

Place:

Participants:

Duration:  Time on Day 1:

Preparatory Meeting:

**Course description:**

The principles of different biosensor techniques such as surface plasmon resonance (SPR), reflectometric interference spectroscopy (RfS) and quartz crystal microbalance (QCM) will be presented. The response that is used in SPR, RfS and QCM based biosensors will be experimentally demonstrated with the spreading of lipid vesicles and protein binding on planar surfaces. Also the analysis and interpretation of the biosensor data will be discussed.

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UniVZ No:  Credits:  Date:

Title of Course:   
 (Course ID):

Group Leader / Supervisor(s):

Place:

Participants:

Duration:  Time on Day 1:

Preparatory Meeting:

#### Course description:

This course will provide a short introduction to the Matlab programming environment as a versatile tool in system neuroscience research. The course will be held on 3 days in consecutive weeks. You will be first introduced to the basic principles in Matlab programming, as introduced in the tutorial chapter of the course book. Course days will consist of a mixture of tutorial presentations and own practical exercises under supervision. During the exercises the new course material can be explored in small groups of two or three participants and discussed with the supervisor. Practical exercises will include analysis and graphical processing of test data. Exercises are chosen to address typical topics of system neuroscience, e.g. signal detection theory, neural encoding/curve fitting, correlation analysis, and spectral analysis.

Contact 1:

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UniVZ No.:  Credits:  Date:

Title of Course (Course ID):

Group Leader / Supervisor(s):

Place:

Participants:

Duration:  Time on Day 1:

Preparatory Meeting:

#### Course description:

Biological events are rapid and often take place within msec-sec time range. These processes can be investigated by means of transient kinetics, which is an essential method to study the mechanisms of enzymes, protein-ligand and protein-protein interactions. Detailed transient kinetics complements high resolution structural studies and together the two methods can give a molecular explanation of biological function. In this course we will explain the basic principles of transient kinetics, make experiments using rapid kinetics instrumentations, and discuss the data analysis, including numerical integration and global fit. Each full day will consist of 2 h seminar, 4 h hands-on practical work, and finish with a 1 h evaluation/feedback tutorial.

The following experiments are planned:  
Kinetics of enzyme-catalyzed reactions in msec range using quench-flow technique.  
Protein-ligand binding using stopped-flow technique.

Contact 1:

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<b>UniVZ No.:</b>	340073	<b>Credits:</b>	1.0	<b>Date:</b>	24-26 Apr 2012
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<b>Title of Course (Course ID):</b>	Affinity purification methods for the isolation of large heterogeneous macromolecular assemblies (A 82)
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<b>Group Leader / Supervisor(s):</b>	Reinhard Lührmann / Dmitry Agafonov
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<b>Place:</b>	MPI for Biophysical Chemistry, Seminar room, Tower III/1 <sup>st</sup> floor
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<b>Participants:</b>	min: 2	max: 4
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<b>Duration:</b>	3 days	<b>Time on Day 1:</b>	9 a.m.
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<b>Preparatory Meeting:</b>	No
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**Course description:**

One of the most powerful methods in present-day biochemical purifications is affinity purification. The practical will introduce the students to procedures in which we employ a molecular tag on the pre-mRNA substrate to isolate spliceosomes.

We make use of a pre-mRNA tagged with three MS2 RNA aptamers. This is incubated with the MS2-MBP fusion protein, which interacts (i) with the pre-mRNA by binding strongly to the MS2 hairpins; and (ii) with an amylose affinity matrix through the MBP (maltose-binding protein) portion of the protein. The latter interaction is fully reversible, under mild conditions, by competition with maltose.

Experimentally, the introduction to our affinity purification procedure consists of (i) preparation of a tagged pre-mRNA, (ii) assembly of spliceosomes on the tagged pre-mRNA, (iii) size fractionation of the spliceosomes by gradient sedimentation, and finally (iv) affinity selection of the spliceosomes

<b>Contact 1:</b>	Prof. Reinhard Lührmann	<a href="mailto:reinhard.luehrmann@mpi-bpc.mpg.de">reinhard.luehrmann@mpi-bpc.mpg.de</a>	0551 201 1407
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<b>Contact 2:</b>	Dr. Dimitry Agafonov	<a href="mailto:dagafon@gwdg.de">dagafon@gwdg.de</a>	0551 201 1413
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<b>Comments:</b>	
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UniVZ No.:  Credits:  Date:

Title of Course:   
(Course ID):

Group Leader / Supervisor(s):

Place:

Participants:

Duration:  Time on Day 1:

Preparatory Meeting:

**Course description:**

The fruit fly *Drosophila* represents a key model organism in modern neuroscience due to the genetic techniques by which neuronal circuits and genes can be manipulated. In this course a background in state-of-the-art genetic techniques used to investigate the function of neuronal circuits for behavior will be provided. Neuroanatomical, physiological, optogenetic and behavioral approaches will be exemplified both theoretically and in hands-on experiments. Topics include germ-line transformation, cell-type specific gene expression, optical calcium imaging, optogenetic manipulation of neuronal activity, genetic tools for neuronal silencing, behavioral and physiological studies.

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UniVZ No.:  Credits:  Date:

Title of Course (Course ID):

Group Leader / Supervisor(s):

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Participants:

Duration:  Time on Day 1:

Preparatory Meeting:

#### Course description:

##### Summary:

Conventional fluorescence microscopy is limited by diffraction to spots of ~200 nm in diameter. The real size of smaller objects cannot be distinguished. Also, objects found closer to each other than the diffraction limit cannot be distinguished. This limitation in imaging resolution can be overcome by several approaches:

One of the most successful is stimulated emission depletion (STED) microscopy, in which the excitation laser beam is overlapped with a second, doughnut-shaped beam, which quenches the excited molecules by stimulated depletion. As a consequence, fluorescence is generated selectively in the center of the excitation spot, where the quenching beam has its lowest intensity, close to zero. The resulting focal area is narrower than the diffraction limit, and therefore provides higher resolution.

A second approach is to take advantage of the exquisite resolution of electron microscopy. The fluorescently labeled preparation is fixed and illuminated in presence of di-amino-benzidine, which induces the formation of a dense precipitate in the immediate vicinity of the dye molecules (photo-oxidation). The precipitate can be easily observed in electron microscopy, and indicates the exact position and morphology of the fluorescent objects.

In the course days we will cover the theoretical basis of both techniques. Experiments involving synaptic vesicle function in both cultured cells and neuromuscular junctions will be performed for the two techniques.

##### Covered Topics and Methods:

Technical: fluorescence microscopy, resolution limitations, STED microscopy, basic electron microscopy, oxidation imaging.

Biological: pre-synaptic function, synaptic vesicle recycling, neuromuscular physiology.

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**Course ID:**  **Credits:**  **Date:**

**Title of Course:**

**Group Leader / Supervisor(s):**

**Place:**

**Participants:**

**Duration:**  **Time on Day 1:**

**Preparatory Meeting:**

**Course description:**

Enzyme activity can be analyzed spectrophotometrically and polarographically. Here we will focus on the analysis of respiratory chain complexes in isolated mitochondria.

**Contact 1:**

**Contact 2:**

**Comments:**

UniVZ No.:  Credits:  Date:

Title of Course (Course ID):

Group Leader / Supervisor(s):

Place:

Participants:

Duration:  Time on Day 1:

Preparatory Meeting:

**Course description:**

In this course we will isolate functional organelles from cultured cells via subcellular fractionation.

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UniVZ No.:  Credits:  Date:

Title of Course (Course ID):

Group Leader / Supervisor(s):

Place:

Participants:

Duration:  Time on Day 1:

Preparatory Meeting:

**Course description:**

R is a freely available programming language for statistics and graphics. This course covers the application of R on biostatistic problems. The following topics will be discussed and applied:

- descriptive statistics
- graphics
- t-test
- wilconxon test
- chi square test
- correlation analysis
- regression analysis
- ANOVA
- parametric and nonparametric multiple comparisons

Contact 1:

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UniVZ No.:  Credits:  Date:

Title of Course (Course ID):

Group Leader / Supervisor(s):

Place:

Participants:

Duration:  Time on Day 1:

Preparatory Meeting:

#### Course description:

*Keywords describing the course contents / lecture & exercises / target group*

To study synaptic transmission mechanisms, my lab takes advantage of the single cell autaptic neuron culture system. This model system is ideally suitable for understanding the most important parameters underlying synaptic communication in a quantitative fashion. It is unique, as all synapses originate from a single axon. Thus different synaptic release modes can be quantified.

#### Step 1. Preparing autaptic neuron cultures

The autaptic preparation is defined by a single neuron that resides on an island of astrocytes with limited size, called a microisland culture. First, course participants will learn how the microisland astrocyte culture is made and developed. Second, course participants will learn how to grow single neurons on the astrocyte islands. The applicants will learn to dissociate neurons from target areas of the mouse brain and to culture them on the astrocyte feeder culture.

#### Step 2. Measuring evoked synaptic transmission in autaptic cultures

In autaptic neuron cultures, all synapses that contact the dendrite of the neuron are formed by a single axon of the same neuron. Thus, all synapses can be stimulated to release transmitter at once by brief somatic depolarization. To understand the evoked synaptic responses, my lab uses a basic application of the patch clamp technique. Course participants will learn the basics of the measurement and quantification of synaptic responses in autaptic neuron cultures.

This course is intended for students who want to explore projects concerned with synaptic function in neurons.

Contact 1:

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UniVZ No.:  Credits:  Date:

Title of Course (Course ID):

Group Leader / Supervisor(s):

Place:

Participants:

Duration:  Time on Day 1:

Preparatory Meeting:

#### Course description:

An ever-increasing amount of biological events can be quantified by means of microscopy. A well-designed experiment may yield spatiotemporal information with regard to events taking place at the cellular or molecular level. A proper evaluation thereof requires understanding of what an image is, how it is generated and what subsequent processing methods are available.

Therefore, the underlying motivation for the course is the quantification of biological events through analysis of images generated with a microscope. The freely available "ImageJ" (<http://rsbweb.nih.gov/ij/>) and its "Fiji" variant (<http://pacific.mpi-cbg.de/wiki/index.php/Fiji>) are some of the several open-source applications that will be introduced towards this goal.

In particular, the components of an image will be discussed, as well as frequently used image types within their appropriate context. Basic concepts such as "lookup tables", "image calibration" or the creation of multi-channel (overlay) images will be explained along with several standard situations that a microscope user is faced with on the road toward a publication.

More advanced topics will include the modification of ImageJ installs to suit the respective need. Moreover, examples of basic image arithmetic and further image processing related to image stacks (i.e. time series), 3D reconstruction and automated image processing will be discussed.

Students attending the course may suggest topics they wish to have covered.

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UniVZ No.:  Credits:  Date:

Title of Course:   
 (Course ID):

Group Leader / Supervisor(s):

Place:

Participants:

Duration:  Time on Day 1:

Preparatory Meeting:

#### Course description:

This course is an introduction to the fundamental statistical concepts used in design and analysis of experiments in the life sciences. The course covers the following topics:

- ❖ *A primer in data management*
  - *How to set up a suitable spreadsheet for my experiment?*
  - *Being aware of data quality: How to conduct effective quality checks?*
  - *How to import data to R?*
- ❖ *Basic statistics for the design and analysis of experiments*
  - *Descriptive statistics and data visualization*
  - *Fundamental concepts of statistical inference: hypothesis testing and confidence intervals*
  - *Comparing two groups (considering various types of endpoints)*
  - *Basic designs*
    - *one-way factorial designs*
    - *two-way factorial designs*
    - *split-plot designs*
    - *cross-over designs*
  - *Sample size calculation: How many subjects or replications do I need?*
- ❖ *Interpretation of results*
- ❖ *The course will include applications in the statistical software package R ([www.r-project.org](http://www.r-project.org)).*

Contact 1:   Phone: 0551-39 4991

Contact 2:   Phone: 0551-39 4989

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UniVZ No.:  Credits:  Date:

Title of Course:  
(Course ID):

Group Leader /  
Supervisor(s):

Place:

Participants:

Duration:  Time on Day 1:

Preparatory Meeting:

**Course description:**

X-ray crystallography is the most powerful tool for the structure determination of macromolecules at atomic resolution. This practical course will provide a comprehensive introduction to state-of-the-art methodology applied in the field of macromolecular crystallography.

One part of the course will cover methods of sample preparation and characterization required prior to crystallization. Topics: bioinformatics for target selection, baculoviral recombinant expression, thermal shift assays and limited proteolysis.

The second part is dedicated to crystallographic methods themselves. Topics: high-throughput screening, storage and imaging of the plates, automated and manual optimization, crystals manipulation and cryo-protection, X-ray data collection.

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UniVZ No.:  Credits:  Date:

Title of Course (Course ID):

Group Leader / Supervisor(s):

Place:

Participants:

Duration:  Time on Day 1:

Preparatory Meeting:

**Course description:**

- LINUX introduction
- X-ray diffraction data collection (strategies)
- Processing of X-ray diffraction data
- Solving crystallographic phase problem
- MR, SAD, MAD, MIRAS
- Refinement & model building
- Structure validation

Contact 1:

Contact 2:

UniVZ No.:  Credits:  Date:

Title of Course (Course ID):

Group Leader / Supervisor(s):

Place:

Participants:

Duration:  Time on Day 1:

Preparatory Meeting:

#### Course description:

There is a number of techniques that can be used to study protein-protein or protein-ligand interactions. The use of fluorescence has advantages as, due to the high sensitivity of fluorescence, measurements can be performed at low concentration, allowing high-affinity complexes to be studied. Structural information can be gained by studying fluorescence quenching and fluorescence resonance energy transfer (FRET).

The course will introduce several kinds of fluorescence measurements (excitation and emission spectra, correction of fluorescence spectra, fluorescence polarization/anisotropy, fluorescence lifetimes, collisional quenching). FRET measurements will also be introduced and performed.

Methods for introducing fluorescence labels into selected positions in proteins or nucleic acids will be presented.

Contact 1:

Contact 2:

Participants can bring their protein containing a single cysteine residue for labeling. The protein should carry a His-tag.

UniVZ No.:  Credits:  Date:

Title of Course (Course ID):

Group Leader / Supervisor(s):

Place:

Participants:

Duration:  Time on Day 1:

Preparatory Meeting:

**Course description:**

Content of Course:

Data collection and integration, phasing, model refinement in X-ray crystallography: detailed insight in order to get the best out of crystals.

Recommended literature:

Rupp, Bernhard (2009) Biomolecular Crystallography: Principles, Practice and Application to Structural Biology. Garland Science, Taylor & Francis group, ISBN 978-0-8153-4081-2

Lecture and practicals:

The lectures will be held on Monday, Tuesday, Thursday and Friday from 9:00 to 11:00 a.m.

The practical part will be held from Monday through Friday from 1:00 to 5 p.m.

Contact 1:

Comments:

UniVZ No.:  Credits:  Date:

Title of Course (Course ID):

Group Leader / Supervisor(s):

Place:

Participants:

Duration:  Time on Day 1:

Preparatory Meeting:

#### Course description:

Genetic mouse models are widely used to study gene function during development or in the initiation or progression of tumors. Our laboratory is analyzing different genetic tumor models to analyze early organ development and the development of intestinal and breast cancer.

Participants of this course will perform basic protocols, including hematoxylin-eosin stainings and immunohistochemistry. We will analyze and compare selected markers for differentiation and proliferation on tissue sections of our genetically engineered mouse models. The stainings will be evaluated for the morphology, the presence of (pre-)malignant transformations and the expression pattern of the selected markers.

The exact dates are to be determined.

Contact 1:

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UniVZ No.:  Credits:  Date:

Title of Course (Course ID):

Group Leader / Supervisor(s):

Place:

Participants:

Duration:  Time on Day 1:

Preparatory Meeting:

#### Course description:

The comparison of gene function across species requires that the respective true orthologs are compared. These can be identified by sequence analysis.

- In the introductory lecture I will introduce to the evolution of genes and sequences with focus on the different origin of orthologs and paralogs.
- In the practical in silico work you will determine orthologs and paralogs of a given gene by performing blast searches, alignments and the calculation of phylogenetic trees.
- Subsequently, you are invited to identify orthologs of your favorite gene.

Contact 1:

Contact 2:

Comments:

UniVz No.:  Credits:  Date:

Title of Course (Course ID):

Group Leader / Supervisor(s):

Place:

Participants:

Duration:  Time on Day 1:

Preparatory Meeting:

**Course description:**

This course will provide an introduction into the graphical programming language LabVIEW. Due to its data flow architecture and easily understandable code LabVIEW is well suited for measurement automation and data acquisition tasks.

The course will be held as a block course on 5 consecutive days starting at 13:00 on each day. Each day will consist of a mixture of tutorial presentations and supervised practical exercises. During the practical exercises participants have the opportunity to explore the new course material and solve small problems alone or in groups of two.

Contact 1:

Contact 2:

UniVZ No.:  Credits:  Date:

Title of Course:  
(Course ID):

Group Leader /  
Supervisor(s):

Place:

Participants:

Duration:  Time on Day 1:

Preparatory Meeting:

**Course description:**

Participants will be introduced to NGS and HTP SNP typing on the SOLiD4 and Illumina HiScan platforms.

Contact 1:

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UniVZ No.:  Credits:  Date:

Title of Course (Course ID):

Group Leader / Supervisor(s):

Place:

Participants:

Duration:  Time on Day 1:

Preparatory Meeting:

#### Course description:

Protein family analyses are the basis for many subsequent experiments, in the wet-lab as well as in silico:

- Phylogenetic analyses
- Differentiation between orthologs and paralogs
- Is your model protein/gene really a model?
- Identification of conserved domains => protein expression, biochemical analyses
- Reconstruction of genes for the generation of knock-outs

In the course you will learn how to identify, assemble, and annotate protein sequences, especially of those species for which mRNA and gene prediction data is not available. This includes the usage of the various genome sequence databases and sequence search tools. Subsequent to the identification of potential protein family members, the candidates are assembled with the help of comparative genomics and multiple sequence alignments. For the subfamily classification you will learn how to use basic and advanced phylogenetic analysis methods. Protein domains will be characterized and gene structures reconstructed. If time remains, alternative splice forms will be analysed.

We will use databases and tools available as webservice in the internet, thus the only requirement for the course is being able to use a web browser. Multiple sequence alignments and some comparative genomics will be done with BioEdit, a free and simple to use software.

Contact 1:

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**UniVZ No.:**       **Credits:**       **Date:**

**Title of Course (Course ID):**

**Group Leader / Supervisor(s):**

**Place:**

**Participants:**

**Duration:**       **Time:**

**Preparatory Meeting:**

**Course description:**

- design of lithography masks
- basics: physics of microfluidics
- fabrication of microfluidic devices
- experiments using continuous flow and drop microfluidics
- data analysis

**Contact 1:**            

**Comments:**

UniVZ No.:  Credits:  Date:

Title of Course (Course ID):

Group Leader / Supervisor(s):

Place:

Participants:

Duration:  Time on Day 1:

Preparatory Meeting:

**Course description:**

The Department of NMR-based structural biology is offering an NMR course. It is intended to tailor the course contents to the needs of the students. Therefore, the course contents will be finalized AFTER a small survey regarding the background and expectations of the prospective participants.

Should you be interested in taking a course on NMR-based structural biology between March and August 2012, you are advised to sign up for it. You will then receive a short questionnaire regarding your background and motivation to take the course. Based in this feedback, the course contents will be further developed.

Contact 1:

Contact 2:

Comments:

UniVZ No.:  Credits:  Date:

Title of Course (Course ID):

Group Leader / Supervisor(s):

Place:

Participants:

Duration:  Time on Day 1:

Preparatory Meeting:

#### Course description:

Programming has become a very important tool in science. It plays a role from preparing and performing experiments to analyzing and plotting the results. Many routine tasks that are highly time-consuming can be automated using programs, increasing the productivity of your work. MATLAB is commonly used in institutes and universities around the world for the simplicity of its language and its immense library of tools and functions. It is not a free software, but knowledge in MATLAB can easily be applied to other free languages like Octave and Scilab.

The course is aimed at beginners. During the 3 days of the course you will learn:

Day 1: Basic concepts of MATLAB's language.

Day 2: Using MATLAB's tools and functions.

Day 3: Debugging, optimising and generalising the code.

Every day there will be a lecture in the morning followed by exercises in the afternoon. The tasks will be done in groups of two students per computer. MATLAB + computers will be provided. Previous knowledge in programming is not required.

Contact:

<b>UniVZ No.:</b>	<input type="text" value="340134"/>	<b>Credits:</b>	<input type="text" value="1.0"/>	<b>Date:</b>	<input type="text" value="9-10 May 2012"/>
<b>Title of Course (Course ID):</b>	<input type="text" value="Introduction to Cardiac Electrophysiology and Heart Optical Mapping (A 120)"/>				
<b>Group Leader / Supervisor(s):</b>	<input type="text" value="Stefan Luther, Nour Raad"/>				
<b>Place:</b>	<input type="text" value="Georg-August University Medical Center, Department of Cardiology &amp; Pneumology, Robert-Koch Str. 40, 37075 Göttingen, Room 2 C3 619 (2nd floor, C3 section, room number 619)"/>				
<b>Participants:</b>	<input type="text" value="min: 3"/>	<input type="text" value="max: 15"/>			
<b>Duration:</b>	<input type="text" value="Day 1: 3 hrs, day 2: 2 hrs"/>	<b>Time on Day 1:</b>	<input type="text" value="12:30 h"/>		
<b>Preparatory Meeting:</b>	<input type="text" value="No"/>				

**Course description:**

This course will give the participants a general overview of basic cardiac electrophysiology and the state-of-the-art technique of whole-heart optical mapping.

It will be composed of two sections. The first is a theoretical part (3hrs) that will deal with the following:

- A- Cardiac electrophysiology
  - a. Cellular electrophysiology / Excitable media
  - b. Normal / Abnormal heart electrical conduction (pathophysiology of heart disease)
- B- Optical mapping of the heart
  - a. General principles
  - b. Progress done in the technique
  - c. Mapping transgenic/mutant hearts for the study of electrical diseases

The second part of the course will be an application of what has been introduced a day earlier. The participants will join in for an optical mapping experiment of a mouse heart.

Time on Day 1: 12:30-15:30h,

Time on Day 2: 10:00-12:00h.

<b>Contact 1:</b>	<input type="text" value="Nour Raad"/>	<input type="text" value="nour.raad@med.uni-goettingen.de"/>	<input type="text" value="0551/ 39 10815"/>
<b>Comments:</b>	<input type="text" value="The course will be suitable for non-biology majors."/>		

UniVZ No.:  Credits:  Date:

Title of Course (Course ID):

Group Leader / Supervisor(s):

Place:

Participants:

Duration:  Time:

Preparatory Meeting:

**Course description:**

Micropatterning and microfluidics are emerging new tools in many areas of experimental biology, biochemistry, and biophysics. This course will provide a hands-on introduction to the foundations of these techniques. Depending on interest, a selection of the following topics will be covered: optical lithography, polymer micro-molding, pattern transfer by thin film deposition and etching, and chemical surface functionalization and patterning. Possible applications may include for example customized substrates for tissue culture and microscopy, chemical gradient generation, or microfluidic mixing for (bio)chemical kinetics experiments.

By fabricating and testing simple microdevices with features on the 10-100  $\mu\text{m}$  scale, students will gain an understanding of the capabilities and limitations of the technology. The emphasis will be on teaching the fundamentals of micro- and nanofabrication; commercial instruments that use microfluidics are not covered. After the course, students will have sufficient background to incorporate microtechnology in methods development for their own research projects.

Contact 1:

Contact 2:

Comments: tburg@mpibpc.mpg.de with a brief description of your research interests once you have been assigned for the course."/>

UniVZ No.:  Credits:  Date:

Title of Course (Course ID):

Group Leader / Supervisor(s):

Place:

Participants:

Duration:  Time on Day 1:

Preparatory Meeting:

#### Course description:

This course will provide basic knowledge and skills on performing electrophysiological measurements in slice preparations.

Participants will get insights into:

- a sagittal slice preparation of the cochlear nucleus and a coronal slice preparation of the MNTB
- the auditory brainstem circuits
- the basics of whole cell voltage clamp
- the typical spontaneous and evoked currents obtained from post-synaptic recordings
- parameters that can be read out from the traces and what they tell about presynaptic and postsynaptic function (e.g. amplitude and kinetics of events, short term plasticity,...)

The two target nuclei, the cochlear nucleus and the medial nucleus of the trapezoid body (MNTB) reside in the auditory pathway and harbor the Endbulb and the Calyx of Held, respectively. These synapses, especially the latter one, are famous models for the study of synaptic transmission in general and part of an auditory circuit involved in sound-source localization.

However, considerations for slice preparation and voltage clamp recordings that apply here are probably valid to most slice preparations across the brain.

Contact 1:

Contact 2:

Comments:

<b>UniVZ No.:</b>	<input type="text" value="340156"/>	<b>Credits:</b>	<input type="text" value="2.0"/>	<b>Date:</b>	<input type="text" value="11-13 &amp; 26-27 Apr 2012"/>
<b>Title of Course (Course ID):</b>	<input type="text" value="Python programming introductory course (A123)"/>				
<b>Group Leader / Supervisor(s):</b>	<input type="text" value="Matthias Mittner, Sven Jahnke, Markus Helmer, David Hofmann"/>				
<b>Place:</b>	<input type="text" value="MPI for Dynamics and Self-Organization, Am Fassberg 17, 37073 Göttingen, Room 1.40."/>				
<b>Participants:</b>	<input type="text" value="min: 5"/>	<input type="text" value="max: 20"/>			
<b>Duration:</b>	<input type="text" value="5 days"/>	<b>Time on Day 1:</b>	<input type="text" value="09:15 h"/>		
<b>Preparatory Meeting:</b>	<input type="text" value="No"/>				

**Course description:**

This course will give a short introduction to basic and advanced programming with Python. We will briefly introduce you to its syntax, revisit simple concepts as loops and proceed quickly to more involved techniques as object oriented programming. Furthermore, we will focus on the tool packages NumPy and SciPy to supply you with the necessary knowledge to use Python for your scientific work. In addition, for those who have some experience in programming with C/C++, we offer an optional session about interfacing Python and C/C++.

The course will be divided into theoretical and practical sessions with the following schedule:  
Start at 9am to 12am, lunch break until 2pm, end at 5pm.

<b>Contact 1:</b>	<input type="text" value="GGNB Office"/>	<input type="text" value="ggnb@gwdg.de"/>	<input type="text" value="0551-39 14002/3/4"/>
<b>Contact 2:</b>	<input type="text" value="David Hofmann"/>	<input type="text" value="david@nld.ds.mpg.de"/>	<input type="text" value="0551-5176 529"/>
<b>Comments:</b>	<input type="text" value="It is recommended to have already some basic programming experience in any programming/scripting language."/>		

UniVZ No.:  Credits:  Date:

Title of Course (Course ID):

Group Leader / Supervisor(s):

Place:

Participants:

Duration:  Time on Day 1:

Preparatory Meeting:

**Course description:**

Many of the target proteins analyzed nowadays are produced by recombinant expression in *E.coli*. In order to obtain sufficient amounts of the desired protein high-density fed-batch fermentation in a bioreactor can be performed (yielding final optical densities ( $OD_{600}$ ) of up to 100 and cell wet weight of ~ 1 kg/6 L).

In this course, participants will be trained in running such fed-batch fermentation. This includes preparation of the required solutions and media, assembly of the bioreactor and controlling the fermentation process itself.

Advantages and limitations of this method will be discussed.

Contact 1:

Contact 2:

Comments: