

# Course Guide – Master Cognitive Science

Winter 2016/17

14.10.2016

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## Enrollment for Courses

Students in the first semester will be registered by the lecturers in the first session of each course. Advanced students (from the second semester on) are requested to register with the university's **VSPL**-system (info: [vspl-support@rub.de](mailto:vspl-support@rub.de)) and should be aware of earlier VSPL-deadlines. Exceptions include the courses held by Wiskott, Schöner and Würtz. Here, there will be **no VSPL-registration**, but a manual enrollment in the first session.

## FIRST YEAR PROGRAM

Every student is strongly recommended to participate in the preparatory courses. Exceptions have to be approved by Dr. Tobias Starzak ([tobias.starzak@rub.de](mailto:tobias.starzak@rub.de)) or by Prof. Dr. Albert Newen ([albert.newen@rub.de](mailto:albert.newen@rub.de)). The course "Academic English" need not be passed by native speakers of English. The course "Biostatistics" need not be passed by students who have a standard BA in psychology.

## Preparatory Courses

### Academic English

*SEMINAR*  
ENGLISH FOR MASTER COGNITIVE SCIENCE (251 210)  
ANNA SOLTYSKA

**TERM:** Winter 2016/17  
**MEETING TIME:** September 27 – October 7, 8.30 – 10.30  
**ROOM:** GABF 04/516

This course takes into account the particular needs of the students of the Master Programme in Cognitive Science and covers all competencies that are necessary to study in English. It focuses on productive skills that will be practiced by means of discussions and short presentations on study-related issues. Using a task-based approach, listening, reading, writing and speaking skills will be trained intensively and social and intercultural competencies will be included as well. Authentic lectures and academic texts on chosen topics related to philosophy,

psychology and neuroscience will be used throughout the course.

The course will be accompanied by a Blackboard/Moodle component to enhance classroom teaching and self-study at home.

At the end of the course the participants have to write a final test that will comprise all four skills taught in class.

Literature: Materials compiled from a variety of sources will be used.

*SEMINAR*  
**BIostatISTICS (119 212)**  
JANOSCH KELLERMANN

<b>TERM:</b>	Winter 2016/17
<b>MEETING TIME:</b>	2016, September 30–October 7: 11.00 – 12.30 and 13.00 – 14.30 2016, October 10-14: 8:30 -11.30
<b>ROOM:</b>	GAFO 04/615 (“Medienraum”)

“Biostatistics” will cover the basic statistical methods used by researchers in the life sciences to collect, summarize, analyze, and draw

conclusions from data. The topics include descriptive statistics, univariate statistical tests, and experimental design.

# A1. Introduction to Cognitive Science

## A1.

A1. Introduction to Cognitive Science

**OBLIGATORY FOR EVERY FIRST YEAR STUDENT**

*LECTURE & SEMINAR*

**INTRODUCTION TO COGNITIVE SCIENCE (LECTURE 030 004)**

PROF. ALBERT NEWEN, PROF. MARTIN BRÜNE,  
PROF. ONUR GÜNTÜRKÜN, PROF. NIKOLAI AXMACHER,  
PROF. NIKOL RUMMEL, PROF. SARAH WEIGELT  
PROF. TOBIAS SCHLICHT, PROF. GREGOR SCHÖNER,  
PROF. LAURENZ WISKOTT, PROF. SEN CHENG

<b>TERM:</b>	Winter 2016/17
<b>LECTURE:</b>	Wednesday, 10 – 12 (First Meeting: 2016 October 19)
<b>ROOM:</b>	HGA 20
<b>SEMINAR:</b>	Wednesday, 12 – 14 (First Meeting: 2016 October 19) Please notice: The seminar will have some modified times to be announced at the first meeting
<b>ROOM:</b>	GAFO 05/425.
<b>CP:</b>	6

### Attention:

- The time of the lecture will not vary but the time of the seminar will vary somewhat: In the first seminar session, you will receive an overview of the times. Seminar #3, 9 and 11 are realized as a "Blockseminar". Three seminars sessions are clustered at November, 11th, 12.15-18.00 in room GAFO 05/609. Thus, there will be no seminar after lectures #3, 9, 11 and 14.
- Lecture and Seminar #14 take place in LWL-Universitätsklinik Bochum, Alexandrinenstraße 1, 44791 Bochum

The lecture introduces the interdisciplinary field of cognitive science in combining philosophy, psychology, computational modeling and neurosciences. The course has the aim to deliver important basic knowledge from empirical sciences in the framework of theory formation. The

credit points are delivered on the basis of a written examination and of some active work in the obligatory additional seminar.

### The structure of the lecture:

1. Introduction: History of Cognitive Science
- 2 Basic Concepts in Cognitive Science
- 3 Cognitive Neuroscience of Perception
- 4 Modeling Vision
- 5 Consciousness of Perception
- 6 Development of Vision
- 7 Enacted and Embodied Cognition
- 8 Models of Motor Control
- 9 Cognitive Neuroscience of Emotion
- 10 Theories of Emotion
- 11 Psychology of Learning
- 12 Cognitive Neuroscience of Memory
- 13 Models of Learning and Memory
- 14 Social Cognition: Evolution, Development, Pathology

## BM. Basic Methods

Students are expected to learn (at least) three out of four basic methods: If you have a BA in psychology, you can skip the "Experimental Psychological Lab" but have to pass the three other basic methods. If you have a BA in philosophy you can skip the course "Logic" but have to learn the other three methods. Some with a BA in neuroscience can skip method BM 4. All the other students need to study all basic methods. Exceptions can be made if someone can prove to have already studied the content of a course but need explicit approval by Dr. Tobias Starzak ([tobias.starzak@rub.de](mailto:tobias.starzak@rub.de)) or by Prof. Dr. Albert Newen ([albert.newen@rub.de](mailto:albert.newen@rub.de)).

### BM1.

#### BM1. Experimental Psychology Lab

*SEMINAR*

**EXPERIMENTAL PSYCHOLOGICAL LAB (119 213)**

DR. SIMON E. BLACKWELL

<b>TERM:</b>	Winter 2016/17
<b>MEETING TIME:</b>	Thursday 12-14; First meeting: 20 <sup>th</sup> of October
<b>ROOM:</b>	GABF 04/352
<b>CP:</b>	6

The Experimental Psychology Lab course aims at introducing the principles of experimental psychology. The participants will learn how to plan and conduct own experimental studies, and how to analyze the data.

As a result, all participants will write a first scientific report. The lab course will be held in small groups.

SEMINAR  
**LOGIC COURSE (030 061)**  
 PROF. CHRISTIAN STRASSER

<b>TERM:</b>	Winter 2016/17
<b>MEETING TIME:</b>	Thursday, 10-12 (First meeting: 2016, October 20)
<b>ROOM:</b>	GABF 04/609
<b>CP:</b>	4

This course offers an elementary introduction to classical logic from a philosophical perspective. Students will get familiarized with the formal languages of propositional and predicate logic. The meaning of logical connectives ("and", "or", "implies", "not") and quantifiers ("for all", "there is a") will be discussed in terms of their model-theoretic semantics. A formal proof method will be introduced. A part of the course will be devoted to practical exercises. In this way students have the opportunity to internalize and consolidate their theoretical insights.

A precondition for receiving a certificate is 1.) to submit weekly homework regularly and 2.) to pass the written exam at the end of the course. The certificate can be with or without grade (dependent on the amount of work).

Please register by sending an email to [christian.strasser@rub.de](mailto:christian.strasser@rub.de)

For literature besides the script (which will be available via the blackboard online portal), see e.g.,

- Graeme Forbes: Modern Logic. Oxford University Press, 1994.
- Wesley C. Salmon: Logik. Reclam, 1983.
- Theodor Sider, Logic for Philosophy, Oxford University Press, 2010.
- Dirk Van Dalen, Logic and Structure, Springer, 2004
- Raymond M. Smullyan, Logical Labyrinths, A K Peters Ltd, Wellesley, MA, 2009
- .

## General Remark Concerning BM3 – Neural Networks

A basic course in neural networks is obligatory. The course of Prof. Cheng is the standard course for the students in Cognitive Science. If you are coming with more background in mathematics you feel free to choose other offers. Students only have to pass one course in BM3.

# BM3.

BM3. Neural Networks

SEMINAR

COMPUTATIONAL COGNITIVE MODELING (310 024)

PROF. SEN CHENG

<b>TERM:</b>	Winter 2016/17
<b>MEETING TIME:</b>	Monday, 14-16 (First Meeting: 2016, October, 17)
<b>ROOM:</b>	NB 3/57
<b>CP:</b>	3
	Max. 20 students

The human mind is most intimately familiar to us, yet we understand very little about how it functions. To study the mind, the field of cognitive science pursues an interdisciplinary approach. One of the pillars of cognitive science is computational modeling. This seminar will survey models of perception, memory and action. Rather than focusing on the mathematical details, we will discuss the motivation, application and noteworthy properties of the models, including their strengths and shortcomings. Class work will include student presentations and discussions.

**Prerequisites:** Basic knowledge of cognition e.g., "Cognition I + II", "Learning".

**Assessment:** Presentation in class

**Course material:** Blackboard (sign-up required)

**Textbook:** "The Cambridge Handbook of Computational Psychology" edited by Ron Sun, Cambridge University Press  
+ modeling papers announced in class

**Contact:** Prof. Sen Cheng, NB 3/33,  
sen.cheng@rub.de

**Office hours:** Thursdays 14:00-15:00 or by appointment

*LECTURE & EXERCISE***COMPUTATIONAL NEUROSCIENCE – NEURAL DYNAMICS****(310 001 & 310 011)**

PROF. GREGOR SCHÖNER

<b>TERM:</b>	Winter 2015/16
<b>LECTURE:</b>	Thursday, 14.15 – 16.00 (First Meeting: 2016, October 20)
<b>ROOM:</b>	NB 3/57
<b>EXERCISE:</b>	Thursday, 16.15 – 17.00 (First Meeting: 2016, October 27)
<b>ROOM:</b>	NB 3/57
<b>CP:</b>	6

This course provides an introduction into the theoretical behavioral and functional neurosciences from a particular theoretical vantage point, the dynamical systems approach. This approach emphasizes the evolution in time of behavioral and neural patterns as the basis of their analysis and synthesis. Dynamic stability, a concept shared with the classical biological cybernetics framework, is one cornerstone of the approach. Instabilities (or bifurcations) extend this framework and provide a basis for understanding flexibility, task specific adjustment, adaptation, and learning.

The course will include tutorial modules that provide mathematical foundations. Theoretical concepts will be exposed in reference to a number

of experimental model systems which will include the coordination of movement, postural and configurational stability, the perception of motion, and elementary forms of spatial cognition. In the spirit of Braitenberg's "synthetic psychology", autonomous robots will be used to illustrate some of the ideas.

Exercises will be integrated into the lectures. They will consist of elementary mathematical exercises, the design of (thought) experiments and their analysis, and the design of simple artificial systems, all on the basis of the theoretical framework exposed in the main lectures.



*LECTURE*  
**NEUROPSYCHOLOGY (112 621)**  
PROF. BORIS SUCHAN

<b>TERM:</b>	Winter 2016/17
<b>MEETING TIME:</b>	Tuesday, 10.00 – 12.00 (First Meeting: 2016, October 25) Exam: 2017, March 21 in HGA 20
<b>ROOM:</b>	GAFO 02/364
<b>CP:</b>	3

Aim of this lecture is to get an insight in the organization of the human brain, functional neuroanatomy and neuropsychology. Starting with an overview of basic methods used in neuroscience, the full brain starting at the occipital lobe and ending at the frontal lobe will be explored

with respect to its functional organization. Beside functional organization, neuropsychological syndromes like neglect apraxia and amnesia will be discussed.

Literature: Kolb & Wishaw: Fundamentals in human neuropsychology.

## C. Topics Selection

# C1.

C1. Social Cognition & Meta-Science

SEMINAR

THE PHILOSOPHY OF ANIMAL MINDS (030 086)

DR. TOBIAS STARZAK

TERM:	Winter 2016/17
MEETING TIME:	Thursday, 12-14 (First Meeting: 2016, October 20)
ROOM:	GABF 04/358
CP:	6

Can animals think? And if so, what do they think about and what are the limits of animal thought? Are they rational in the same sense humans are? Or is there a distinct animal rationality? Do they have concepts or beliefs? Do they understand causality or other minds? How can we get access to the animal mind? And how can we choose between alternative explanations for animal behavior? Philosophers have been discussing questions like these since antiquity and they do so for various reasons. Answers to these questions can have important implications for animal ethics but they are also important from an anthropological perspective, since one possible way to determine human nature is by comparison to non-human animals. But is there really an essential difference between humans and non-human animals, a so-called *anthropological* difference? Or are there only gradual differences that add up to a something that seems more fundamental than it really is? And why do we put

more emphasis on some differences than on others? Finally, what can we learn about the psychological abilities in question and our mental vocabulary by studying the animal mind?

In this seminar we'll discuss these philosophical questions in due consideration of the relevant empirical literature from comparative psychology.

Suggested literature for preparation:

Hurley, S. & Nudds, M. (eds.) (2006). *Rational animals?* Oxford University Press.

**Office hours:** Wednesdays 12-13

*SEMINAR*  
**NEW WORK ON SOCIAL COGNITION (030 087)**  
PROF. TOBIAS SCHLICHT

<b>TERM:</b>	Winter 2016/17
<b>MEETING TIME:</b>	Tuesday, 12-14 (First Meeting: 2016, October 18)
<b>ROOM:</b>	GA 3/143
<b>CP:</b>	6

In this seminar, which is taught in English, we will read recent text from the vivid debate on social understanding, i.e. on topics related to the question how we understand each other. Human beings are importantly social beings and an adequate philosophical theory of the capacity to get access to other people's mental states must conform to the best evidence from developmental psychology and social neuroscience. The seminar will cover debates on a) social perception, b) the developmental paradox that young infants seem to have an implicit understanding of false beliefs but cannot express this explicitly until they are 5 years old, c) dual process theories of social cognition, and d) the role

of social cognition in collective activities like joint actions.

The texts will be available for students in a moodle course from September.

**Office hours:** Tuesdays 11-12 in GA 3/29 or by appointment

## SEMINAR

## EMBODIED AND ENACTIVE COGNITION (T.B.A.)

PROF. ALBERT NEWEN, PROF. ISTVÁN ARANYOSI

<b>TERM:</b>	Winter 2016/17
<b>MEETING TIME:</b>	Monday, 16-18 (First Meeting: 2016, October 24)
<b>ROOM:</b>	GA 03/46
<b>CP:</b>	6

Philosophy of mind and the cognitive sciences have been undergoing a radical theory shift in the last 20 or so years, from the classical cognitivist-computational model of cognition to the current embodied and enactive approaches. The old model's implicit assumptions included the view that the brain is to be thought of as a self-sufficient processing unit when it comes to our task of explaining how cognition works. The brain, in other words, was in fact assumed to be a disembodied organ in the sense that being part of an organism was not considered as essential to how the brain grounds cognitive processes. This neo-Cartesian approach has come under heavy fire, both theoretically and empirically, and to be gradually replaced by the embodied mind hypothesis, according to which bodily states and processes, which in the old cognitivist paradigm were considered non-cognitive, are essential elements of cognition. The course is designed to introduce the student to the classic theoretical underpinnings as well as empirical findings connected to this new paradigm of cognitive science and the philosophy of mind.

Course objectives: to introduce students to both classic and more recent and advanced work in the post-cognitivist era of embodied and enactive approaches to the mind. The

course will be divided into the following thematic parts:

- (i) What Embodied and Enactive Cognitive Science (EECS) is an alternative to: classical computational/symbolic cognitivism.
- (ii) The basics of the paradigm: essential brain-body and organism-environment connections.
- (iii) Early embodied theory: Merleau-Ponty
- (iv) Ecological Psychology: Gibson's affordances
- (v) Pre-noetic constraints on perception and action: Gallagher
- (vi) Body schema, phantom limbs.
- (vii) Gestures and cognition
- (viii) Enactivism 1: visual perception: Noe
- (ix) Enactivism 2: other sense modalities
- (x) Extending the mind: Clark&Chalmers
- (xi) Embodied memory
- (xii) Embodiment and culture

*LECTURE & EXERCISE***ARTIFICIAL NEURAL NETWORKS (310 002 & 310 012)**

PD DR. ROLF WÜRTZ

<b>TERM:</b>	Winter 2016/17
<b>LECTURE:</b>	Friday, 12– 14 (First Meeting: 2016, October 21)
<b>ROOM:</b>	HZO 100
<b>EXERCISE:</b>	Wednesday, 15 – 16 (and/or 16-17), (First Meeting: 2016, October 26)
<b>ROOM:</b>	ND 3/99
<b>CP:</b>	5

This lecture presents standard algorithms and new developments of feedforward Artificial Neural Networks, their functioning, application domains, and connections to more conventional mathematical methods. Examples show the potential and limitations of the methods. Supervised as well as unsupervised learning methods are introduced. In detail:

- 1) Introduction, some biological facts
- 2) Mathematical foundations: probability theory and partial derivatives
- 3) One layer networks and linear discriminants
- 4) Multilayer networks and error backpropagation

- 5) Universality of two-layer networks
- 6) Radial basis function networks
- 7) Neuronal maps: Kohonen network, Growing Neural Gas
- 8) Optimization methods

*Learning objectives:*

Theoretical understanding of feedforward neural networks, practical skills in computer implementations

*Soft skills:*

Each student must present the results of one exercise.

*Individual competences:*

Programming selected routines in C++, theoretical understanding of feedforward Neural Networks

LECTURE  
INTRODUCTION TO PERCEPTION (118 311)  
PROF. SEN CHENG

TERM:	Winter 2016/17
MEETING TIME:	Monday, 10 – 12 (First Meeting: 2016, October 17)
ROOM:	GA 04/187
CP:	3

Perception of sensory inputs can be studied along three different dimensions: modality, description level and methodology. This lecture will discuss several different examples along each dimension and highlight common principles, when possible. Modalities include, for instance, vision, audition, olfaction and proprioception. The description level will range from receptor physiology to Gestalt psychology. The methodology will include psychophysics, electrophysiology and computational modeling.

**Prerequisite:** *[no special prerequisite]*

**Assessment:** final exam (Monday, 20.02.2017, 10-12); make-up exam (Monday, 13.03.2017, 10-12)

**Attendance:** optional, but highly recommended

**Course material:** Blackboard (required, key: RuhrUni)

**Textbook:** Sensation and Perception by E. Bruce Goldstein, 8th or 9th ed, Wadsworth

**Contact:** Prof. Sen Cheng, NB 3/33,  
sen.cheng@rub.de

**Office hours:** Thursdays 14-15 or by appointment

*LECTURE***THE NEURAL BASIS OF VISION (118 312)**

PROF. SEN CHENG, DR. AMIR AZIZI

<b>TERM:</b>	Winter 2016/17
<b>MEETING TIME:</b>	Friday, 10 – 12 (First Meeting: 2016, October 14)
<b>ROOM:</b>	GA 04/187
<b>CP:</b>	3 Max. 20 students

Of all modalities vision is best studied, perhaps due to the dominance of the visual sense in humans. Even so much is still unknown about the neural basis of vision and visual plasticity. The goal of this seminar is to introduce students to the classic and current research literature. Therefore, a range of experimental approaches will be covered, including electrophysiology and imaging techniques such as fMRI, EEG and MEG.

**Enrollment:** VSPL, max. 20 students

**Assessment:** presentation in class

**Attendance:** mandatory, min. 66%

**Course material:** Blackboard (required)

**Contact:** Prof. Sen Cheng, NB 3/33,  
sen.cheng@rub.de

Dr. Amir Azizi, NB 3/70, amir.azizi@rub.de

*ONE-WEEK INTERNSHIP*  
**AUTONOMOUS ROBOTICS (310 036)**  
M. SC. MATHIS RICHTER

<b>TERM:</b>	Winter 2016/17
<b>MEETING TIME:</b>	<b>2017, FEBRUARY 20.-24.</b> (First meeting: 2017, February 2, NB 3/57)
<b>ROOM:</b>	NB 02/77
<b>CP:</b>	3

The practical course gives an introduction to mobile robotics with a focus on dynamical systems approaches. In the exercises, the computing environment Matlab is used to control e-puck miniature mobile robots, equipped with a differential drive, combined infrared/proximity sensors and a video camera. The course covers elementary problems in robot odometry, use of sensors and motor control. It then teaches basic dynamic methods for robot navigation, in which the robot's sensors are used for obstacle avoidance and approach to a target location.

Interested students who do not have experience in Matlab should attend the Matlab introduction of the lab exercise Computer Vision (typically the week before this course). Details about availability and credit points have to be clarified early via email.

**Contact:** [mathis.richter@ini.rub.de](mailto:mathis.richter@ini.rub.de)



*LECTURE***LEFT BRAIN - RIGHT BRAIN (118 111)**

PROF. ONUR GÜNTÜRKÜN

<b>TERM:</b>	Winter 2016/17
<b>MEETING TIME:</b>	Thursday, 12– 14 (First meeting: 2016, October 27.)
<b>ROOM:</b>	GAFO 03/252
<b>CP:</b>	3

Most of our brain's processes are executed by different mechanisms in the left and the right hemisphere. Language, spatial orientation, motor control, emotional processing, face perception, and even the ability to comprehend the rhythm of a drum are guided by neural circuits that are differently tuned within the two hemi-

spheres. These asymmetries of mental processing mean that damages of the human brain cannot be understood without a thorough understanding of asymmetries. The lecture aims at explaining the current knowledge about the structure and the mechanisms of cerebral asymmetries by making use of highly interactive teaching methods.

SEMINAR  
 THEORIES OF PERCEPTION AND PREDICTIVE CODING (030 074)  
 PROF. ALBERT NEWEN

<b>TERM:</b>	Winter 2016/17
<b>MEETING TIME:</b>	Tuesday, 10-12 (First Meeting: 2016, October 15)
<b>ROOM:</b>	GA 03/143
<b>CP:</b>	6

The seminar introduces into the philosophical debate about object-perception and the role of concepts. This is connected with the debate about cognitive penetration: how is our perception of objects influenced by knowledge, beliefs, desire or other higher-order processes. Students who participate in the seminar are invited to participate in (and may prepare comments for) the lecture series by Prof. Jakob Hohwy with the general title "Predictive Coding" (3.-5. March 2017). Prof. Hohwy is one of the most influential philosophers working on predictive coding.

The seminar starts with an overview of theories of perception, especially concerning the classical debate what the role of concepts is for the perception of objects. Is any object perception involving concepts? This is claimed and argued for in the Neo-Kantian theory of McDowell. Or can we have a perceptual experience when seeing an object which is independent from concepts? This is claimed and argued for by Dretske who defends the view that the perceptual experience is nonconceptual while only the judgments based on this experience involve concepts. This epistemological debate is connected with recent developments in cognitive psychology and neurosciences. The new way to discuss the question in philosophy and cognitive science is: to which extent is object perception influenced by higher cognitive processes? The claim

that high-level cognitive states such as (conceptual) beliefs and desires may influence how we perceive the world goes under the name of "cognitive penetrability". Is there really a direct influence of our background beliefs on the perception of an object or our knowledge - on the basis of a nonconceptual perceptual experience - only modulating our perceptual judgement. What is the nature of perceptual experience and perceptual judgment? One main issue concerns the problem of content. It is usually accepted that high-level states have conceptual content, which is propositional in format. However, many theorists hold that, if lower-level perceptual states also have content, such content is non-conceptual and has a format analog to the perceptual stimulus itself. Therefore, one of the most pressing problems for advocates of cognitive penetrability is to explain how contents that are so different can interact with each other. Related question for cognitive penetration and for a more general philosophical epistemology of object perception are: What is the role of attention and predictive coding for cognitive penetration? What is the role of consciousness? What is the role of culture and emotion in object perception? How should we characterize concepts when we discuss their role for perception?

In the final part of the seminar we will focus on predictive coding reading core parts of Prof. Jakob Hohwy's book "The Predictive Mind".

*SEMINAR*  
**THE EVOLUTION OF HIGHER COGNITIVE FUNCTIONS IN  
NON-HUMAN ANIMALS (112 615)**  
DR. FELIX STRÖCKENS

<b>TERM:</b>	Winter 2016/17
<b>MEETING TIME:</b>	Thursday, 12-14 (First Meeting: 2016, October 27) Max. 24 participants
<b>ROOM:</b>	GAFO 03/901
<b>CP:</b>	6

"Humans represent without a doubt the pinnacle in the evolution of higher cognitive functions. However, other non-human animals, even outside the primate order, also possess surprisingly complex forms of higher cognition. Within this seminar, selected studies on the occurrence of such complex cognitive skills will be presented by students, focusing on species like chimpanzees, parrots, crows and dolphins. Furthermore, the seminar aims to clear up with some of the myths about what animals are capable of and what is beyond their reach. In addition to behavioral data, the seminar will also deal with the

question what the neuronal underpinnings of such skills are, and if there are any neuronal similarities between species expressing complex cognition. By dealing with these topics, participants of the seminar will get an overview of the cognitive abilities of non-human animals and learn that many of the cognitive skills considered unique to humans actually developed much earlier during evolution. The seminar will be held in English and students are required to give a talk on preselected literature."

*LECTURE & EXERCISE***MACHINE LEARNING: UNSUPERVISED METHODS  
(310 003 & 310 013)**

PROF. LAURENZ WISKOTT

<b>TERM:</b>	Winter 2016/17
<b>EXERCISE:</b>	Tuesday, 9-12 (First Meeting: 2016, October 25)
<b>LECTURE:</b>	Tuesday, 12.15 – 13.45 (First Meeting: 2016, October 18)
<b>ROOM:</b>	NB 3/57
<b>CP:</b>	6

This course covers a variety of unsupervised methods from machine learning such as principal component analysis, independent component analysis, vector quantization, clustering, self-organizing maps, growing neural gas, Bayesian theory and graphical models. We will also briefly discuss reinforcement learning.

The mathematical level of the course is mixed but generally high. The tutorial is almost entirely mathematical. Criteria for a certificate for the tutorial are an active participation, in particular presentation of selected exercises, and at least 50% in the final exam.

*COLLOQUIUM***PHILOSOPHY AND THE COGNITIVE SCIENCES – RECENT DEBATES AND LEARNING TO MAKE A PRESENTATION IN ENGLISH (030 123)**

PROF. ALBERT NEWEN / PROF. MARKUS WERNING

<b>TERM:</b>	Winter 2016/17
<b>MEETING TIME:</b>	Thursday, 16-18
<b>ROOM:</b>	GA 04/187
<b>CP:</b>	6

The colloquium will offer regular presentations given partly by Bochum MA and PhD students and partly by external guests. The presentations will all be in the general domain of theoretical philosophy and the cognitive sciences with a focus on language and concepts. The presentations should ideally, but not necessarily have some interdisciplinary dimension such that perspectives from philosophy, psychology, linguistics and neurosciences can be systematically interconnected. The aim of the colloquium is to offer a platform for the discussion of ongoing research and to support the education of students at the Master and PhD level. Students who are accepted for a presentation in this seminar will receive a special training in preparing presentations in English.

PhD-students who are interested in presentations should write an email to both organizers (albert.newen@rub.de and markus.werning@rub.de) and come to the first meeting. The semester program will be fixed then. PhD-students can receive 2 credit points for an active participation. MA students can receive 4-6 CP for a presentation in the colloquium (to receive a mark, MA students have to write an additional essay). Topics can be freely chosen such that MA students can develop a talk in the area of their MA project.

Language: The presentations in the colloquium and the discussion will be in English. Questions can be raised in German, but will then be translated for the whole audience.

*SEMINAR*  
**PHILOSOPHY OF PSYCHOANALYSIS (030 070)**  
DR. BEATE KRICKEL

**TERM:** Winter 2016/17  
**MEETING TIME:** Tuesday, 14-16 (First Meeting: 2016, October 18)  
**ROOM:** GA 3/143  
**CP:** 6

Since Freud, Psychoanalysis, its metapsychology and clinical/therapeutic application, has been further developed and improved. Additionally, some neuroscientists start to be interested in psychoanalytic concepts such as "repression", "dissociation", and "ego defense" (so-called neuropsychoanalysis). For contemporary analytic philosophy, psychoanalysis in the light of these developments is interesting for several reasons: For the philosophy of mind, the question arises, what notion of conscious and unconscious processes psychoanalysis suggests and whether

they are compatible with contemporary philosophical theories of consciousness. Philosophers of cognitive science might ask how the psychoanalytic unconscious relates to the unconscious as postulated by, for example, dual system theories. From the perspective of philosophy of science, crucial questions are: Is psychoanalysis a scientific discipline? What kind of explanations are psychoanalytic explanations? How do these explanations relate to neuroscientific explanations?

*SEMINAR***EXERCISE LEARNING (112 240)**

DR. PATRICK ANSELME, M.SC. MENG GAO

<b>TERM:</b>	Winter 2016/17
<b>MEETING TIME:</b>	Tuesday, 14-16 (First Meeting: 2016, October 25) Max. 30 participants
<b>ROOM:</b>	GAFO 03/974
<b>CP:</b>	3

This practical participation-based course will provide an applied overview of the psychological foundations of learning and behavior, touching on the neurophysiological basis of learning and memory processes with a view to potential applications in technology, therapy and other areas. Participants will present on various aspects of learning and behavior such as habituation, sensitization, conditioning and extinction and place our understanding of these mechanisms in a relevant real-world context. This course will aim at an overview of general knowledge, as well as an in-depth look at early and current examples of research studies.

## Learning Objectives

1. Acquire general content knowledge about the field of 'Learning' and 'Behavior' within a psychological context.
2. Find, read and understand more specific in-depth knowledge related to content by looking at published experiments (primary source materials).
3. Comfortably, clearly and concisely present about both general and in-depth knowledge to peers.
4. Engage in classroom discussion, expanding upon and applying topics to experience.

*SEMINAR*  
**LINGUISTIC RELATIVITY: THE INFLUENCE OF LANGUAGE ON  
THOUGHT (030 077)**  
PROF. MARKUS WERNING

**TERM:** Winter 2016/17  
**MEETING TIME:** Wednesday, 12-14  
**ROOM:** GA 04/187  
**CP:** 6

Since Edward Sapir and Benjamin Whorf formulated their famous hypothesis that the grammar of a person's native language determines the structure of her thought, linguistic relativity has been a major topic in the philosophy of mind and language, linguistics and cognitive science. Numerous studies have investigated in how far the vocabulary and syntax of a language influence people's ontology, the way they categorize objects and properties and how they think about time, space and causality. Philosophers have contributed to that debate by arguing for and against the indeterminacy of translation, ontological relativity, or the priority of language over

thought. In the seminar we will review those arguments and evaluate them in the light of recent empirical studies.

Aside from active participation, participants will be expected to give a presentation in English. Assistance regarding the English language will be provided.



*SEMINAR*  
**INTRODUCTION TO THE PHILOSOPHY OF LANGUAGE (030 056)**  
DR. ERICA COSENTINO

**TERM:** Winter 2016/17  
**MEETING TIME:** Tuesday, 14-16 (First Meeting: 2016, October 19)  
**ROOM:** GA 04/187  
**CP:** 4

The seminar will introduce the students to a number of key topics and central issues of the contemporary philosophy of language, focusing specifically on the nature of meaning and reference, the relationship between language and the world and between language and the mind. Classic writings by Frege, Russell, Wittgenstein, Quine, Davidson, Grice will be presented and critically examined. Other texts which have had a

seminal influence in the field, including writings by Chomsky, Fodor, Sperber and Wilson will also be discussed.

Participants will be expected to give a presentation on selected papers. The literature will be announced in the first meeting but many of the texts for the seminar can be found in the anthologies listed below. All the reading material will be made available for the students

## SEMINAR

## MENTAL REPRESENTATION (030 093)

PROF. FRANCES EGAN / PROF. ALBERT NEWEN

<b>TERM:</b>	Winter 2016/17
<b>MEETING TIME:</b>	Friday, First meeting, 2016, October 21, 10-12 November 11, 10-14 November 18, 10-14 November 25, 10-14 December 02, 10-14 December 09, 10-14
<b>ROOM:</b>	GABF 04/714
<b>CP:</b>	6

The seminar will focus on mental representation. A central question is: what are the grounds of the meaning or intentionality of mental states? We will begin by looking at some of the classic (recent) literature on the problem of intentionality. One goal of the seminar is to uncover the assumptions that account for the shape that discussion of the problem has taken, and, if possible, to challenge these assumptions with a view to opening up the possibility space. We will then turn to the role of mental content in computational cognitive science, considering such questions as whether content can be causally efficacious in computational models of cognition and whether computationalism is likely to provide a 'naturalization' of intentionality. We will consider the requirements for a theoretical posit in a theory of cognition to genuinely count as a representation. We will conclude by considering the plausibility of representationalism about perceptual experience.

The seminar is planned as a research seminar  
Introductory Meeting: Students who want to participate should enroll in VSPL and are supposed to come to the preparatory meeting:

**Friday 21. October 10.15-11.45**

The seminar will take place on further five Fridays on the following time slots:

10:15-11:45 and 12:15-13:45

11.11.; 18.11.; 25.11.; 02.12.; 09.12.2016

Week 1 readings should be read before the first meeting. Tentative syllabus and readings:

Week 1: Preliminaries; 'Strong representationalism'

John Haugeland. "The Intentionality All-Stars"  
Jerry Fodor, *Psychosemantics* ch.1

Week 2 (1st half): Naturalism and the 'naturalization project'

Fred Dretske. "Misrepresentation" Ruth Millikan. "Biosemantics"

Weeks 2 (2nd half), 3: Content and computational cognitive science

Zenon Pylyshyn. "The Explanatory Role of Representations" Robert Cummins & Martin Roth. "Meaning and Content in Cognitive Science"  
Frances Egan. "How to Think about Mental Content" Frances Egan. "Function-Theoretic Explanation and the Search for Neural Mechanisms"

Week 4: Challenges to representationalism

William Ramsey. *Representation Reconsidered* (excerpts) Daniel Hutto. "Radically Enactive Cognition in our Grasp" Mark Sprevak. "Fictionalism"

about Neural Representations" Week 5: The contents of perceptual experience Terry Horgan and George Graham. "Phenomenal Intentionality and Content Determinacy" William Fish, Philosophy

of Perception: A Contemporary Introduction (chapters. 1,3,5) Alex Byrne, "Intentionalism Defended" (recommended)

## AM. Advanced Methods

Advanced methods are usually studied in the second semester. One exception is the "fMRI"-course which is only offered in the winter. Students who already have basic knowledge in cognitive neuroscience can choose to learn the "fMRI"-technique in the first semester. Necessary background: basic knowledge in cognitive neuroscience. The fMRI-seminar must be integrated into the course program during the first or the third semester; in the case you want to learn the fMRI –technique in the first semester, an individual application for the course is necessary: [boris.suchan@rub.de](mailto:boris.suchan@rub.de).

The laboratory-class "Neural substrates of memory function" is a flexible whole day course that can be integrated whenever a student is free to do so; usually it only makes sense in the semester breaks.

Further advanced methods can be found in the program from the last summer semester on our webpage: [http://www.ruhr-uni-bochum.de/philosophy/mcs/program\\_courses.html](http://www.ruhr-uni-bochum.de/philosophy/mcs/program_courses.html). They will again be offered in the upcoming summer semester.

The following courses, practical course and seminar have to be attended both together. They cannot be taken individually.

<h1>AM7.</h1>	AM7. Free Selection
<p><i>PRACTICAL COURSE/EXERCISE</i>  <b>ANGEWANDTE NEUROPSYCHOLOGISCHE METHODEN</b>          – MRT (118512)          DR. LORENA DEUKER</p>	
<b>TERM:</b>	Winter 2016/17
<b>MEETING TIME:</b>	Monday, 14-16 (First meeting: 2016, October 24)
<b>ROOM:</b>	GAFO 05/609
<b>CP:</b>	Max. 14 participants t.b.a.

The practical course will be given in English. It introduces into the practical usage of the advanced neuroscientific imaging technique MRI. It is combined with the following seminar into an educational package. It should be taken by students who aim to do a master project with MRI technique.

"Das Praktikum steht in direktem Zusammenhang mit dem gleichnamigen Seminar (ebenfalls 2 SWS). Die Teilnahme an beiden Veranstaltungen ist erforderlich. Ziel ist die Vermittlung der Fähigkeit, auf der Basis der veröffentlichten neuropsychologischen Literatur weiterführende Forschungsfragen im Bereich der kognitiven Neurowissenschaft zu entwickeln, die entsprechenden

Untersuchungen zu konzipieren, eigenständig durchzuführen und auszuwerten. Ein weiteres Ziel ist das Erlernen der Fertigkeit, die Ergebnisse einer Untersuchung entsprechend den Standards neurowissenschaftlicher Fachzeitschriften in schriftlicher Form zu präsentieren. Ein

zentrales Lernziel dieser Veranstaltung - und damit auch Grundlage für die erfolgreiche Teilnahme und Leistungsbewertung - ist das Erlernen praktischer Fähigkeiten. Daher ist eine regelmäßige

Anwesenheit im Umfang von mindestens zwei Dritteln der Termine notwendig."

SEMINAR  
ANGEWANDTE NEUROPSYCHOLOGISCHE METHODEN  
– MRT (118 511)  
DR. LORENA DEUKER

<b>TERM:</b>	Winter 2016/17
<b>MEETING TIME:</b>	Monday, 10-12 (First meeting: 2016, October 24)
<b>ROOM:</b>	GAFO 05/609
	Max. 14 participants
<b>CP:</b>	t.b.a.

This seminar is held in English. It introduces into the theory of the advanced neuroscientific imaging technique MRI. It is combined with the practical course above into an educational package. It should be taken by students who aim to do a master project with MRI technique.

"Das Seminar steht in direktem Zusammenhang mit dem gleichnamigen Praktikum (ebenfalls 2 SWS). Die Teilnahme an beiden Veranstaltungen ist erforderlich. Ziel ist die Vermittlung der Fähigkeit, auf der Basis der veröffentlichten neuropsychologischen Literatur weiterführende Forschungsfragen im Bereich der kognitiven Neurowissenschaft zu entwickeln, die entsprechenden Untersuchungen zu konzipieren, eigenständig durchzuführen und auszuwerten. Ein weiteres Ziel ist das Erlernen der Fertigkeit, die Ergebnisse

einer Untersuchung entsprechend den Standards neurowissenschaftlicher Fachzeitschriften in schriftlicher Form zu präsentieren. Ein zentrales Lernziel dieser Veranstaltung - und damit auch Grundlage für die erfolgreiche Teilnahme und Leistungsbewertung - ist die regelmäßige aktive Beteiligung am wissenschaftlichen Diskurs. Daher ist eine regelmäßige Anwesenheit im Umfang von mindestens zwei Dritteln der Termine notwendig."

SEMINAR  
FROM BASIC TO ADVANCED fMRI METHODS (118 517)  
DR. HUI ZHANG

<b>TERM:</b>	Winter 2016/17
<b>MEETING TIME:</b>	Thursday, 12-14 (27.10.2016 – 09.02.2017)
<b>ROOM:</b>	GAFO 05/609
	<b>CP:</b> t.b.a.

This seminar seeks to provide a broad, comprehensive, and rigorous introduction to fMRI research. We will start from a systematic review of the physics and biology of fMRI and then extend upward into modern fMRI research. Attendants will learn about proton spin, experimental design, the general linear model, and signal processing. We will discuss chapters of an introductory book by Huettel, Song and McCarthy. Ein zentrales Lernziel dieser Veranstaltung - und damit auch Grundlage für die erfolgreiche Teilnahme und

Leistungsbewertung - ist die regelmäßige aktive Beteiligung am wissenschaftlichen Diskurs. Daher ist eine regelmäßige Anwesenheit im Umfang von mindestens zwei Dritteln der Termine notwendig.

Certificate: Presupposition for regular and active attendance.

## D1. Free Selection

There is one free selection module in the program which can take any course of the program you passed and do not need to complete the modules. If there is a problem to complete a module, in principle, the courses in the free selection module can be used for obligatory modules. But this has to be explicitly confirmed in advance by Dr. Tobias Starzk or Prof. Albert Newen. Students are only allowed to take maximally 3 German courses in the whole program up to maximally 12 credit points.

D1.

D1. Free Selection

*SEMINAR*

**DISKURS DER NEUROPSYCHOLOGIE (118 611)**

PROF. NIKOLAI AXMACHER

<b>TERM:</b>	Winter 2016/17
<b>MEETING TIME:</b>	Thursday, 10.00 – 12.00 (First Meeting: 2016, October 27)
<b>ROOM:</b>	GAFO 05/609
<b>CP:</b>	3

Hier wird der intensive Austausch über ein vorgegebenes Forschungsthema in einer kleinen Gruppe ermöglicht. Ein wichtiger Aspekt ist auch die Einladung und Betreuung von Gastrednern

und die Teilnahme am wissenschaftlichen Vortrag. Die kritische Auseinandersetzung mit den Lerninhalten in Form von Diskussionen ist ein zentrales Lernziel und geht in die Bewertung mit ein.





*LECTURE*  
**STRESS (117 031)**  
PROF. OLIVER WOLF

<b>TERM:</b>	Winter 2016/17
<b>MEETING TIME:</b>	Monday, 12-14 (First Meeting: 2016, October 17) Exam: Wednesday, 2017, April 05, 10-12 in HGA 30
<b>ROOM:</b>	HGA 20
<b>CP:</b>	t.b.a.

Ursachen und Folgen von Stress werden aus einer psychologischen Perspektive beleuchtet. Es werden sowohl Aspekte der biopsychologischen Grundlagenforschung als auch Aspekte der anwendungsbezogenen Forschung (Gesundheitspsychologie, Klinische Psychologie, Wirtschaftspsychologie) berücksichtigt. Die Vorlesung gibt einen Überblick über aktuelle Forschungsthemen der Stressforschung. Folgende Fragen werden adressiert: Was ist Stress? Was ist ein Stressor? Welche psychischen und biologischen Veränderungen treten in Reaktion auf Stress auf? Wie kann man sich die große

interindividuelle Varianz im Stresserleben erklären? Wann ist Stress adaptiv und unter welchen Umständen kann er negative Konsequenzen haben (maladaptiv sein)? Welche Auswirkungen hat Stress auf affektive und kognitive Prozesse? Wie wird unser Körper und unser Gehirn durch Stress beeinflusst? Neben psychologischen Ansätzen werden Theorien und Befunde aus den Forschungsfeldern der Psychoneuroendokrinologie, der Psychoneuroimmunologie und den affektiven und kognitiven Neurowissenschaften besprochen.

*LECTURE***LERNEN (112 231)**

PROF. ONUR GÜNTÜRKÜN

<b>TERM:</b>	Winter 2016/17
<b>LECTURE:</b>	Thursday, 16.00 – 18.00 (First Meeting: 2016, October 27)
<b>ROOM:</b>	HGA 10
<b>CP:</b>	Exam: Thursday, 2017, March 30, 10-12 in HGA 10 6

Die Vorlesung soll einen Überblick über die Lerngesetze, ihre Anwendungsmöglichkeiten in therapeutischen Verfahren und die hirneurophysiologischen Grundlagen von Lern- und Gedächtnisprozessen bieten. Soweit möglich, sollen alle drei Aspekte immer zusammen besprochen werden; z.B. werden bei der klassischen Konditionierung zuerst die historischen Entwicklungslinien, dann die Details des eigentlichen Lernphänomens, dann die therapeutischen Anwendungen (z.B. systematische Desensibilisierung) und anschließend die synaptischen Mechanismen referiert.

Begleitend zur Vorlesung "Lernen" von Prof. Dr. Güntürkün soll dieses Seminar verschiedene Fragen zur wissenschaftlichen Auseinandersetzung mit dem Thema Lernen vertiefen. Dazu werden die Studierenden wissenschaftliche Artikel und Kapitel aus Lehrbüchern in Referatsform vortragen.

**Literatur:**

Als Vorbereitung ist folgendes Buch zu empfehlen:  
The Principles of Learning and Behavior, Michael Domjan, 6. Auflage, 2009.

*SEMINAR*  
**JOURNAL CLUB NEUROPSYCHOLOGY (118 915)**  
PROF. NIKOLAI AXMACHER

<b>TERM:</b>	Winter 2016/17
<b>MEETING TIME:</b>	Thursday, 16.00 – 18.00 (First Meeting: Thursday, 2016 October 27.)
<b>ROOM:</b>	GAFO 05/609
<b>CP:</b>	t.b.a.

In Analogie zu den Kognitiven Neurowissenschaften - der Untersuchung der neuronalen Korrelate kognitiver Prozesse - wurden in den letzten Jahren auch Konzepte der Psychoanalyse mit bildgebenden Methoden untersucht. Dieses Seminar vermittelt einen Überblick über diese Studien. Dabei werden aktuelle Untersuchungen zu zentralen psychoanalytischen Konzepten (Ver-

drängung, Konversion, Träume, Traumatisierung...) aber auch Studien zu den Mechanismen der psychodynamischen Psychotherapie sowie psychodynamische Konzeptualisierungen neuropsychologischer Symptome vorgestellt und diskutiert. Die kritische Auseinandersetzung mit den Lerninhalten in Form von Diskussionen ist ein zentrales Lernziel und geht in die Bewertung mit ein.

**D1.**

Free Selection

*SEMINAR***BILDGEBENDE VERFAHREN IN DER NEUROPSYCHOLOGIE (118 513)**

PROF. BORIS SUCHAN

**TERM:** Winter 2016/17  
**MEETING TIME:** Wednesday, 14-16 (First meeting: 2016, October, 26)  
**ROOM:** GAFO 05/609  
**CP:** 3

In diesem Seminar sollen die für den/die Neuropsychologen/in relevante bildgebende Verfahren vorgestellt werden. Hierbei werden sowohl die theoretischen Grundlagen, als auch die Methoden in der Versuchsplanung und Auswertung vorgestellt. Anhand von ausgewählten Arbeiten werden die Kenntnisse in Methode und Anwendung vertieft. Folgende bildgebende Verfahren, deren Anwendung und Auswertung werden vorgestellt: Positronen Emissions Tomographie

(PET), Single Photonen Emissions Computer Tomographie (SPECT), Magnet Resonanz Tomographie/Funktionelle Magnet Resonanz Tomographie, Magnet Enzephalographie (MEG), Transkranielle Magnetstimulation (TMS). Statistical Parametric Maps (SPM). Es ist geplant, eine Auswertung eines Experimentes exemplarisch während des Seminars durchzuführen. Eventuelle praktische Sitzungen (MRT-Scans) sind je nach Terminplanung auch möglich.

**D1.**

Free Selection

*LECTURE*  
**SOZIALPSYCHOLOGIE II (112 321)**  
PROF. JENS FÖRSTER

<b>TERM:</b>	Winter 2016/17
<b>MEETING TIME:</b>	Thursday, 10.00 – 12.00 (First Meeting: 2015, October 20) Exam: Wednesday, 2017, March 29, 10-12
<b>ROOM:</b>	HGA 10
<b>CP:</b>	6

Wie erfahren wir, wer wir sind? Brauchen Menschen eher Freiheit oder eher Orientierung? Was ist das Unbewusste? Wie gehen wir mit Misserfolgen um und wie erreichen wir unsere Ziele? Wie können wir uns motivieren, etwas zu tun? Wie überwinden wir Hindernisse? Neigen alle Menschen dazu, andere zu diskriminieren? Haben wir alle aggressive Anteile? Wie entsteht Aggression? Und wie entstehen Konflikte zwischen Gruppen? Wie kann man Zivilcourage fördern? Fördert Brainstorming die Kreativität oder behindert sie sie?

In der Vorlesung zur Sozialpsychologie 2 wollen wir die Inhalte der Vorlesung zur Sozialpsychologie 1 vertiefen. Zudem sollen Anwendungsaspekte diskutiert und Forschungsmethoden anhand von Experimenten dargestellt werden. Brücken zur soziologischen, philosophischen, konsumenten-psychologischen, organisationspsychologischen, emotionspsychologischen, motivationspsychologischen und wirtschaftspsychologischen Forschung werden geschlagen, Überschneidungen werden diskutiert.

D1.

Free Selection

*COLLOQUIUM*

**FORSCHUNGSKOLLOQUIUM SOZIALPSYCHOLOGIE (115 915)**

PROF. JENS FÖRSTER

<b>TERM:</b>	Winter 2016/17
<b>MEETING TIME:</b>	Thursday, 16.00 – 18.00 First Meeting: 2015, October 27)
<b>ROOM:</b>	GAFO 03/974
<b>CP:</b>	t.b.a.

In diesem Kolloquium sollen Pläne für wissenschaftliche Studien, Ergebnisse und Methoden diskutiert werden. Wissenschaftlerinnen und Wissenschaftler in den unterschiedlichsten Pha-

sen ihrer Karriere berichten über neue Entwicklungen und Probleme sozialpsychologischer Forschung. Für Studierende mit gutem Vorwissen.

*SEMINAR*  
**WILLENSFREIHEIT UND DETERMINISMUS (030 088)**  
PROF. MARKUS WERNING

**TERM:** Winter 2016/17  
**MEETING TIME:** Thursday, 12-14  
**ROOM:** GA 04/187  
**CP:** 6

Die Freiheit unseres Willens bildet eine zentrale Annahme in unserem Selbstverständnis als verantwortliche Personen. Sie kommt in der Auffassung zum Ausdruck, dass jeder von uns etwas anderes hätte tun können, als er/sie tatsächlich getan hat. Nur unter der Bedingung, dass eine Person bei ihrer Entscheidung für eine Handlung frei war, ist sie für die Folgen ihres Tuns moralisch und auch strafrechtlich sanktionierbar. Die Intuition, dass jede(r) auch hätte anders handeln können, scheint allerdings in einem Widerspruch zur gut begründeten Annahme zu stehen, dass all unser Tun und Wollen in eine Welt eingeordnet ist, die den Naturgesetzen folgt, und deshalb vollständig von ihnen bestimmt ist. Mit dem Hinweis auf neuere Erkenntnisse aus der Hirnfor-

schung wird von prominenter Seite weiterhin angeführt, dass das Gehirn bereits entsprechende Aktionspotentiale für ein Verhalten aufgebaut hat, bevor uns bewusst ist, dass wir eine Entscheidung für die Handlung getroffen haben.

Das Thema der Willensfreiheit hat gerade in jüngster Zeit eine hitzige Debatte unter Philosophen, Strafrechtlern und Neurowissenschaftlern entfacht. In dem Seminar soll eine Einführung in die Kontroverse gegeben und die Argumentationslage geordnet werden. Dies geschieht anhand von Texten aus einem interdisziplinären Umfeld. Von den Seminarteilnehmer(inne)n wird die Bereitschaft zur Übernahme eines Referats erwartet..

D1.

Free Selection

*VORLESUNG*  
**GRUNDLAGEN DER NEURO- UND SINNESPHYSIOLOGIE)**  
DR. TAGRID YOUSEF

**TERM:** Winter 2016/17  
**MEETING TIME:** Wednesday, 8-10 (First meeting: 2016, October 19)  
**ROOM:** HGA 10  
**CP:** 6

Ziel der Vorlesung ist es, ein Grundverständnis der Informationsverarbeitung im ZNS und der Sinnesorgane zu übermitteln. Neben den anatomischen Grundlagen im Aufbau von Nervenzellen werden auch das Verhalten, d.h. die Erregungsleitung und -übertragung, sowie die Ver-

rechnungsprozesse an Synapsen näher betrachtet. Hierbei soll auch ein Schwerpunkt auf die synaptische Plastizität gelegt werden. Auch die in der Psychologie und Medizin eingesetzten diagnostischen Verfahren, wie z. B. das EEG, sollen erläutert werden.



D1.

Free Selection

*VORLESUNG*  
**MOTIVATION UND VOLITION(112 271)**  
DR. MARLIES PINNOW

**TERM:** Winter 2016/17  
**MEETING TIME:** Monday, 16-18 (First meeting: 2016, October 17)  
Exam: Monday, 10-12, 2017, October 27  
**ROOM:** HGA 20  
**CP:** 6

Die Vorlesung führt in das Gebiet der Motivations- und Volitionspsychologie ein. In einem ersten Abschnitt wird in einem kurzen Überblick über die Forschungs- und Problemgeschichte eine Gegenstandsbestimmung der Motivationspsychologie und ihrer zentralen Fragestellungen erarbeitet. Darüber hinaus werden zentrale Methoden der Motivationsforschung erörtert. Auf

dieser Basis werden dann einzelne Verhaltenssysteme wie Hunger, Neugier, Angst, Leistung, Aggression diskutiert. Spezifische Ansätze wie Attributionstheorien, Erwartungs- X Wert-Modelle, Instrumentalitätstheorie etc. werden innerhalb der Motivsysteme oder als Exkurse behandelt. Den Abschluss bildet eine Erörterung handlungstheoretischer und volitionaler Probleme zielgerichteten Verhaltens.

**D1.**

Free Selection

*SEMINAR*  
**MEIN KÖRPER UND ICH – WAS UNS BEWUSSTSEINS-  
PHÄNOMENE ÜBER DIE WAHRNEHMUNG UNSERES SELBST ERZÄHLEN (112 616)**  
PROF. MARTINA MANNS

**TERM:** Winter 2016/17  
**MEETING TIME:** Wednesday, 12-14  
**ROOM:** GAFO 05/609 (FIRST MEETING: 2016, OCTOBER 26)  
**CP:** 6 CP  
Max. 30 participants

Die Kognitive Psychologie zeigt uns, dass das Bild, welches wir uns von der Welt machen, eine Interpretation unseres Gehirns ist. Dies gilt auch für die bewusste Wahrnehmung unseres Selbst. Der portugiesische Dichter Fernando Pessoa beschreibt dies so „Meine Seele ist ein verborgenes Orchester; ich weiß nicht, welche Instrumente, Geigen und Harfen, Pauken und Trommeln es in mir spielen und dröhnen lässt. Ich kenne mich nur als Symphonie“. Basierend auf Referaten, aber auch in hoffentlich kontroversen Diskussionsrunden werden wir in diesem Seminar verschiedene Bewusstseinsphänomene besprechen und so bizarre Phänomene wie Phantom-

glieder, Out-of-Body-Experience, Anosognosie oder Cotard Syndrom kennenlernen. Wir wollen hierzu das biopsychologische Wissen beleuchten um zu verstehen, wie das Gehirn ein Bild unseres Selbst erzeugt.

Literatur wird zu Beginn des Seminars bekannt gegeben. Ein populärwissenschaftliches Buch zum Thema ist: Vilaynur S. Ramachandran, Sandra Blakeslee. Die blinde Frau, die sehen kann: Rätselhafte Phänomene unseres Bewusstseins. Taschenbuchausgabe rororo ;

**D1.**

Free Selection

*LECTURE***KOGNITION 1: WAHRNEHMUNG, AUFMERKSAMKEIT, GEDÄCHTNIS  
(112 211)**

PROF. OLIVER T. WOLF

<b>TERM:</b>	Winter 2016/17
<b>MEETING TIME:</b>	Wednesday, 12-14
<b>ROOM:</b>	HGA 10 (First Meeting: 2016, October 20)
<b>CP:</b>	6 CP
	Exam: Thursday, 2017, April 6, 10-12, HGA 10

Die Kognitive Psychologie zeigt uns, dass das Bild, welches wir uns von der Welt machen, eine Interpretation unseres Gehirns ist. Dies gilt auch für die bewusste Wahrnehmung unseres Selbst. Der portugiesische Dichter Fernando Pessoa beschreibt dies so „Meine Seele ist ein verborgenes Orchester; ich weiß nicht, welche Instrumente, Geigen und Harfen, Pauken und Trommeln es in mir spielen und dröhnen lässt. Ich kenne mich nur als Symphonie“. Basierend auf Referaten, aber auch in hoffentlich kontroversen Diskussionsrunden werden wir in diesem Seminar verschiedene Bewusstseinsphänomene besprechen und so bizarre Phänomene wie Phantom-

glieder, Out-of-Body-Experience, Anosognosie oder Cotard Syndrom kennenlernen. Wir wollen hierzu das biopsychologische Wissen beleuchten um zu verstehen, wie das Gehirn ein Bild unseres Selbst erzeugt.

Literatur wird zu Beginn des Seminars bekannt gegeben. Ein populärwissenschaftliches Buch zum Thema ist: Vilaynur S. Ramachandran, Sandra Blakeslee. Die blinde Frau, die sehen kann: Rätselhafte Phänomene unseres Bewusstseins. Taschenbuchausgabe rororo ;

## SECOND YEAR PROGRAM

### I. Interdisciplinary Research Module

If a student wants to use a course from C1 to C4 as a substitute for I1 to I4, this is possible if the substitute course is closely connected with the master thesis project.

I1.

#### I1. Cognitive Philosophy

##### COLLOQUIUM

PHILOSOPHY AND THE COGNITIVE SCIENCES – RECENT  
DEBATES AND LEARNING TO MAKE A PRESENTATION IN ENGLISH  
(030 123)

PROF. ALBERT NEWEN / PROF. MARKUS WERNING

<b>TERM:</b>	Winter 2016/17
<b>MEETING TIME:</b>	Thursday, 16-18
<b>ROOM:</b>	GA 04/167
<b>CP:</b>	6

The colloquium will offer regular presentations given partly by Bochum MA and PhD students and partly by external guests. The presentations will all be in the general domain of theoretical philosophy and the cognitive sciences with a focus on language and concepts. The presentations should ideally, but not necessarily have some interdisciplinary dimension such that perspectives from philosophy, psychology, linguistics and neurosciences can be systematically interconnected. The aim of the colloquium is to offer a platform for the discussion of ongoing research and to support the education of students at the Master and PhD level. Students who are accepted for a presentation in this seminar will receive a special training in preparing presentations in English.

PhD-students who are interested in presentations should write an email to both organizers (albert.newen@rub.de and markus.werning@rub.de) and come to the first meeting. The semester program will be fixed then. PhD-students can receive 2 credit points for an active participation. MA students can receive 4-6 CP for a presentation in the colloquium (to receive a mark, MA students have to write an additional essay). Topics can be freely chosen such that MA students can develop a talk in the area of their MA project.

Language: The presentations in the colloquium and the discussion will be in English. Questions can be raised in German, but will then be translated for the whole audience.

*SEMINAR*  
**NEW WORK ON SOCIAL COGNITION (030 087)**  
 PROF. TOBIAS SCHLICHT

<b>TERM:</b>	Winter 2016/17
<b>MEETING TIME:</b>	Monday, 12-14 (First Meeting: 2015, October 18)
<b>ROOM:</b>	GA 3/143
<b>CP:</b>	6

In this seminar, which is taught in English, we will read recent text from the vivid debate on social understanding, i.e. on topics related to the question how we understand each other. Human beings are importantly social beings and an adequate philosophical theory of the capacity to get access to other people's mental states must conform to the best evidence from developmental psychology and social neuroscience. The seminar will cover debates on a) social perception, b) the developmental paradox that young infants seem to have an implicit understanding of false beliefs but cannot express this

explicitly until they are 5 years old, c) dual process theories of social cognition, and d) the role of social cognition in collective activities like joint actions.

The texts will be available for students in a moodle course from September.

**Office hours:** Tuesdays 11-12 in GA 3/29 or by appointment

*SEMINAR*  
**THEORIES OF PERCEPTION AND PREDICTIVE CODING (030 074)**  
 PROF. ALBERT NEWEN

<b>TERM:</b>	Winter 2016/17
<b>MEETING TIME:</b>	Tuesday, 10-12 (First Meeting: 2015, October 25)
<b>ROOM:</b>	GA 3/143
<b>CP:</b>	6

The seminar introduces into the philosophical debate about object-perception and the role of concepts. This is connected with the debate about cognitive penetration: how is our perception of objects influenced by knowledge, beliefs, desire or other higher-order processes. Students who participate in the seminar are invited to participate in (and may prepare comments for) the lecture series by Prof. Jakob Hohwy with the general title "Predictive Coding" (3.-5. March 2017). Prof. Hohwy is one of the most influential philosophers working on predictive coding.

The seminar starts with an overview of theories of perception, especially concerning the classical debate what the role of concepts is for the perception of objects. Is any object perception involving concepts? This is claimed and argued for in the Neo-Kantian theory of McDowell. Or can we have a perceptual experience when seeing an object which is independent from concepts? This is claimed and argued for by Dretske who defends the view that the perceptual experience is nonconceptual while only the judgments based on this experience involve concepts. This epistemological debate is connected with recent developments in cognitive psychology and neurosciences. The new way to discuss the question in philosophy and cognitive science is: to which extent is object perception influenced by higher cognitive processes? The claim

that high-level cognitive states such as (conceptual) beliefs and desires may influence how we perceive the world goes under the name of "cognitive penetrability". Is there really a direct influence of our background beliefs on the perception of an object or our knowledge - on the basis of a nonconceptual perceptual experience - only modulating our perceptual judgement. What is the nature of perceptual experience and perceptual judgment? One main issue concerns the problem of content. It is usually accepted that high-level states have conceptual content, which is propositional in format. However, many theorists hold that, if lower-level perceptual states also have content, such content is non-conceptual and has a format analog to the perceptual stimulus itself. Therefore, one of the most pressing problems for advocates of cognitive penetrability is to explain how contents that are so different can interact with each other. Related question for cognitive penetration and for a more general philosophical epistemology of object perception are: What is the role of attention and predictive coding for cognitive penetration? What is the role of consciousness? What is the role of culture and emotion in object perception? How should we characterize concepts when we discuss their role for perception?

In the final part of the seminar we will focus on predictive coding reading core parts of Prof. Jakob Hohwy's book "The Predictive Mind".

*SEMINAR*

RESEARCH COLLOQUIUM GENETIC PSYCHOLOGY (118 913)

PROF. ROBERT KUMSTA

<b>TERM:</b>	Winter 2016/17
<b>MEETING TIME:</b>	Monday, 16.00 – 18.00 (First Meeting: 2016, October 17.)
<b>ROOM:</b>	GAFO 04/425
<b>CP:</b>	t.b.a.

Dieses Forum dient zur Vorstellung aktueller Forschungsprojekte und Qualifikationsarbeiten (Bachelorarbeiten, Masterarbeiten, Promotionsprojekte) der Arbeitseinheit Genetic Psychology. Darüber hinaus werden eingeladene Wissen-

schaftler aktuelle Forschungsbefunde zur Genetik, Epigenetik und Entwicklungspsychobiologie präsentieren. Ein Zeitplan mit Information über Themen und Referenten wird zu Beginn des Semesters per Aushang und auf der Homepage bekannt gegeben.

*LECTURE*

## INTRODUCTION TO PERCEPTION (118 311)

PROF. SEN CHENG

<b>TERM:</b>	Winter 2016/17
<b>MEETING TIME:</b>	Monday, 10.00 – 12.00 (First Meeting: 2016, October 17)
<b>ROOM:</b>	GA 04/187
<b>CP:</b>	3

Perception of sensory inputs can be studied along three different dimensions: modality, description level and methodology. This lecture will discuss several different examples along each dimension and highlight common principles, when possible. Modalities include, for instance,

vision, audition, olfaction and proprioception. The description level will range from receptor physiology to Gestalt psychology. The methodology will include psychophysics, electrophysiology and computational modeling.



*LECTURE***LEFT BRAIN - RIGHT BRAIN (118 111)**

PROF. ONUR GÜNTÜRKÜN

<b>TERM:</b>	Winter 2016/17
<b>MEETING TIME:</b>	Thursday, 12– 14 (First meeting: 2016, October 27)
<b>ROOM:</b>	GAFO 03/252
<b>CP:</b>	3

Most of our brain's processes are executed by different mechanisms in the left and the right hemisphere. Language, spatial orientation, motor control, emotional processing, face perception, and even the ability to comprehend the rhythm of a drum are guided by neural circuits that are differently tuned within the two hemi-

spheres. These asymmetries of mental processing mean that damages of the human brain cannot be understood without a thorough understanding of asymmetries. The lecture aims at explaining the current knowledge about the structure and the mechanisms of cerebral asymmetries by making use of highly interactive teaching methods.

*COLLOQUIUM*  
RESEARCH COLLOQUIUM NEUROPSYCHOLOGY (118 915)  
PROF. NIKOLAI AXMACHER

<b>TERM:</b>	Winter 2016/17
<b>MEETING TIME:</b>	Thursday 16-18 (First meeting: 2016, October 27)
<b>ROOM:</b>	GAFO 05/609
<b>CP:</b>	t.b.a.

Inhalt der Veranstaltung ist die Vorstellung laufender Forschungsarbeiten der Arbeitseinheit Neuropsychologie sowie Vorträge der Gastdozenten zu klinisch-neuropsychologischen Themen. Ein Zeitplan mit Informationen über die Themen und Referenten wird zu Beginn des WS per Aushang bekannt gegeben. Auch unter: <http://www.ruhr-uni-bochum.de/neuropsychology/>

zentrales Lernziel dieser Veranstaltung - und damit auch Grundlage für die erfolgreiche Teilnahme und Leistungsbewertung - ist die regelmäßige aktive Beteiligung am wissenschaftlichen Diskurs. Daher ist eine regelmäßige Anwesenheit im Umfang von mindestens zwei Dritteln der Termine notwendig.

*SEMINAR*  
THE EVOLUTION OF HIGHER COGNITIVE FUNCTIONS  
IN NON-HUMAN ANIMALS (112 615)  
DR. FELIX STRÖCKENS

<b>TERM:</b>	Winter 2016/17
<b>MEETING TIME:</b>	Thursday 12-14 (First meeting: 2016, October 27) Max. 24 participants
<b>ROOM:</b>	GAFO 03/901
<b>CP:</b>	6

"Humans represent without a doubt the pinnacle in the evolution of higher cognitive functions. However, other non-human animals, even outside the primate order, also possess surprisingly complex forms of higher cognition. Within this seminar, selected studies on the occurrence of such complex cognitive skills will be presented by students, focusing on species like chimpanzees, parrots, crows and dolphins. Furthermore, the seminar aims to clear up with some of the myths about what animals are capable of and what is beyond their reach. In addition to behavioral data, the seminar will also deal with the

question what the neuronal underpinnings of such skills are, and if there are any neuronal similarities between species expressing complex cognition. By dealing with these topics, participants of the seminar will get an overview of the cognitive abilities of non-human animals and learn that many of the cognitive skills considered unique to humans actually developed much earlier during evolution. The seminar will be held in English and students are required to give a talk on preselected literature."

# 13.

## 13. Computational Modeling

*LECTURE & EXERCISE*

**MACHINE LEARNING: UNSUPERVISED METHODS**

**(310 003 & 310 013)**

PROF. LAURENZ WISKOTT

<b>TERM:</b>	Winter 2016/17
<b>EXERCISE:</b>	Tuesday, 9-12 (First Meeting: 2016 October 25)
<b>LECTURE:</b>	Tuesday, 12.15 – 13.45 (First Meeting: 2016, October 18)
<b>ROOM:</b>	NB 3/57
<b>CP:</b>	6

This course covers a variety of unsupervised methods from machine learning such as principal component analysis, independent component analysis, vector quantization, clustering, self-organizing maps, growing neural gas, Bayesian theory and graphical models. We will also briefly discuss reinforcement learning.

The mathematical level of the course is mixed but generally high. The tutorial is almost entirely mathematical. Criteria for a certificate for the tutorial are an active participation, in particular presentation of selected exercises, and at least 50% in the final exam.

*LECTURE & EXERCISE*

## ARTIFICIAL NEURAL NETWORKS (310 002 &amp; 310 012)

PD DR. ROLF WÜRTZ

<b>TERM:</b>	Winter 2016/17
<b>LECTURE:</b>	Friday, 12– 14 (First Meeting: 2016, October 21)
<b>ROOM:</b>	HZO 100
<b>EXERCISE:</b>	Wednesday, 15.00 – 16.00 (and/or 16.00- 17.00) (First Meeting: 2016, October 26)
<b>ROOM:</b>	ND 3/99
<b>CP:</b>	5

This lecture presents standard algorithms and new developments of feedforward Artificial Neural Networks, their functioning, application domains, and connections to more conventional mathematical methods. Examples show the potential and limitations of the methods. Supervised as well as unsupervised learning methods are introduced. In detail:

- 1) Introduction, some biological facts
- 2) Mathematical foundations: probability theory and partial derivatives
- 3) One layer networks and linear discriminants
- 4) Multilayer networks and error backpropagation
- 5) Universality of two-layer networks
- 6) Radial basis function networks
- 7) Neuronal maps: Kohonen network, Growing Neural Gas
- 8) Optimization methods

*Learning objectives:*

Theoretical understanding of feedforward neural networks, practical skills in computer implementations

*Soft skills:*

Each student must present the results of one exercise.

*Individual competences:*

Programming selected routines in C++, theoretical understanding of feedforward Neural Networks

*ONE-WEEK INTERNSHIP*  
**AUTONOMOUS ROBOTICS (310 036)**  
M.SC. MATHIS RICHTER

<b>TERM:</b>	Winter 2016/17
<b>MEETING TIME:</b>	<b>2017, FEBRUARY</b> 20-24 (First meeting: 2017, February 2, NB 3/57)
<b>ROOM:</b>	NB 2/77
<b>CP:</b>	3

The practical course gives an introduction to mobile robotics with a focus on dynamical systems approaches. In the exercises, the computing environment Matlab is used to control e-puck miniature mobile robots, equipped with a differential drive, combined infrared/proximity sensors and a video camera. The course covers elementary problems in robot odometry, use of sensors and motor control. It then teaches basic dynamic methods for robot navigation, in which

the robot's sensors are used for obstacle avoidance and approach to a target location.

Interested students who do not have experience in Matlab should attend the Matlab introduction of the lab exercise Computer Vision (typically the week before this course). Details about availability and credit points have to be clarified early via email.

**Contact:** [mathis.richter@ini.rub.de](mailto:mathis.richter@ini.rub.de)

*COLLOQUIUM*  
**LEARNING AND MEMORY (310 026)**  
PROF. SEN CHENG

<b>TERM:</b>	Winter 2016/17
<b>MEETING TIME:</b>	Tuesday, 12-14 (First meeting: 2016, October 18)
<b>ROOM:</b>	NB 3/72
<b>CP:</b>	3 Max. 15 Participants

We will discuss the latest research results in learning and memory at the systems level. Each session will be based on a journal article or unpublished results. These will be presented by one participant and discussed by all. The topics will include a diverse set of approaches: electrophysiology, imaging, computational modeling, and robotics. They will be selected particularly in the areas of spatial and episodic

memory with a focus on the functional role of the mammalian hippocampus.

**Contact:** Prof. Sen Cheng, NB 3/33,  
sen.cheng@rub.de

**Office hours:** Thursdays 14-15 or by appointment

*COLLOQUIUM*

BIOPSYCHOLOGY RESEARCH COLLOQUIUM (118 914)

PROF. ONUR GÜNTÜRKÜN

<b>TERM:</b>	Winter 2016/17
<b>MEETING TIME:</b>	Monday, 13.00 – 15.00 (First Meeting: see <a href="http://www.bio.psy.ruhr-unibochum.de/">www.bio.psy.ruhr-unibochum.de/</a> )
<b>ROOM:</b>	GAFO 05/425
<b>CP:</b>	t.b.a.

The research colloquium is open to all employees and graduate students of the Biopsychology department. The Aim is to present and discuss their research. In addition external guests are invited to give talks on different aspects of

biopsychology. You can have a look at the schedule at the department's information board and our homepage: <http://www.bio.psy.ruhr-unibochum.de/>



*COLLOQUIUM*

## THEMEN DER KOGNITIVEN NEUROWISSENSCHAFT (118 711)

PROF. ONUR GÜNTÜRKÜN, PROF. OLIVER WOLF,  
PROF. NIKOLAI AXMACHER

<b>TERM:</b>	Winter 2016/17
<b>MEETING TIME:</b>	Friday, 10.00 – 12.00 (First meeting: October 2016, 28)
<b>ROOM:</b>	GAFO 05/609
<b>CP:</b>	3

Interesse an neurowissenschaftlicher Master-Arbeit  
Kommentar: In dieser Veranstaltung werden laufende Forschungsprojekte, die sich für eine M.Sc. Arbeit eignen, vorgestellt.

Literatur: wird in der Veranstaltung bekannt gegeben

LECTURE  
 INTRODUCTION TO PERCEPTION (118 311)  
 PROF. SEN CHENG

<b>TERM:</b>	Winter 2016/17
<b>MEETING TIME:</b>	Monday, 10.00 – 12.00 (First Meeting: 2016, October 17)
<b>ROOM:</b>	GA 04/187
<b>CP:</b>	3

Perception of sensory inputs can be studied along three different dimensions: modality, description level and methodology. This lecture will discuss several different examples along each dimension and highlight common principles, when possible. Modalities include, for instance, vision, audition, olfaction and proprioception. The description level will range from receptor physiology to Gestalt psychology. The methodology will include psychophysics, electrophysiology and computational modeling.

**Prerequisite:** *[no special prerequisite]*

**Assessment:** final exam (Monday, 20.02.2017, 10-12); make-up exam (Monday, 13.03.2017, 10-12)

**Attendance:** optional, but highly recommended

**Course material:** Blackboard (required, key: RuhrUni)

**Textbook:** Sensation and Perception by E. Bruce Goldstein, 8th or 9th ed, Wadsworth

**Contact:** Prof. Sen Cheng, NB 3/33, sen.cheng@rub.de

**Office hours:** Thursdays 14-15 or by appointment

*SEMINAR***JOURNAL CLUB: STRESS UND GEHIRN / BRAIN AND STRESS  
(118 910)**

M. SC. VALERIE KINNER

<b>TERM:</b>	Winter 2016/17
<b>MEETING TIME:</b>	Wednesday, 12-14 (First Meeting: 2016, October 26)
<b>ROOM:</b>	GAFO 02/365
<b>CP:</b>	t.b.a.

In der Veranstaltung werden aktuelle englischsprachige Zeitschriftenartikel zum Themenbereich Stress und kognitive Prozesse vorgestellt und kritisch diskutiert.

English Journal articles regarding stress and cognitive processes will be presented and discussed.