Zentrum für systemische Neurowissenschaften Hannover

Study Book

for the PhD program "Systems Neuroscience" of the Center for Systems Neuroscience Hannover *Zentrum für Systemische Neurowissenschaften (ZSN) Hannover*

All pages with tables for signatures as download file:
https://www.tiho-hannover.de/studium-lehre/promotion-und-phd-programme/phd-systems-neuroscience/downloads/

1. Obligatory Classes

2. Elective Classes

2.1 Elective Classes

Elective classes cover one or more of the following categories. In the catalogue they are marked by abbreviations:

Basics of Cellular and Molecular Neuroscience	**(CMN)**
Basics of Biometrics, Presentation, Animal Welfare, etc.	**(BPA)**
Sensory Systems	**(SS)**
Behavioural and Cognitive Systems	**(CS)**
Limbic Systems	**(LS)**
Motor Systems	**(MS)**
Systems Neuroscience: Clinical Applications	**(CA)**

2.2 Journal clubs and lab meetings

These classes do not cover neuroscience only, however partial credit can be given on request after approval of the supervisor.

2.3 Complementary activities

1. Obligatory Classes

4201/5201 ZSN seminar

Esser (Organization)

Joint seminar of the ZSN, invited speakers present research projects in neuroscience.

Hours and credit: 1.5 hours credit each

date	topic and lecturer	signature

*See: http://**www.zsn-hannover.de/events/***

Laboratory classes

Hours and credit: 5 days, full day, 25 hours credit for each course

no.	topic	lecturers	date	signature
4203	Cellular biology (1st year)	Mazzuoli-Weber et al.		
5204	Molecular techniques (1st year)	Beineke et al.		
4204	The senses, emotions, motor functions (2nd year)	Esser et al.		

Interdisciplinary key qualifications

no.	topic	lecturer	hours	date	signature
3001	Avoiding plagiarism: a) Online course + test b) Seminar	Leonhard-Marek	1 h 2 h		

Aim and content: How to cite and reference other people's work. Avoiding intentional or unintentional plagiarism. The seminar consists of two parts. The online course (1 h) can be taken at any time. The seminar (2 h) is meant to discuss open questions and to receive feedback. The online course ends with a test. Certificates will only be issued after passing the test.

3004	Repetition biometry	Kreienbrock et al.	12 h		

4202	Second Year Project Topic:	2 h		
		2 h		
		2 h		
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		2 h		
		2 h		

4200	General meeting of ZSN students	Behrens, SV	2 h		

4211 Workshop Neuroscience

Obligatory lecture series for PhD students in the program "Systems Neuroscience".
PhD students are supposed to collect 40 hours credit in the 1st and 2nd year, at the latest by end of the study. **Missed continuous lectures have to be attended at another time.**

for 1st year students: Members of the ZSN give an introduction to selected topics in neuroscience. It is the aim to provide a common neuroscientific base for all PhD students.

for 2nd year students: Each student gives a presentation on a topic.

Hours and credit: 2 hours credit each

		1st year students	**2nd year students**
Day 1	**introductory lectures**	X	to catch up with missed lectures
Day 2	**seminars by students**		X
Day 3	**introductory lectures**	X	to catch up with missed lectures
Day 4	**seminars by students**		X

1st year students: Introductory part

topic	**lecturer**	**date**	**signature**
Introduction to neuroanatomy	*Grothe*		
Introduction to neuropathology	*Beineke, Gerhauser*		
Introduction to neuropharmacology	*Gernert/Löscher*		
Introduction to cell biology	*Ponimaskin*		
Introduction to psychiatry	*Sinke, Szycik, Bleich*		
Introduction to emission tomography in neuroscience	*Berding/J. Bankstahl*		
Introduction to neurometabolic diseases	*Das*		
Stroke	*Weißenborn*		
Introduction to neuroscience of emotions	*Altenmüller*		
Introduction to cognitive neuroscience	*Kopp*		

2nd year students: Seminar part

topic	lecturer + student	date	signature
1. The limbic system – principal parts and their topography, function and interaction with other brain systems	*Claus*		
2. Motor systems – extrapyramidal motor system, principal parts and pathways, – pyramidal tract including innervation of the cranial nerve nuclei	*Claus*		
1. Inter- and intracellular signal pathways	*Ponimaskin*		
2. Transport pathways in neurons	*Ponimaskin*		
1. Animal models of neurological diseases (parkinsonism, cerebral ischemia (stroke), epilepsy, acute and chronic pain).	*Gernert/Löscher*		
2. Animal models of psychiatric diseases (anxiety, depression, schizophrenic psychoses, drug abuse)	*Gernert/Löscher*		
1. Zoonotic diseases of the central nervous system	*Beineke, Gerhauser*		
2. Animal models for demyelinating disorders (EAE, viral models, toxic models, genetic models)	*Beineke, Gerhauser*		
1. Neuroplasticity and depression	*Frieling, Rhein, Bleich*		
2. Opioidsystem and reward in addictive disorders	*Frieling, Rhein, Bleich*		
1. Nuclear imaging of neurodegeneration	*Berding/J. Bankstahl*		
2. Nuclear imaging of brain inflammation	*Berding/J. Bankstahl*		
1. Inborn errors of the urea cycle and neurological symptoms	*Das*		
2. Disorders of energy metabolism and the brain	*Das*		
1. Atherosclerosis	*Weißenborn*		
2. Inflammation processes after ischemic infarction	*Weißenborn*		
1. Music as a model for neuroplasticity	*Altenmüller*		
2. Affective communication in animal and man	*Altenmüller*		
1. Executive brain functions	*Kopp*		
2. Cognitive plasticity (learning)	*Kopp*		

Public defence

topic	candidate	hours	date	signature
		1 h		
		1 h		
		1 h		
		1 h		
		1 h		
		1 h		
		1 h		
		1 h		

3011 Graduate School Days

The Graduate School Days take place each year during the winter term and is an obligatory event for all PhD students. The two requested public presentations are part of the GS-Day.

Graduate School Days	contribution	hours	date	signature
GS-Days	–	8 h		
GS-Days (after 1st year)	poster	8 h		
GS-Days (after 2nd year)	talk	8 h		

2. Elective Classes

2.1 Elective Classes

4312/5312 Modern neuroimaging methods *in vivo* – from anatomy to pathophysiology of human brain

Lanfermann, Ding
Institute of Diagnostic and Interventional Neuroradiology, MHH

Category: CA

Aim and content: This seminar will give an overview about the modern neuroimaging tools used to observe physiological/pathological changes in human central nervous system in vivo, such as the basics of MRI, the diffusion tensor imaging, the functional MRI, as well as the MR spectroscopy. Special CNS diseases caused by genetic defects or other noxa will also be shortly introduced.

MR basics, relaxation time measurement, DTI, spectroscopy – Maturation of the brain – Clinical neuroanatomy – CNS-tumor diagnostics – Ischemic lesions in brain – Infection in the CNS – Imaging of the cranial nerves – Functional Magnetic Resonance Imaging (fMRI) – Advanced applications of fMRI – Further neuroradiological methods

Hours and credit: weekly, 10 lectures, 1.5 hours credit each

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4313 Functional magnetic resonance imaging of the human brain – from experimental design to data analysis

Beißner
Institute of Diagnostic and Interventional Neuroradiology, MHH

Category: SS, CS, LS, MS, CA

Aim and content: Functional magnetic imaging (fMRI) is one of the key methods used in human neuroscience. Its non-invasiveness and the wide availability of MRI scanners have led to an explosive growth of knowledge in the past 25 years. This introductory lecture will cover the physical and physiological basis of fMRI, experimental design, data analysis and key applications. Students will have the opportunity to take part in an fMRI study themselves. The aim is to enable them to set up their own fMRI experiments.

Hours and credit: 8 lectures, 2 hour credit each

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5313 Autonomic neuroscience

Beißner
Institute of Diagnostic and Interventional Neuroradiology, MHH

Category: SS, LS, MM, CA

Aim and content: The autonomic nervous system (ANS) is of key importance for the functioning of our body. Virtually all organ functions are controlled by the sympathetic and/or parasympathetic arm of the ANS. This introductory lecture will cover the anatomy and function of the peripheral autonomic nervous system, its biochemical and pharmacological mechanisms, central autonomic control, autonomic physiology, and pathophysiological mechanisms. The focus will be on the human ANS. Students will have the opportunity to take part in an autonomic neuroscience experiment themselves.

Hours and credit: 10 lectures, 1.5 hour credit each

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5316 Somatosensory therapies – The neuroscience of acupuncture, cupping and massage therapy

Beißner
Institute of Diagnostic and Interventional Neuroradiology, MHH

Category: SS, LS, MS, CA

Aim and content: What do acupuncture, cupping and massage therapy have in common? They stimulate the somatic nervous system! This simple observation provides a linking thread for a vast and heterogeneous group of therapies from complementary as well as conventional medicine.

This lecture will explore the various effects that somatosensory stimulation can have on our body and review the neuroanatomical systems that are responsible for them. Starting with a brief review of the sense of touch, we will explore interactions of the somatosensory system with the autonomic nervous system and other important regulatory systems. Finally, we will review some common concepts in complementary therapies, such as therapeutic zones (e.g. acupuncture points and meridians) and the idea of energy exchange and subject them to neuroscientific examination.

Hours and credit: 5 lectures, 1.5 hour credit each

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4416/5425 Sensory neuroscience (4416)

Kral
Institute of Audioneurotechnology, VIANNA, MHH

Categories: SS

Aim and content: Topics of the seminar are neuronal excitation, biological sensors and somatosensory system, auditory and vestibular system, visual system and chemical senses. Each topic are introduced by morning lectures. In the afternoons students will prepare a presentation of a given topic in group work.

Hours and credit: One week, 25 hours credit for the course

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4362 Imaging disorders of the central nervous system with radiotracers

Berding (Coordination)
Nuclear Medicine, Neurology, Neurosurgery, Psychiatry, Otolaryngology, MHH

Category: CA

Aim and content: ***THIS ELECTIVE PROVIDES AN UNIQUE OVERVIEW OF BRAIN DISEASES FROM A CLINICAL AND IMAGING PERSPECTIVE AND IS THEREFORE A CLEAR ASSET FOR ALL STUDENTS WORKING IN NEUROSCIENCE***

Lectures by clinical experts will cover the pathophysiology and clinical appearance of disorders in which nuclear medicine methods can contribute to the diagnostic work up.

In particular the following conditions will be addressed:

CNS tumoursMovement Disorders and dementia

Metabolic brain diseases

Schizophrenia

Tourette syndrome, obsessive compulsive disorder

Central hearing disorders

Imaging devices (SPECT/CT, PET/CT) and software tools for data analysis

Production of radiopharmaceuticals

Preclinical (animal) imaging

Clinical cases and corresponding imaging results are demonstrated. Studies in animal models of disease are presented. Finally, the participants will have the opportunity to visit the human PET centre, the radiochemistry unit and the preclinical imaging lab of the MHH and to obtain preliminary hands-on experience using specific software tools for the analysis of neuroimaging data.

Workload: The best overview is obtained with participation in most of the lectures. Supervisors of the participants' PhD theses should agree to this.

Course slides can be provided – allowing for 1 h specific preparation/reading, if interested.

Additionally, short visits to the nuclear medicine department are possible, for seeing/participating in patient anamnesis, informed consent, preparation before imaging, data acquisition and analysis, reporting to referring physician (e.g. 2–4 h, poss. on two separate days).

Hours and credit:12 times weekly, 1.5 hours credit each

date	topic	signature	date	topic	signature
	Introductory meeting			Metabolic brain diseases	
	Introduction to radiotracer imaging of the CNS			Schizophrenia	
	Production of radionuclides, synthesis of radiopharmaceuticals			Tourette syndrome, Obsessive compulsive disorder	
	Imaging devices, radiation protection			Cochlear implantation in adults and children	
	Tumors of the central nervous system (CNS)			Radiotracer imaging in animals	
	Movement disorders and dementia			Wrap-up	

4411 Translational research in rehabilitation medicine – introduction

Gutenbrunner, Nugraha
Department of Rehabilitation Medicine, MHH

Categories: CA

Aim and content: The series of lectures will give an introduction about translational research in the field of rehabilitation medicine. As the main basic/clinical research at the Dept. of Rehabilitation Medicine is pain, mostly pain and related symptoms will be the main subject. However, other neurological disorders will be covered. Additionally, students will learn how to use assessment tools to measure disability in patients. In the end this lecture will help the students to understand the translational research in the field of Rehabilitation Medicine.

Hours and credit: 1 hour credit each

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4318/5318 Neuroscience and paediatrics: Selected neurometabolic disorders and neurological development during childhood

Das, Hartmann
Clinic of Paediatrics, MHH

Categories: CA

Aim and Content: In this seminar we will give an overview regarding diagnosis of inborn errors of metabolism and shall talk about some inborn errors of metabolism with neurological symptoms. We will deal with the biochemical basis/pathogenesis, clinical symptoms and therapeutic approaches of selected diseases in detail.

One seminar shall focus on the development of brain and psychomotor function during childhood.

You will have the opportunity to see patients with metabolic and/or neuropaediatric diseases in our outpatient clinics.

Hours and credit: 3–4 times 1.5 hours credit each

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4463 Preparation of human brain and spinal cord

Grothe, Braun
Institute of Neuroanatomy, MHH

Categories: CMN

Aim and content: Using human anatomical preparates of the brain and spinal cord, topography, macroscopic anatomy, and functional connections will be explained.

Hours and credit: 2 hours credit

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4320 Quantitative morphology – Basic concepts and practical implementation of stereology

Leiter
Institute of Neuroanatomy, MHH

Categories: CMN

Aim and content: Using human anatomical preparates of the brain and spinal cord, topography, macroscopic anatomy, and functional connections will be explained.

Hours and credit: 3 hours credit

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5315 Parkinson's disease – from bench to bedside

Krauss, Grothe, Petri, Schwabe
Institute of Neuroanatomy and Cell Biology, Neurological Clinic and Clinic for Neurosurgery, MHH

Categories: CA

Aim and content:: On the first day we will give an overview about the pathophysiology and symptoms of Parkinson's Disease (PD), animal models for this condition and therapeutic approaches. In particular, the following topics will be addressed:

- clinical pathophysiology and symptoms of PD and pharmacological treatment of this condition
- basal ganglia function and animal models of PD
- novel experimental approaches (stem-cell transplantation) for the treatment of PD
- neurosurgical approaches (ablative methods, deep brain stimulation) for the treatment of PD

The next day students will be divided in groups of 3–4 participants and trained in one specific method of the 6-hydroxydopamine (6-OHDA) PD model of the rat. In the afternoon each group will present their experience and data to the other groups. In particular, the following aspects will be addressed:

- stereotactic injection of 6-OHDA into the nigrostriatal system of the anaesthesized rat
- immunohistological evaluation of the 6-OHDA lesion
- behavioral and pharmacological evaluation of the 6-OHDA induced lesion
- preparation, differentiation and evaluation of transfected stem cells

On an optional day:

- Live surgery: a limited number of six students will be given the opportunity to attend surgery for deep brain stimulation in the subthalamic nucleus with patients of the Clinic for Neurosurgery
- Clinical examination and treatment of PD patients in the PD outpatient clinic of the Clinic for Neurology.

Hours and credit: 2–3 days, 18 hours for the course

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4311 Modulation of basal ganglia activity in movement disorders by functional neurosurgery

Krauss
Clinic for Neurosurgery, MHH

Categories: CA

Aim and Content: The basal ganglia play a central role in the pathophysiology of movement disorders, such as Parkinson's disease, dystonia and tremor. In this lecture we give an overview about experimental and therapeutic approaches in the field of functional neurosurgery, which are used to explore the physiology and pathophysiology of basal ganglia activity in these disorders.

Hours and credit: 1,5 hours credit

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4316 Animal models for psychiatric disorders

Schwabe
Clinic for Neurosurgery, MHH

Categories: CS

Aim and Content: Despite considerable progress in clinical and basic neuroscience, the etiology and molecular mechanisms of mental disorders are still poorly understood. In this lecture we present different approaches to study certain psychiatric disorders at the level of animal neurobiology.

Hours and credit: 1,5 hours credit

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4412 The neurosciences of music

Altenmüller
Institute of Music Physiology and Musicians' Medicine, HMTMH

Categories: SS, CS, LS, MS

Aim and content: This seminar focuses on actual results of studies investigating the neurobiological foundations of music perception and music production in general. Literature will be critically reviewed and laboratory results will be discussed.

Hours and credit: weekly, 1.5 hours credit each

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3103 Necropsy rounds

Baumgärtner, Hewicker-Trautwein, Beineke, Wohlsein, Puff, Seehusen
Institute for Pathology, TiHo

Categories: CMN, BPA

Aim and content: Daily presentation of completed necropsies with discussion of macroscopic lesions, phrasing of appropriate morphologic diagnoses, and discussions of possible etiologies and pathogeneses.

Evaluation of achievement: Discussion throughout the seminar

Hours and credit: weekly, 1 hours credit each

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3104 Microscopic slide seminar, AFIP

Baumgärtner, Hewicker-Trautwein, Beineke, Wohlsein, Puff, Seehusen, Gerhauser, Schaudien
Institute for Pathology, TiHo

Categories: CMN, BPA

Aim and content: The seminar aims to extend the knowledge of the participants in regard to foreign animal diseases, rare and unusual animal diseases, or emerging animal diseases. The slides provided by the AFIP will be presented by participants and subsequently discussed.

Evaluation of achievement: 1. Discussion throughout the seminar, 2. Preparation of each participant

Hours and credit: weekly, 1 hours credit each

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3105 Training for the ECVP exam

Baumgärtner, Hewicker-Trautwein, Beineke, Wohlsein, Gerhauser, Puff, Seehusen
Institute for Pathology, TiHo

Categories: CMN, BPA

Aim and content: The seminar aims to prepare trainees in veterinary pathology for the certifying exam of the European College of Veterinary Pathologists (ECVP). This involves training in lesion recognition and interpretation, stating appropriate morphological diagnoses and consideration of various differential diagnoses at the macroscopic, histologic and ultrastructural level.

Evaluation of achievement: 1. Discussion throughout the seminar, 2. Preparation of each participant

Hours and credit: weekly, 1 hours credit each

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3112 Toxicological pathology of rodents – Introduction

Rittinghausen, Schaudien
Institute for Pathology, TiHo, Fraunhofer ITEM

Categories: BPA

Aim and content: The seminar provides an overview to the background pathology of aging laboratory rodents. There will be an introduction to guidelines, Good Laboratory Practice, frequently used rodents strains, the organ trimming guide, normal histological structures with special emphasis on rodent specific organs and internationally harmonized nomenclature.

Following the introduction, there will be an interactive microscope session with a demonstration of a variety of histopathological slides with common pathological findings in rats and mice at a discussion microscope.

Hours and credit: 4 hours credit

date	
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3115 Toxicological pathology of rodents – Female reproductive system

Rittinghausen, Schaudien
Institute for Pathology, TiHo, Fraunhofer ITEM

Categories: BPA

Aim and content: The seminar engrosses the insight into the background pathology of aging laboratory rodents. There will be an introduction to the most common pathological findings in laboratory rodents with special emphasis to the urinary system. Following the introduction to the organ system, there will be an interactive microscope session with a demonstration of a variety of histopathological slides at a discussion microscope.

Hours and credit: 4 hours credit

date	
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3110 Introduction into digital image analysis in pathology

Schaudien
Institute for Pathology, TiHo, Fraunhofer ITEM

Categories: CA

Aim and content: The seminar provides an introduction to the basic concept of digital image processing and image analysis. Basic operations (e.g. segmentation, dilation, erosion, opening and closing) will be presented and their use in quantification of cells and structures in e.g. special or immunohistologically stained slides will be discussed. Furthermore, different ways of tissue processing and image acquisition and their possible influence on the quality of image analysis will be addressed.

Theoretical parts will be supplemented by case presentations with thorough discussion

Hours and credit: 3 hours credit

date	
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3100 Clinical-neuropathological conferences of submitted cases (hands on)

Baumgärtner, Tipold, Beineke
Institute of Pathology and Small Animal Clinic, TiHo

Category: CA, Pathology

Aim and content: Case presentation and discussion of clinical and neuropathological diagnoses as well as correlation between MRI, histopathology and clinic.

Evaluation of achievement: Discussion throughout and at the end of the seminar

Hours and credit: 1 conference/month, 2 hours credit each

date							
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4307/5307 Clinics in neurology

Tipold et al.
Small Animal Clinic, TiHo

Category: CA

Aim and content: Special examinations of neurological cases

Hours and credit: 2 hours credit each

date							
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4306/5306 Clinics in veterinary anaesthesiology

Kästner et al.
Small Animal Clinic, TiHo

Category:CA

Aim and content: Special anaesthesia cases in cats, dogs and horses.

Hours and credit: 2 hours credit each

date							
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5308 Course in experimental pharmacology and toxicology

Löscher et al.
Institute of Pharmacology, Toxicology and Pharmacy, TiHo

Categories: BPA, CS, LS, MS

Aim and content:: Students are trained in experimental animal pharmacology, in vitro models and computer simulations, covering a wide spectrum of topics. About 50% of the course is dedicated to neuropharmacology, including topics such as anaesthesiology, analgesia and behavioural pharmacology. At the beginning of the course there is introduction into the basics of research planning and data analysis, animal welfare and biometrics.

Hours and credit: 2–3 hours credit each

date							
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4301 Advanced lab course systems neurobiology

Esser
Institute for Zoology, TiHo

Categories: CS, BPA, SS

Aim and content: Introduction to specific methods & research tools

Hours and credit: 3 weeks full day, 75 hours credit for the course

date	
signature	

5319 Neuro- and sensory biology

Esser, S. Schmidt
Institute for Zoology, TiHo

Aim and Content: In our seminar students present and discuss (together with us) recent literature from the field of neuro- and sensory biology with special reference to hearing, vision and multimodal orientation.

Hours and credit: One week, 12 hours credit for the course

date	
signature	

5343 Neurobiology of acoustic communication and orientation

Zimmermann, S. Schmidt, Scheumann, Schmidtke
Institute for Zoology, TiHo

Aim and content: This course on vocal communication and acoustic orientation in mammals addresses the mechanisms of vocal call production and call processing from an evolutionary perspective. Non-human primates and bats are discussed as important models in comparative research on communication, cognition and orientation. The participants will present and discuss recent articles from the field and get hands-on training on modern techniques in bioacoustics, psychoacoustics and experimental behavioural research.

Hours and credit: One week full day, 25 hours credit for the course

date	
signature	

4302/5333 Cellular neurophysiology of the auditory system

Felmy
Institute for Zoology, TiHo

Categories: CMN

Aim and Content: The course provides hands on experience in electrophysiological *in vitro* recordings from auditory brain stem neurons. The student will gain insights into the acute slice preparation, whole-cell patch-clamp recordings. Theoretical focus will be on the action potential generation and synaptic transmission.

Hours and credit: 1 week full day, 25 hours credit for the course

date	
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3220 Introduction to neurogastroenterology

Mazzuoli-Weber, Elfers
Institute for Physiology, TiHo

Categories: CMN

Aim and Content: The students have insight into the current research of the working group in the field of neurogastroenterology. The students have the opportunity to learn and join established methods (e.g. primary cell culture of enteric neurons, immunohistochemistry, visualization of neuronal activity with voltage-sensitive or calcium-sensitive dyes). They will be encouraged to critically evaluate the usefulness of different experimental approaches.

Hours and credit: 1 week full day, 25 hours credit for the course

date	
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5415 The neurosciences of music

Altenmüller et al.
Institute of Music Physiology and Musicians' Medicine, HMTMH

Categories: SS, CS, LS, MS

Aim and Content: This seminar focuses on actual results of studies investigating the neurobiological foundations of music perception and music production in general. Literature will be critically reviewed and laboratory results will be discussed.

Hours and credit: 2 hours credit each

date							
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2.2 Journal clubs and group meetings

Participation can be summarized per semester.

No.	topic	lecturer	hours/ semester	semester	signature

2.3 Complementary activities

3122 Veterinary pathology under enhanced biosafety conditions, *German*

Ulrich
FLI, Greifswald - Insel Riems

Aim and content: The seminar offers the participants hands-on experience in veterinary pathology under enhanced biosafety conditions. The workshop consists of practical courses in necropsy techniques and histotechnology, as well as a theoretical part concerning principal guidelines for personal and environmental protection. The aim is to provide an overview on the structural needs of enhanced biosafety facilities and guide the participants in 1:1 supervision while performing necropsies and histotechnology. Furthermore archives of gross images and slide sets of officially notifiable diseases are available for extensive self-training.

Hours and credit: 2 weeks with 5 days, 8 hours/day, 50 hours credit

date	
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3123 Advanced veterinary pathology under enhanced biosafety conditions, *German*

Only in combination with introductory course (3122)

Ulrich, Teifke
FLI, Greifswald - Insel Riems

Aim and content: This seminar is part two of a series and offers the participants hands-on experience in veterinary pathology under enhanced biosafety conditions with a focus on **zoonotic infectious diseases**. Furthermore, the topic of **dual use research of concern (DURC)** will be considered. The workshop consists of practical courses in necropsy techniques and histotechnology, as well as a theoretical part concerning principal guidelines for personal and environmental protection. The aim is to provide deeper insights into the structural needs of enhanced biosafety facilities and guide the participants in 1:1 supervision while performing necropsies and histotechnology. Furthermore archives of gross images and slide sets of officially notifiable diseases are available for extensive self-training.

Hours and credit: 2 weeks with 5 days, 8 hours/day, 50 hours credit

date	
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4102/5102 Course in Basics of Laboratory Animal Science with rats/mice

(according to FELASA B guidelines)

Hiebl
Institute for Animal Hygiene, Animal Welfare and Behaviour of Farm Animals, TiHo

Aim and content: This course is mandatory for persons carrying out animal experiments and is performed in strong accordance to the recommendations of the Federation of European Laboratory Animal Science Associations (FELASA category B-course) and the Society of Laboratory Animal Science. This course consists of lectures and practical exercises.

Hours and credit: One week, full day, 40 hours credit, special certificate

3016 Grundlagen der Versuchstierkunde und Grundmodul Tierexperimentelle Techniken, *German*

Lecturers of the ZTL, MHH

Aim and content: Die Vorlesung richtet sich an Studierende naturwissenschaftlicher Studiengänge, Studierende der Human- und Zahnmedizin sowie an alle Mitarbeiter der MHH, die in Tierversuchen mitwirken wollen. Die Vorlesung vermittelt an insgesamt 12 Terminen umfangreiches Wissen zu den Themen Versuchstiere und Versuchstierkunde. An einem 13. Termin wird das erworbene Wissen in Form einer Klausur abgefragt. Die Teilnahme an der Klausur ist nur mit maximal einem Fehltermin möglich. Ein versäumter Vorlesungstermin kann im Folgesemester nachgeholt werden.

Die erfolgreiche Teilnahme an der Vorlesung ist Voraussetzung für die Teilnahme am „Grundmodul Tierexperimentelle Techniken“ (Anmeldung erforderlich).

Für die erfolgreiche Teilnahme an der Vorlesung und dem „Grundmodul Tierexperimentelle Techniken“ wird eine Bescheinigung als Nachweis der erworbenen Sachkunde ausgestellt.

Hours and credit: Thursdays and Tuesdays weekly, 25 hours credit for the course, special certificate

3015 Basics in laboratory animal science and Basic Laboratory Animal Module

A. Bleich
ZTL, MHH

Aim and content: The lecture and practical course “Basics in Laboratory animal Science” is for persons involved in the use of animals for scientific purposes to achieve competence in the sense of animal welfare and according the German Animal Welfare Law (TierSchG §7).

The local authority (LAVES) will provide a “certificate of exemption” only after successful attention of a theoretical plus a practical module.

Theoretical module:
The 2-day theoretical module “Basics in Laboratory Animal Science” includes following topics: Legal aspects (including national legislation), basics in anatomy and physiology of different laboratory animal species, application of substances, anesthesia, operation and perioperative care, blood collection, euthanasia, basics in genetics, nomenclature and breeding management, husbandry, labelling, health monitoring and hygienic requirements.

Learning outcome will be assessed by a written exam.

Practical module:
In the 2-day practical “Basic Training Module” basic skills will be obtained: propaedeutics, handling (mouse, rat, guinea pig), anatomy and physiology, application and blood sample collection techniques, humane killing, sample collection, anesthesia, labelling of laboratory animals, documentation (please, bring your own lab coat with you).

Precondition for participation in the practical “Basic Training Module” is the proved successful attendance in the theoretical module “Basics in Laboratory Animal Science” or a comparable theoretical course.

Hours and credit: 25 hours credit for the course, special certificate

3851 Biochemistry Seminar

Naim, von Köckritz-Blickwede
Institute for Physiological Chemistry, TiHo

Aim and content: Current topics in life science.

Hours and credit: 1 hour credit each

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3010 Data analysis with R, *English in winter term*
3012 Data analysis with R, *German in summer term*

K. Jung
Department of Animal Breeding and Genetics, TiHo

Aim and content: Introduction to R programming; data structures and data processing in R; statistical methods for the analysis of scientific experiments (statistical testing, regression, analysis of variance, correlation analysis); basics of statistical bioinformatics (analysis of molecular high-throughput data from microarray and NGS experiments, normalization, visualization multiple testing)

Hours and credit: 18 hours credit for the course

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3002 Effective searching – An update

Leonhard-Marek
Library, TiHo

Aim and content: Information can be found in different places. After an introduction to "where, how and what to search", we will have a look on the features of search engines, different kinds of databases, catalogues and discovery systems. We will elaborate effective search strategies and discuss the requirements of narrative versus systematic reviews.

Hours and credit: Two days, 4 hours credit

date		
signature		

3005 The use of EndNote in bibliographic database management

Leonhard-Marek
Library, TiHo

Aim and content: EndNote enables its users to manage bibliographic data effectively. This includes retrieval and display. It allows reversible changes in format to suit the requirements of journals publishers when submitting a paper. The features of EndNote are explored by means of various examples.

Hours and credit: One day, 2 hours credit

date	
signature	

3009 Wissenschaft prägnant vermitteln, *German and English*

Lepenies, Leonhard-Marek
RIZ and Library, TiHo

Aim and content: Im Kontext der stetig steigenden Zahl von Publikationen und Anträgen sowie der zunehmenden Interdisziplinarität der Forschung wird es immer wichtiger, die eigenen Inhalte und Ziele kurz, prägnant und allgemeinverständlich zu formulieren. In diesem Workshop stehen daher die folgenden Themen im Vordergrund:
- Erlernen neuer Vortragsformate (Science Slam, Pecha Kucha, Stegreifpräsentation)
- Kernbotschaften identifizieren
- Visualisierungen
- Präsentation als Kunsthandwerk
- Rhetorische Mittel
- Vortragsfähigkeiten ausprobieren und erweitern
- Umgang mit Lampenfieber
- eigene Beiträge der Teilnehmer

Hours and credit: Two days, 18 hours credit

date		
signature		

3007 The scientific oral presentation and poster presentation

Wohlsein
Institute for Pathology, TiHo

Aim and content: This seminar provides general information about the planning and preparation of an oral scientific presentation. Participants will get general information about the transfer of information to an audience. Additionally, principal information is provided for the preparation of a poster presentation.

Hours and credit: 2 hours credit

date	
signature	

3006 How to write and publish a scientific paper

Alldinger
Institute for Pathology, TiHo

Aim and Content: The seminar aims to provide an overview over the process of preparing a scientific publication. A second emphasis will be put on the organization and procedure of the publishing and printing process (concept of editor/publisher/printer, criteria for the choice of an appropriate journal, article categories, manuscript submission, procedure of peer review, re-submission, reprints, patent/protected publication, electronic publication).

Hours and credit: 3 hours credit

date	
signature	

3008 English lecture and presentation skills

von Reumont
HGNI, TiHo

Aim and content: Oral presentation, manuscripts, structure of an oral presentation, linguistic competence

Hours and credit: Two days, 16 hours credit

date		
signature		

3041 Scientific English papers workshop I

Sherwood-Brock
HGNI, TiHo

Aim and content: This workshop is aimed at all those interested in learning about, or reviewing, the intricacies of writing scientific papers in clear English. There will be opportunities for participants to discuss particular difficulties.

Hours and credit: Two days, 12 hours credit

date		
signature		

3042 Scientific English papers workshop II

Sherwood-Brock
HGNI, TiHo

Aim and content: This workshop is aimed at all those interested in learning about, or reviewing, the intricacies of writing scientific papers in clear English. There will be opportunities for participants to discuss particular difficulties. Participants are asked to bring along any written drafts either of parts of their PhD thesis or of papers to be submitted for publication.

Hours and credit: Two days, 12 hours credit

date		
signature		

3043 Scientific posters and presentations workshop

Sherwood-Brock
HGNI, TiHo

Aim and content: This workshop is directed at all students wanting to brush up their language and presentation skills needed for a poster/paper in English.
Grammar points will be reviewed, and language introduced for presenting topics and data.
Opportunity will be given for all participants to learn the dos and don´ts when presenting their own poster or paper.
Participants are asked on registration for this workshop to state whether they will be presenting a poster or paper.

Hours and credit: Two days, 12 hours credit

date		
signature		

3044 English grammar

Sherwood-Brock
HGNI, TiHo

Aim and content: English grammar: no problem!
This workshop aims to provide students with an individual grammar checklist, making writing English texts less of a problem. With help of this crash course the main English grammar pitfalls will be focused on and individual questions will be answered.

Hours and credit: Two days, 12 hours credit

date		
signature		

3045 Job applications and interview techniques

Sherwood-Brock
HGNI, TiHo

Aim and content: Job applications and interview techniques.

Hours and credit: Two days, 12 hours credit

date		
signature		

Further electives of choice

no.	topic	lecturers	hours	date	signature

Scientific congresses and meetings

Congresses with active participation or with attendance. (8 h credit for more than one day)**:**

congress/meeting	contribution	hours	date	**signature**