GEORG-AUGUST-UNIVERSITÄT
GÖTTINGEN / GERMANY

International Max Planck Research School

Neurosciences

MSc/PhD/MD-PhD Program

YEARBOOK 2010 / 2011

Yearbook 2010/2011

MSc/PhD/MD-PhD Neuroscience Program

at the University of Göttingen

International Max Planck Research School

Index / Imprint

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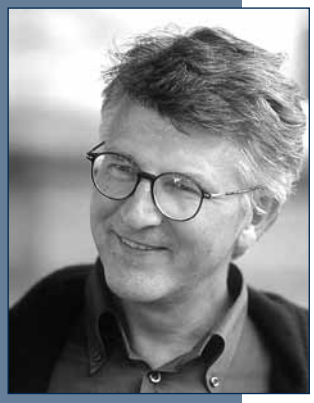


Letter from the President

The international Master's / PhD Programs Molecular Biology and Neurosciences were established by the Georg August University Göttingen, together with the Max Planck Society for the Advancement of Science, in the year 2000 to attract excellent students from all over the world and provide them with an outstanding, research-oriented graduate program. Both programs are taught in English by internationally renowned scientists and offer a high level of services and individual support.

Several hundred students from all over the world apply for the 20 study places available in each of the programs every year. Both programs have introduced and combined elements of international recruitment, competitive admission procedures, advanced curricula, research training, social integration programs, extracurricular support and evaluation procedures into successful working structures. They have achieved excellent recommendations in several external evaluations and have been awarded the 2004 prize for excellent support services for foreign students by the German Federal Foreign Office. For the newly established Georg August University School of Science (GAUSS) and other graduate schools in Göttingen, the Molecular Biology and Neuroscience Programs are considered exemplary and serve as best practice models.

In October 2006, the two programs were awarded the label „Top 10 International Master‘s Degree Courses made in Germany“ by the „Stifterverband für die Deutsche Wissenschaft“ and the German Academic Exchange Service (DAAD) in a national contest, in which 121 Master‘s programs of 77 universities participated. The Göttingen Molecular Biology and Neuroscience programs were the only Master‘s programs in the natural sciences and medicine which received this award. Both programs are members of the Göttingen Graduate School for Neurosciences and Molecular Biosciences (GGNB), which was successful in the recent Excellence Initiative by the German Federal and State Governments to promote science and research at German universities.

Five Göttingen University faculties, three Göttingen Max Planck Institutes as well as the German Primate Center participate in the programs. International guest lecturers are also involved. The Max Planck Society contributes through its newly established International Max Planck Research Schools. Both programs keep close contact with the relevant industries to further enhance the chances of the graduates for a successful professional career.

I would very much like to thank all scientific bodies and institutions for their committed support in establishing these international programs and, last but not least, the German Academic Exchange Service (DAAD), the Lower Saxony Ministry of Science and Culture, and the various generous donors.

The Georg August University of Göttingen is proud of its long-standing international experience the two attractive and innovative programs have already become an integral part of. The university will continue to support these programs within the setting of Göttingen's lively urban, cultural, and social life, in itself a prerequisite for creative teaching and research.

Prof. Dr. Kurt von Figura
(President of the Georg August University Göttingen)

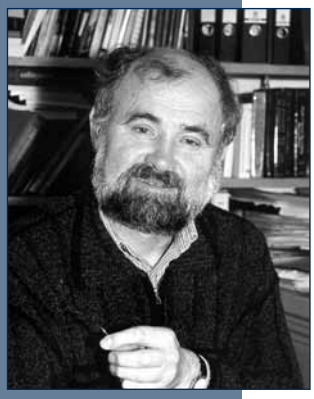
Letter from the Max Planck Society

The mission of the Max Planck Society is to conduct basic research in science and humanities at the highest level. More than 80 Max Planck Institutes are located on scientific campuses across Germany, most of them close to universities.

Scientific ties between Max Planck Institutes and universities are traditionally strong. In 1998, during the 50th year celebration of the Max Planck Society in Göttingen, the Max Planck Society, together with the Hochschulrektorenkonferenz, launched the International Max Planck Research Schools as a new joint program to further intensify cooperation.

The goals of the International Max Planck Research Schools are

- to attract excellent students from all around the world to intensive Ph.D. training programs in Germany, preparing them for careers in science,
- to integrate Max Planck scientists in top-level scientific training of junior scientists,
- to intensify the ties to the universities owing to the participation of internationally renowned Max Planck scientists in joint teaching activities, and
- to strengthen international relationships by providing individual support to each student and by exposing foreign students to German culture and the German language.



By now, 59 International Max Planck Research Schools have been established involving more than 71 Max Planck Institutes, 37 German universities with 79 participating faculties and more than 38 universities abroad. About 2700 PhD students from 108 countries are presently enrolled. Approximately 2127 PhD students have graduated to date from an International Max Planck Research School.

Since their foundation in the year 2000, the Göttingen International Max Planck Research Schools in Molecular Biology and Neurosciences have met with extraordinary success. Every year, the programs receive hundreds of applications, with the quality of the students consistently being very high. Most students graduated so far have moved on to postdoctoral positions, many at prestigious international institutions. In the past years, the Göttingen Schools received unanimous acclaim during external evaluations and won national awards. For instance they are the only Life Science Programs within Germany that were selected for the “Top Ten International Master’s Degree Courses 2006”. The Schools have also re-shaped the local scientific community, strengthening the ties between the participating institutions, and initiated new scientific collaborations that augment the international reputation of Göttingen as a center of scientific excellence. Furthermore, the Schools served as role models and founding members of the Göttingen Graduate School for Neurosciences and Molecular Biosciences, thus being instrumental for the success of the University in the German Excellence Initiative. We hope that in the years to come the students of the International Max Planck Research Schools will be successful in their professional careers. We also hope that they will remember their training period in Göttingen as an exciting and stimulating phase in their lives.

Peter Gruss
President
Max Planck Society

Erwin Neher
Dean of the IMPRS
Neurosciences

Overview

This yearbook is intended to provide information on the International MSc/PhD/MD-PhD Neuroscience Program in Göttingen, Germany, which was established in 2000. In addition to general information on the program, the yearbook introduces the current year's students, the faculty members, the program committee, and the coordination team.

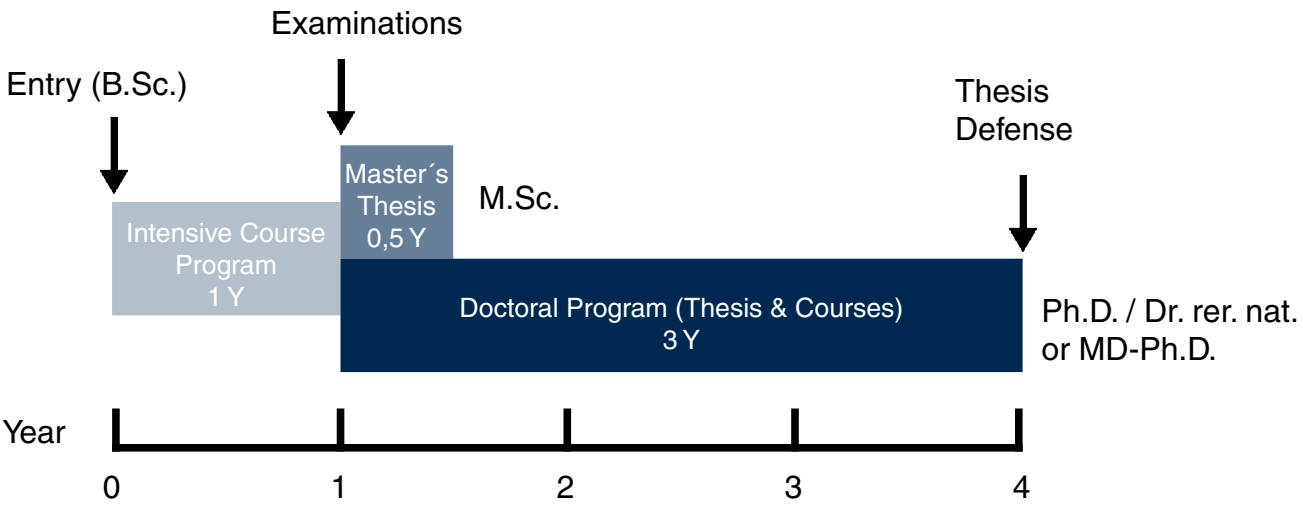
The program is a member of the Göttingen Graduate School for Neurosciences and Molecular Biosciences (GGNB), which is funded by the Excellence Initiative of the German Federal and State Governments. It is offered by the University of Göttingen, the Max Planck Institute for Biophysical Chemistry (MPIbpc), the Max Planck Institute for Experimental Medicine (MPIem), the Max Planck Institute for Dynamics and Self-Organization (MPIds), the German Primate Center (DPZ), and the European Neuroscience Institute (ENI). Further to their active participation in the Neuroscience Program, the above-mentioned partners closely cooperate in the DFG Research Center for Molecular Physiology of the Brain (CMPB), the Göttingen Center for Molecular Biosciences (GZMB), the Center for Systems Neuroscience (ZNV), in several collaborative research centers (Sonderforschungsbereiche, SFB) and in interdisciplinary doctoral programs (Graduiertenkollegs, GK).

The International MSc/PhD/MD-PhD Neuroscience Program qualifies students for professional work in the neurosciences. The program is open to students from Germany and from abroad, who hold a Bachelor's degree (or equivalent) in the biosciences, medicine, psychology, physics, or related fields. All courses are held in English. Scholarships are available. The academic year starts in October and is preceded by a three week orientation program. Applications may be submitted until January 15 of the year of enrollment. To ensure a high standard of individual training, the number of participants is limited to 20 students per year.

All students initially participate in one year of intensive course work. This first segment of the program comprises lectures, tutorials, seminars, methods courses, and independent, individually supervised research projects (laboratory rotations). The traditional German structure of academic semesters is not followed. The condensed schedule allows students to accumulate 90 credits (ECTS) within one year, which would normally require three semesters.

Subsequently, two separate segments are offered:

- **PhD Program:** Good to excellent results after the first year qualify for direct admission to a three-year doctoral project in one of the participating research groups. The Master's thesis requirement is waived in this case. After successful defense of a doctoral thesis, the degree Doctor of Philosophy (Ph.D.) or the equivalent title Doctor rerum naturalium (Dr. rer. nat.) is conferred. Students who finished medical school can apply for an MD-Ph.D. title.
- **MSc Program:** Alternatively, students may conclude the program with a Master's thesis, based on six months of experimental scientific research. The degree Master of Science (M.Sc.) is awarded upon successful completion of the Master's thesis.



Funding of the Program

The Neuroscience Program thanks the following institutions and funding initiatives, who contributed to the success of the Neuroscience Program:

DAAD

German Academic Exchange Service (DAAD), Bonn, Germany, http://www.daad.de

International Degree Programs - Auslandsorientierte Studiengänge (AS)

IPP made in Germany

International Postgraduate Programs – Internationale Promotionsprogramme (IPP)

Max Planck Society for the Advancement of Science, Munich, Germany, http://www.mpg.de

International Max Planck Research Schools

Niedersächsisches Ministerium für Wissenschaft und Kultur

Ministry of Lower Saxony for Science and Culture, Hannover, Germany, http://www.mwk.niedersachsen.de

Innovationsoffensive

Doctoral Programs - Promotionsprogramme

Stifterverband für die Deutsche Wissenschaft

Stifterverband für die Deutsche Wissenschaft, Essen, Germany, http://www.stifterverband.org

Exzellenzstiftung zur Förderung der Max-Planck-Gesellschaft, Munich, Germany, http://www.exzellenzstiftung.de

Gemeinnützige Hertie-Stiftung

Gemeinnützige Hertie-Stiftung, Frankfurt am Main, Germany, http://www.ghst.de

Donors

The Neuroscience Program thanks the following companies for their donations, which were used to financially support students during the first year of studies:

Bayer AG, Leverkusen, Germany

Carl Zeiss Lichtmikroskopie, Göttingen, Germany

Degussa AG, Düsseldorf, Germany

DeveloGen AG, Göttingen, Germany

Heka Elektronik GmbH, Lambrecht / Pfalz, Germany

Hellma GmbH & Co. KG, Müllheim / Baden, Germany

KWS Saat AG, Einbeck, Germany

Leica Microsystems GmbH, Bensheim, Germany

Luigs & Neumann, Ratingen, Germany

Olympus Europa Holding GmbH, Hamburg, Germany

Roche Diagnostics GmbH, Penzberg, Germany

Sartorius stedim AG, Göttingen, Germany

Solvay Pharmaceuticals, Hannover, Germany

Springer Verlag, Heidelberg, Germany

Vossius & Partner, München, Germany

Intensive Course Program (First Year)

Throughout the first year, current topics in the neurosciences are covered by

- lectures
- tutorials
- methods courses
- laboratory rotations
- seminars

Lectures and Tutorials

A comprehensive lecture series is organized into a sequence of 4-6 week units. The following topics are taught on an advanced level throughout the first year (36 weeks, 4 hours per week):

A. Neuroanatomy

B. Physiology and Basic Statistics

C. Modelling, Autonomous Nervous System, Pharmacology

D. Molecular Biology, Development, and Neurogenetics

E. Sensory and Motor Systems

F. Clinical Neurosciences and Higher Brain Functions

G. Specialization Seminars and Tutorials

Each lecture is accompanied by a tutorial session, where students meet with a tutor in small groups. Tutorials involve exercises, review of lecture material, and discussion of related topics.

Methods Courses

During the first months of the Neuroscience Program, students participate in a series of methods courses to introduce them to principles and practical aspects of basic scientific techniques and the handling of model organisms. The practical courses and tutorials comprise the following topics:

I Neuroanatomy

- comparative development of the vertebrate brain
- cytology and ultrastructure of the human brain
- functional neuroanatomy of sensory and motor systems
- immunocytochemical techniques
- single neuron staining and recording
- invertebrate model systems

II Physiology and Basic Statistics

- introduction to medical statistics
- electrophysiological techniques
- membrane physiology / synaptic transmission
- FLIM / Ca-imaging / FCS techniques
- sensory and behavioral physiology

III Modelling, Autonomous Nervous System, Pharmacology

- neuronal modelling
- behavioral analysis
- neuroendocrinology / neuropharmacology
- protein separation techniques

IV Molecular Biology, Development, and Neurogenetics

- cell culture methods
- methods in molecular biology

Laboratory Rotations

Starting in January, every student carries out three independent research projects (laboratory rotations) in participating laboratories. Each project is individually supervised and involves seven weeks of experimental work, followed by one week for data analysis and presentation. For each project, a report must be completed in the format of a scientific publication. The laboratory rotations must cover at least two different subjects.

Seminars

Seminars start in March. The class meets weekly for two hours to discuss two or three student presentations. The presentations are research reports based on work from the laboratory rotations.

Examinations

After the first year of intensive training, all students take one written and two oral Master's examinations. The Master's examinations explore the students' theoretical background in topics covered by lectures and tutorials. All candidates are examined both in the field of anatomy and physiology in two separate oral exams.

PhD Program

Students who have passed the Master's examinations with good or excellent results qualify for direct admission to a three-year doctoral project in one of the participating research groups without being required to complete a Master's thesis first.

The PhD program emphasizes independent research on the part of the students. Doctoral students select three faculty members as their doctoral thesis committee which closely monitors progress and advises students in their research project. Laboratory work is accompanied by seminars and lecture series, a wide variety of advanced methods courses, training in scientific writing and oral presentation skills, courses in intercultural communication, bioethics and research ethics, elective courses, and participation in international conferences or workshops.

At the end of the PhD training program, a doctoral thesis is submitted either in the traditional format, or as a collection of scientific publications in internationally recognized journals along with a general introduction and a discussion of the results. The degree Ph.D. or, alternatively, Dr. rer. nat. will be awarded after the successful defense of the doctoral thesis. Having fullfilled all PhD degree requirements, medical students may apply for the degree of an MD-Ph.D. at the Medical Faculty.

Master's Program

After the first year of intensive training, students may conclude the program with a six-month thesis project, leading to a Master of Science degree. The thesis project involves experimental work under the supervision of faculty members of the Neuroscience Program. Students have the opportunity to conduct their Master's thesis project at an affiliated research institution abroad.

Orientation, Language Courses, Social Activities

A three-week orientation prior to the program provides assistance and advice for managing day-to-day life, including arrangements for bank account, health insurance, residence permit, housing, and enrollment. Students have the opportunity to meet faculty members and visit laboratories of the participating institutions. In addition, the orientation program informs students about computing and library facilities, the city and university of Göttingen, sports facilities, and cultural events.

An intensive basic language course in German is offered in cooperation with the *Lektorat Deutsch als Fremdsprache* to facilitate the start in Göttingen. Additional language courses and social activities accompany the program.

Application, Selection, and Admission 2010

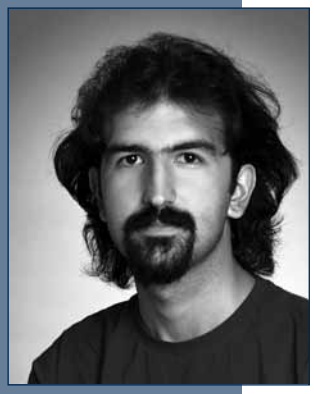
Applicants must hold a Bachelor's degree or equivalent in biology, medicine, psychology, physics, or related fields. Applicants who are not native speakers of English should demonstrate adequate competence of the English language by acceptable results in an internationally recognized test.

In the year 2010, the coordination office received 207 applications from 48 countries

Continent	Applications	Admissions
Europe (total)	**45**	**7**
Germany	27	3
other West Europe	7	2
East Europe	11	2
America (total)	**22**	**1**
North America	7	1
Central/South America	15	0
Africa (total)	**25**	**1**
North Africa	10	1
Central/South Africa	15	0
Asia (total)	**113**	**8**
Near East	26	2
Central Asia/ Far East	88	6
Australia	**1**	**0**

Students 2010/2011

Name		Home Country
Bekir	Altas	Turkey
Mateusz	Ambrozkiewicz	Poland
Vinita	Bharat	India
David	Brockelt	Germany
Han-Yun	Chen	Taiwan
Yen-Ying	Chen	Taiwan
Ananya	Chowdhury	India
Ilma	Dewiputri	Malaysia
Zohreh	Farsi	Iran
Lauren	Haag	USA
Ulrike	Leipscher	Germany
Lawrence	McKechnie	Scotland
Kareem	Soliman	Egypt
Markus	Stahlberg	Germany
Ananya	Tiwari	India
Oana	Toader	Romania
Siv	Vingill	Norway



Turkey

Bekir Altaş

EDUCATION

College / University

Middle East Technical University (METU)

Highest Degree

B.Sc.

Major Subjects

Molecular Biology and Genetics

Lab Experience

Various techniques in Molecular and Cellular Biology, Microbiology and Genetics

Projects / Research

Feb 2009 – Mar 2010: Development of a Sandwich Aptamer Assay, Molecular Biology and Biotechnology Research Center, METU, Turkey

May – Aug 2008: Light controlled heavy metal transport by using *E.coli*, METU IGEM (Internationally Genetically Engineered Machines Competition) Team, Turkey

Scholarships / Awards

2010 – 2011: Stipend of the Excellence Foundation for the Promotion of the Max Planck Society

2005 – 2010 Full Undergraduate Scholarship by TUBITAK (The Scientific and Technical Research Council of Turkey)

Poland

Mateusz Ambrożkiewicz

EDUCATION

College / University:

Warsaw University of Life Sciences

Highest Degree:

Bachelor of Science/Engineer

Major Subjects:

Biotechnology

Lab Experience:

Standard techniques of biophysics, molecular biology and biochemistry enabling nucleic acids and protein analysis, cell and tissue culture

Projects / Research:

2010: The analysis of proteins involved in the canonical Wnt signal transduction pathway in different adult rat brain regions and neuronal cultures, International Institute of Molecular and Cell Biology Warsaw

2009 – 2010: Stress-regulated expression of Chp 1/morgana – a gene for a novel chaperone-like protein. Morgana/CHP-1 is a novel chaperone able to protect cells from stress', Biochim Biophys Acta, 2010, 1803(9):1043-9.

2009: Mutational Surface Engineering of the Restriction Enzymes and Microcalorimetric Analysis of NlaIV – dsDNA Interaction, International Institute of Molecular and Cell Biology Warsaw

Scholarships:

2010 – 2011 Stipend of the Excellence Foundation for the Promotion of the Max Planck Society

2007 – 2010: Scholarship for the scientific achievements (Warsaw University of Life Sciences)

Vinita Bharat

India

Vinita Bharat

EDUCATION

College / University

Sri Venkateshwara College, Delhi University

Highest Degree:

B.Sc. (H) in Biochemistry

Major Subjects:

Biochemistry, Molecular Biology, Immunology, Cell Biology, Bioenergetics, Genetics, Membrane Biology

Lab Experience:

Quality control and instrumentation lab comprising UV spectrophotometer, HPLC, GLC, ion exchange chromatography, gel filtration, affinity chromatography, biochemistry, microbiology, molecular biology

Projects / Research:

June 2009: Training in various immunology laboratories at Central Research Institute, Kasauli (India)

May 2009: Worked in quality control at Surya Pharmaceuticals Pvt. Ltd., Chandigarh, India

2008: Review project on “Duccheene Muscular Dystrophy”, Institute of Human Genetics, Ahmedabad, India

Scholarships / Awards

2010 – 2011 Stipend of the Excellence Foundation for the Promotion of the Max Planck Society

David Brockelt

Germany

David Brockelt

EDUCATION

College / University

Georg August University Göttingen

Highest Degree:

B.Sc.

Major Subjects:

Neuroscience, Molecular Biology

Lab Experience:

Basic techniques in molecular and neurobiology

Projects / Research:

Bachelor thesis: “Functional characterization of the interaction of Disrupted-in-Schizophrenia-1 (DISC1) and F-box-protein-31 (FBXO31)”, Dr. Judith Stegmüller, Max Planck Institute for Experimental Medicine Göttingen

Scholarships:

2010 – 2011 International Max Planck Research School support

Taiwan

Han-Yun Chen

EDUCATION

College / University

National Yang-Ming University

Highest Degree:

B.Sc.

Major Subjects:

Medical Technology

Lab Experience:

Basic techniques in molecular biology, biochemistry, cell culture and animal models

Projects / Research:

Jan 2007 – Jan 2009: The effect of polyunsaturated fatty acids on the expression of adhesion molecules in human aortic endothelial cells

Scholarships:

2010 – 2011: Stipend of the Excellence Foundation for the Promotion of the Max Planck Society

2008: Science Research Fund for Undergraduate Students, National Yang-Ming University

Taiwan

Yen-Ying Chen

EDUCATION

College / University

National Taiwan University

Highest Degree:

M.Sc.

Major Subjects:

Biochemistry

Lab Experience:

Mass spectrometry, purification of glycoconjugates, basic methods in cell and molecular biology

Projects / Research:

2006 – 2008: Systematic and targeted glycomic analysis to map specific glycotopes in relation to β1,3-galactosyltransferase V

2009 – 2010: Site-specific identification of H antigen-carrying glycopeptides in human breast and colorectal carcinoma

Scholarships:

2010 – 2011: Stipend of the Excellence Foundation for the Promotion of the Max Planck Society

2005 – 2006: College Student Research Project Fellowship from National Science Council

India

Ananya Chowdhury

EDUCATION

College / University

Jawaharlal Nehru University

Highest Degree:

M.Sc.

Major Subjects:

Life Sciences

Lab Experience:

Electrophysiology, handing of lab animals, surgery, reward training, sleep recording, statistical programs like ANOVA, power spectral analysis, histochemistry

Projects / Research:

One- year project on the topic 'role of sleep in the consolidation of associative reward learning in rats' under Dr. S.K Jha, Assistant Prof, J.N.U.

Scholarships:

2010 – 2011: Stipend of the Excellence Foundation for the Promotion of the Max Planck Society

Malaysia

Wan Ilma Dewiputri

EDUCATION

College / University

The University of Adelaide, Australia

Highest Degree:

B. Health Science (Honours)

Major Subjects:

Genetics, Immunology

Lab Experience:

Basic techniques in genetics, molecular biology and immunology

Projects / Research:

Molecular mechanisms of craniosynostosis. Women and Children Health Research Institute, Adelaide

Population genetics of barley pathogens *Rhyncosporium secalis*. Molecular Plant Breeding CRC, Adelaide

Scholarships:

Ministry of Higher Education Malaysia scholarship

Zohreh Farsi

Iran

Zohreh Farsi

EDUCATION

College / University

Shahed University

Highest Degree:

B.Sc.

Major Subjects:

Cellular and Molecular Biology, Genetics

Lab Experience:

Cell isolation from mice, cell culture, molecular biology and biochemical methods

Projects / Research:

In vitro effect of antidepressant drugs on murine macrophages and lymphocytes

Investigation of the role of Arginine 97 in allosteric signal transduction pathway of Methylglyoxal Synthase

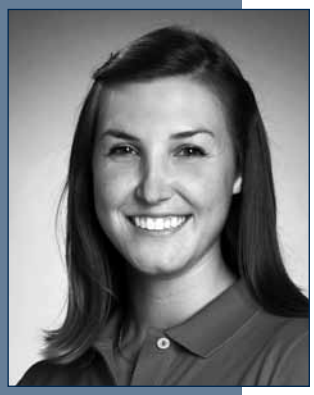
Scholarships:

2010 – 2011: Stipend of the Excellence Foundation for the Promotion of the Max Planck Society

2009 – 2010: National Foundation of Elites stipend, Iran

2009: The best Award of Ministry of Science for 14th Nationwide Student Olympiad in the field of Biology, Tehran, Iran

Lauren Haag



USA

Lauren Haag

EDUCATION

College / University

Emory University

Highest Degree:

B.Sc.

Major Subjects:

Neuroscience and Behavioral Biology

Lab Experience:

Hormonal RIAs

Projects / Research:

Lee VK, Flynt K, Haag LM, Taylor DK (in press): Comparison of the effects of ketamine, ketamine-medetomidine and ketamine-midazolam on physiological parameters and anesthesia-induced stress in rhesus (Macaca mulatta) and cynomolgus macaques (Macaca fasicularis), JAALAS

Scholarships:

2010 – 2011: Stipend of the Excellence Foundation for the Promotion of the Max Planck Society

Germany

Ulrike Leipscher

EDUCATION

College / University

Universität zu Lübeck

Highest Degree:

B.Sc.

Major Subjects:

Molecular Life Sciences

Lab Experience:

Basic techniques in biochemistry, molecular biology, cell culture, stereotaxic surgery, microdialysis, HPLC

Projects / Research:

Analysis of the influence of rTMS on neurotransmission in the nucleus accumbens shell of the rat *in vivo*

Scholarships:

2010 – 2011 International Max Planck Research School support

Scotland

Lawrence McKechnie

EDUCATION

College / University

University of Glasgow

Highest Degree:

M.Sc. (honours)

Major Subjects:

Molecular and Cellular Biology

Lab Experience:

Macromolecular modelling tools such as rasmol and pymol; generation of computer simulations using MATLAB; basic molecular biology/biochemical /genetic techniques; various bioinformatics tools and statistical packages

Projects / Research:

The role of internal models in motor control, Donders Institute, Nijmegen, the Netherlands

Relationship between dihedral geometry of dipeptides peptides and their chemistry of action, University of Glasgow

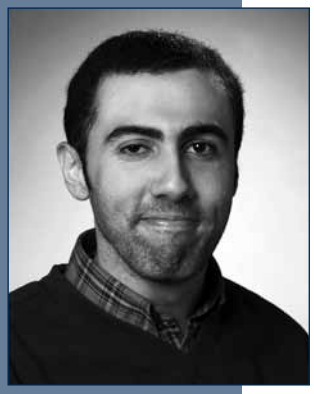
Investigation into the application of nimbelgen micro arrays using PARTEK biostatistical software and DAVID bioinformatics tool, University of Glasgow

Investigation: Possible roles of ras protein in receptor clustering of NMDA NR1 subunit, Wellcome Trust Sanger Institute, Genes2Cogntion project

Dissertation/literature review: The use of various computational methods to elucidate the meaning of the histone code, University of Glasgow

Scholarships:

2010 – 2011: Stipend of the Excellence Foundation for the Promotion of the Max Planck Society



Egypt

Kareem Soliman

EDUCATION

College / University

German University in Cairo

Highest Degree:

B.Sc.

Major Subjects:

Pharmacy & Biotechnology

Lab Experience:

2008: Molecular Neurobiology Lab, Psychiatrie, Klinikum, Universität Erlangen

2007: Molecular Biology Lab, Dept. of Pharmacology & Cancer Biology, Duke University, USA

Projects / Research:

Aug – Oct 2008: Testing a de novo approach which may evaluate cell viability via spectroscopic technique. Evaluating the neuron protection activity of *Fluoxetin* against alcohol toxicity

July – Oct 2008: ASM gene (Acid Sphingomeylinase) different splice variants expression in MDD patients versus healthy volunteers

Scholarships:

2010 – 2011: Stipend of the Excellence Foundation for the Promotion of the Max Planck Society

Germany

Markus Stahlberg

EDUCATION

College / University

University of Heidelberg

Highest Degree:

B.Sc. in Molecular Biotechnology

Major Subjects:

Drug research, Bioinformatics, Biophysics

Lab Experience:

Basic techniques in molecular biology, micro- and cellular biology and biophysics

Projects / Research:

Bachelor thesis: “Pregnane X receptor as determinant of multidrug resistance gene expression and inducibility in head and neck squamous cell carcinoma” Department of Clinical Pharmacology and Pharmacoepidemiology, University of Heidelberg, Germany

2009: “Dense reconstruction of neuronal circuits by computer based analysis of 3 dimensional images of neuronal tissue taken by electron microscopy” MPI for Medical Research, Heidelberg, Germany

2008: “Supporting the study of the influence of HDAC activities on the development of the central nervous system in the mouse” Interdisciplinary Center for Neurosciences, University of Heidelberg, Germany

Scholarships:

2010 – 2011: International Max Planck Research School support

Since March 2010: Online scholarship from e-fellows.net

India

Ananya Tiwari

EDUCATION

College / University

St. Stephen's College, Delhi

Highest Degree:

B.Sc. (Chemistry Honours)

Major Subjects:

Chemistry (Inorganic, Organic and Physical), Physics, Mathematics

Lab Experience:

Dynamic Light Scattering, Static Light Scattering, Rheology, Zeta Potential (Zeecom), UV/V Spectroscopy, Western Blotting

Projects / Research:

2010: Supervision on Schizophrenia and Abnormal Glucose Metabolism, University of Cambridge, UK; Effects of Epigenetic Regulation on Learning and Memory, Banaras Hindu University, Banaras, India

2009: Towards Understanding Brain and the Major Techniques Used To Map It, Indian Institute of Technology, Delhi; Solution Phase Peptide Synthesis, Indian Institute of Science, Bangalore

2008: Preparation And Characterization Of Protein-Protein Complex Coacervates And Their Application In Drug Delivery, Jawaharlal Nehru University

Scholarships:

2010 – 2011: Stipend of the Excellence Foundation for the Promotion of the Max Planck Society

2009/2010: Pembroke, King's Program Scholarship, University of Cambridge, UK; SRFP, Indian Academy of Sciences; Erasmus Mundus Scholarship in Advanced Spectroscopy; Bank of Tokyo, Mitsubishi UFJ Scholarship

Romania

Oana Toader

EDUCATION

College / University

University of Bucharest

Highest Degree:

B.Sc.

Major Subjects:

Biochemistry

Lab Experience:

Basic molecular biology techniques, calcium imaging, patch clamp, cell cultures

Projects / Research:

Diploma: *"Sensitization of TRPA1 receptor by serotonin and prostaglandin E2"*

Substance MCS-18 isolated from Helleborus purpurascens is a potent antagonist of the capsaicin receptor, TRPV1, in rat cultured sensory neurons. Physiol. Res. 2009, PMID: 19537933

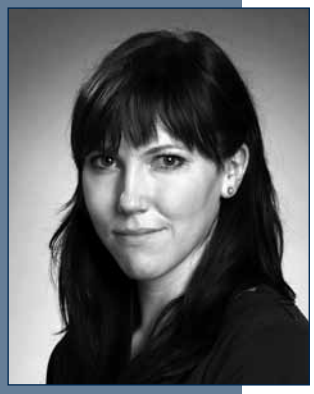
Scholarships:

2010 – 2011: Stipend of the Excellence Foundation for the Promotion of the Max Planck Society

2005 – 2009: Romanian Ministry of Education, Study Scholarship / Olympic Honors Scholarship

Awards:

2005: Gold medal in Chemistry, Int. Pluridisc. Olympiad, Yakutsk, Russia; 2008: Best Poster Award, The National Neuroscience Society; 2009: First prize at the Student Scientific Communications Session / Physiological Society Vacation Studentship Award



Norway

Siv Vingill

EDUCATION

College / University

University of Oslo

Highest Degree:

B.Sc. in Molecular Biology

Major Subjects:

Molecular Biology and Biochemistry

Lab Experience:

Standard techniques in molecular biology and biochemistry

Scholarships:

2010 – 2011 Stipend of the Excellence Foundation for the Promotion of the Max Planck Society

2010 – 2011 The State Educational Loan Fund by the Ministry of Education and Research, Norway

Faculty

Name		Institute	
Mathias	Bähr	Neurology	U Göttingen
Thomas	Bayer	Molecular Psychiatry	U Göttingen
Nils	Brose	Molecular Neurobiology	MPI em
Wolfgang	Brück	Neuropathology	U Göttingen
Hannelore	Ehrenreich	Clinical Neurosciences	MPI em
Stefan	Eimer	Molecular Neurogenetics	ENI
Wolfgang	Engel	Human Genetics	U Göttingen
André	Fiala	Molecular Neurobiology of Behavior	U Göttingen
André	Fischer	Laboratory for Aging and Cognitive Diseases	ENI
Gabriele	Flügge	Neurobiology	DPZ
Jens	Frahm	Biomedical NMR Research / Physical Chemistry	MPI bpc
Eberhard	Fuchs	Animal Physiology / Neurobiology	DPZ
Theo	Geisel	Nonlinear Dynamics	MPI ds
Martin	Göpfert	Cellular Neurobiology	U Göttingen
Uwe-Karsten	Hanisch	Neuropathology	U Göttingen
Ralf	Heinrich	Neurobiology	U Göttingen
Michael	Hörner	Neurobiology	U Göttingen
Swen	Hülsmann	Neuro- and Sensory Physiology	U Göttingen
Reinhard	Jahn	Neurobiology	MPI bpc
Hubertus	Jarry	Clinical and Experimental Endocrinology	U Göttingen
Till	Marquardt	Developmental Neurobiology	ENI
Tobias	Moser	Otolaryngology	U Göttingen
Klaus-Armin	Nave	Neurogenetics	MPI em
Erwin	Neher	Membrane Biophysics	MPI bpc
Luis	Pardo	Molecular Biology of Neuronal Signals	MPI em
Walter	Paulus	Clinical Neurophysiology	U Göttingen
Diethelm W.	Richter	Neuro- and Sensory Physiology	U Göttingen
Michael	Rickmann	Neuroanatomy	U Göttingen
Silvio O.	Rizzoli	STED Microscopy of Synaptic Function	ENI
Detlev	Schild	Molecular Neurophysiology	U Göttingen
Oliver	Schlüter	Molecular Neurobiology	ENI
Mikael	Simons	Biochemistry and Molecular Cell Biology	MPI em
Judith	Stegmüller	Cellular and Molecular Neurobiology	MPI em
Nicole	von Steinbüchel-Rheinwall	Medical Psychology and Medical Sociology	U Göttingen
Anastassia	Stoykova	Molecular Cell Biology	MPI bpc
Walter	Stühmer	Molecular Biology of Neuronal Signals	MPI em
Andreas	Stumpner	Neurobiology	U Göttingen
Victor	Tarabykin	Molecular Biology of Neuronal Signals	MPI em
Stefan	Treue	Cognitive Neuroscience and Biological Psychology	DPZ
Andreas	Wodarz	Stem Cell Biology	U Göttingen
Fred	Wolf	Nonlinear Dynamics	MPI ds
Fred	Wouters	Cellular Biophysics	U Göttingen

U Göttingen = Georg August University, MPI bpc = Max Planck Institute for Biophysical Chemistry, MPI em = Max Planck Institute for Experimental Medicine, MPI ds = Max Planck Institute for Dynamics and Self-Organization, DPZ = German Primate Center, ENI = European Neuroscience Institute

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Mathias Bähr

Professor of Neurology

- 1985 MD, University of Tübingen Medical School, Training in Neurology at University Hospitals in Tübingen and Düsseldorf
- DFG and Max Planck Fellow at the Max Planck Institute for Developmental Biology Tübingen and at the Department of Anatomy and Cell Biology, Washington University St.Louis
- Schilling-Foundation Professor for Clinical and Experimental Neurology, University of Tübingen
- Director at the Department of Neurology, University of Göttingen since 2001

Major Research Interests

Neuronal cell loss is not only a major feature of human neurodegenerative diseases like Parkinson's disease (PD), Alzheimer's disease (AD) or stroke, but can also be observed in neuroinflammatory conditions like Multiple Sclerosis (MS) or after traumatic lesions, e.g. of the optic nerve. We examine the cellular and molecular mechanisms of neuronal dysfunction and neuronal cell death in animal models of the respective disorders with the ultimate goal to detect new targets for a therapeutic neuroprotective intervention.
In PD for example, a multidisciplinary research team with our participation in the area C2 of the CMPB examines the role of alpha-synuclein aggregation for dopaminergic dysfunction and cell death and characterizes other disease related proteins in order to develop new neuroprotective strategies. To that end we use AAV viral gene transfer to express different disease-associated and design mutants of alpha-synuclein in the nigrostriatal system of rodents. Using this technology we also developed a novel model of PD based on RNA-interference mediated depletion of anti-oxidant defense mechanisms, demonstrating several features of idiopathic PD such as selective degeneration of DA neurons, progressive aggregate formation and inflammation. A similar approach is also used to develop new gene therapy strategies using viral vectors for delivery of neuroprotective factors to specific neurons or glial cells in various species.
In the recent years it became also clear that axonal and neuronal loss do not only occur in classical neurodegenerative disorders but also in immune-mediated diseases like MS. To study this issue in more detail we have developed a model system of MS in rodents that reproducibly leads to optic neuritis, one of the most common early manifestations of MS. To monitor disease course we have established electrophysiological measurements like visually evoked potentials (VEP), electroretinogramm (ERG) and optical coherence tomography (OCT) that allow us to correlate onset, course and outcome of disease with and without therapy with histomorphological and molecular analyses. The aim is to describe in detail the molecular pathophysiology that leads to axonal and neuronal loss and to develop new therapeutic strategies, some of which have already been translated into proof of concept studies in human patients.

Selected Recent Publications

Knöferle J, Koch JC, Ostendorf T, Michel U, Planchamp V, Vutova P, Tönges L, Stadelmann C, Brück W, Bähr M, Lingor P (2010) Mechanisms of acute axonal degeneration in the optic nerve *in vivo*. Proc Natl Acad Sci USA. 107(13): 6064-9

Deeg S, Gralle M, Sroka K, Bähr M, Wouters FS, Kermer P (2010) BAG1 restores formation of functional DJ-1 L166P dimers and DJ-1 chaperone activity. J Cell Biol: 188(4): 505-13

Gadjanski I, Boretius S, Williams SK, Lingor P, Knöferle J, Sättler MB, Fairless R, Hochmeister S, Sühs KW, Michaelis T, Frahm J, Storch MK, Bähr M, Diem R (2009) Role of N-Type voltage-dependent calcium channels in autoimmune optic neuritis. Ann Neurol 66(1): 81-93

Planchamp V, Bermel C, Tönges L, Ostendorf T, Kügler S, Reed JC, Kermer P, Bähr M, Lingor P (2008) BAG1 promotes axonal outgrowth and regeneration *in vivo* via Raf-1 and reduction of ROCK activity Brain131(Pt 10): 2606-19

Lingor P, Tönges L, Pieper N, Bermel C, Barski E, Planchamp V, Bähr M (2008) ROCK inhibition and CNTF interact on intrinsic signalling pathways and differentially regulate survival and regeneration in retinal ganglion cells. Brain 13 131 (Pt 1): 250-63

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Thomas Bayer

Professor of Molecular Psychiatry

- 1993 Postdoctoral Research Fellow, University of Cologne, Cologne, Germany
- 1993 - 1997 Postdoctoral Research Fellow, Institute of Neuropathology (Prof. O. Wiestler), University of Bonn Medical Center, Bonn, Germany
- 1997 - 2002 Lab leader, Department of Psychiatry (Prof. P. Falkai), University of Bonn Medical Center, Bonn, Germany
- 2002 - 2007 Head of Neurobiology Lab, University of Saarland Medical Center, Homburg, Germany
- 2004 Appointment to apl Professor at the University Medical Center Saarland
- 2007 - present W2 Professor in Molecular Psychiatry at the University Medicine Göttingen, Department of Psychiatry
- Since 2006 Coordinator of the European Commission funded International Alzheimer PhD School «Neurodegeneration in Alzheimer's disease – mechanism, consequence and therapy» (NEURAD).

Major Research Interests

pathogenesis of Alzheimer's disease, neuronal cell death mechanisms, preclinical proof-of-concept studies; characterization and development of mouse models for Alzheimer's disease (neuropathology, anatomy, biochemistry, behavioural tests), preclinical therapy studies in mouse models, blood and CSF biomarker analysis, coordination and design of a phase II clinical study with Alzheimer's disease patients.

Selected Recent Publications

Bayer TA and Wirths O (2010) Intracellular accumulation of amyloid-beta – a predictor for synaptic dysfunction and neuron loss in Alzheimer's disease. Front Ag Neurosci 2(8): 1-10

Christensen DZ, Bayer TA, Wirths O (2010) Intracellular Abeta triggers neuron loss in the cholinergic system of the APP/PS1KI mouse model of Alzheimer's disease. Neurobiol Aging. 31: 1153–1163

Wirths O, Breyhan H, Marcello A, Cotel M., Brück W, Bayer TA (2010) Inflammatory changes are tightly associated with neurodegeneration in the brain and spinal cord of the APP/PS1KI mouse model of Alzheimer's disease Neurobiology of Aging 31 (5): 747-757

Christensen D, Schneider-Axmann T, Lucassen P, Bayer TA, Wirths O (2010) Accumulation of intraneuronal beta-amyloid correlates with ApoE4 genotype Acta Neuropathol 119: 555–566

Cotel MC, Jawahr S, Christensen D, Bayer TA, Wirths O (2010) Environmental enrichment fails to rescue working memory deficits, neuron loss and neurogenesis in APP/PS1KI mice. Neurobiol Aging, DOI:10.1016/j.neurobiolaging.2010.02.012

Venkataramani V, Rossner C, Iffland L, Schweyer S, Tamboli I, Walter J, Wirths O, Bayer , TA (2010) The histone deacethylase inhibitor valproic acid inhibits cancer cell proliferation via down-regulation of the Alzheimer amyloid precursor protein. Journal of Biological Chemistry 285: 10678-10689

Marcello A, Wirths O, Schneider-Axmann T, Degerman-Gunnarsson M, Lannfelt L, Bayer TA (2009) Reduced levels of IgM autoantibodies against N-truncated pyroglutamate Aβin plasma of patients with Alzheimer's disease. Neurobiol Aging, 10.1016/j.neurobiolaging.2009.08.011

Wirths O, Breyhan H, Cynis H, Schilling S, Demuth H-U, Bayer TA (2009) Intraneuronal pyroglutamate-Abeta 3-42 triggers neurodegeneration and lethal neurological deficits in a transgenic mouse model. Acta Neuropathol 118: 487–496

Breyhan H, Wirths O, Duan K, Marcello A, Rettig J, Bayer TA (2009) APP/PS1KI bigenic mice develop early synaptic deficits and hippocampus atrophy. Acta Neuropathol 117: 677–685

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Nils Brose

Professor, Director at the Max Planck Institute for Experimental Medicine

- Dr. rer. nat. (Ph.D.) 1990, Ludwig Maximilians University Munich
- Appointed as Director at the Max Planck Institute for Experimental Medicine 2001

Major Research Interests

Research in the Department of Molecular Neurobiology focuses on the molecular mechanisms of synapse formation and function in the vertebrate central nervous system. Typically, synapses are formed between cellular processes of a sending and a receiving nerve cell. They are the central information processing units in the vertebrate brain where some 1012 nerve cells are connected by 1015 synapses to form an elaborate and highly structured neuronal network that is the basis for all forms of behaviour. Signal transmission at synapses is mediated by the regulated release of signal molecules (neurotransmitters) which then diffuse to the receiving nerve cell and change its physiological state. In the Department of Molecular Neurobiology, we combine biochemical, morphological, mouse genetic, behavioural, and physiological methods to elucidate the molecular basis of synapse formation and transmitter release processes. Our synaptogenesis research concentrates on synaptic cell adhesion proteins and their role in synapse formation. Studies on the molecular mechanisms of neurotransmitter release focus on components of the presynaptic active zone and their regulatory function in synaptic vesicle fusion.

Selected Recent Publications

Jamain S, Radyushkin K, Hammerschmidt K, Granon S, Boretius S, Varoqueaux F, Ramanantsoa N, Gallego J, Ronnenberg A, Winter D, Frahm J, Fischer J, Bourgeron T, Ehrenreich H, Brose N (2008) Reduced social interaction and ultrasonic communication in a mouse model of monogenic heritable autism. Proc Natl Acad Sci USA 105: 1710-1715

Jockusch W, Speidel D, Sigler A, Sørensen J, Varoqueaux F, Rhee J-S, Brose N (2007) CAPS-1 and CAPS-2 are essential synaptic vesicle priming proteins. Cell 131: 796-808

Varoqueaux F, Aramuni G, Rawson RL, Mohrmann R, Missler M, Gottmann K, Zhang W, Südhof TC, Brose N (2006) Neuroligins determine synapse maturation and function. Neuron 51: 741-754

Junge H, Rhee J-S, Jahn O, Varoqueaux F, Spiess J, Waxham MN, Rosenmund C, Brose N (2004) Calmodulin and Munc13 form a Ca^{2+}-sensor/effector complex that controls short-term synaptic plasticity. Cell 118: 389-401

Rhee J-S, Betz A, Pyott S, Reim K, Varoqueaux F, Augustin I, Hesse D, Südhof TC, Takahashi M, Rosenmund C, Brose N (2002) Beta Phorbol ester- and diacylglycerol-induced augmentation of transmitter release is mediated by Munc13s and not by PKCs. Cell 108: 121-133

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Wolfgang Brück

Professor of Neuropathology

- 1986 MD Johannes Gutenberg University in Mainz, 1994 national boards in neuropathology
- 1996 - 2002 Associate professorships for neuropathology at the University of Göttingen and the Charité in Berlin
- Since 2002 full professor and director of the Department of Neuropathology, University of Göttingen

Major Research Interests

- Immunpathology of multiple sclerosis
- Brain-specific mechanisms of immune response in multiple sclerosis
- Axonal damage in inflammatory demyelination and mechanisms of remyelination
- Mechanisms and consequences of microglial activation

Selected Recent Publications

Kuhlmann T, Remmington L, Maruschak B, Owens T, Brück W (2007) Nogo-A is a reliable oligodendroglial marker in human and mouse adult CNS as well as in demyelinated lesions. J Neuropathol Exp Neurol 66: 238-246

Albert M, Antel J, Brück W, Stadelmann C (2007) Extensive cortical remyelination in patients with chronic multiple sclerosis. Brain Pathol 17: 129-138

Metz I, Lucchinetti CF, Openshaw H, Garcia-Merino A, Lassmann H, Freedman MS, Azzarelli B, Kolar OJ, Atkins HL, Brück W (2007) Autologous hematopoietic stem cell transplantation fails to stop demyelination and neurodegeneration in multiple sclerosis. Brain 130: 1254-1262

Jack C, Antel J, Brück W, Kuhlmann T (2007) Contrasting potential of nitric oxide and peroxynitrite to mediate oligodendrocyte injury in multiple sclerosis. Glia 55: 926-934

Schwartz M, Butovsky O, Brück W, Hanisch UK (2006) Microglial phenotype: Is the commitment reversible? Trends Neurosci 29: 68-74

Merkler D, Ernsting T, Kerschensteiner M, Brück W*, Stadelmann C* (2006) A new focal EAE model of cortical demyelination: MS-like lesions with rapid resolution of inflammation and extensive remyelination. Brain 129: 1972-1983

Patrikios P, Stadelmann C, Kutzelnigg A, Rauschka H, Schmidbauer M, Laursen H, Sorensen P, Brück W, Lucchinetti C, Lassmann H (2006) Remyelination is extensive in a subset of Multiple Sclerosis patients. Brain 129: 3165-3172

Zhou D, Srivastava R, Nessler S, Grummel V, Sommer N, Brück W, Hartung HP, Stadelmann C, Hemmer B (2006) Identification of a Pathogenic Antibody Response to Native Myelin Oligodendrocyte Glycoprotein in Multiple Sclerosis. PNAS 103: 19057-19062

Gutenberg A, Buslei R, Fahlbusch R, Buchfelder M, Brück W (2005) Immunopathology of primary hypophysitis: implications for pathogenesis. Am J Surg Pathol 29: 329-38

Keegan M, König F, McClelland R, Brück W, Morales Y, Bitsch A, Panitch H, Lassmann H, Weinshenker B, Rodriguez M, Parisi J, Lucchinetti CF (2005) Humoral Multiple Sclerosis Pathology Correlates With Response To Therapeutic Plasma Exchange. The Lancet 366: 579-582

Merkler D, Boretius S, Stadelmann C, Ernsting T, Michaelis T, Frahm J, Brück W (2005) Multicontrast MRI of remyelination in the central nervous system. NMR Biomed 18: 395-403

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Hannelore Ehrenreich

Professor of Neurology and Psychiatry

- 1981 Doctor of veterinary medicine, University of Munich
- 1983 Elective Period, University of Newcastle-upon-Tyne, England
- 1985 Guest Lecturer, University of the Philippines, Manila
- 1985 - 1986 Assistant, Department of Internal Medicine, University of Munich
- 1987 Graduation (Medicine), University of Munich
- 1987 - 1988 Assistant, Department of Neurology, University of Munich
- 1989 Doctor of Medicine, University of Munich
- 1989 - 1991 Guest Scientist (BMBF grant) NIAID, NIH, Bethesda, MD, USA
- 1992 - 1994 Assistant, Departments of Neurology and Psychiatry, University of Göttingen
- 1994 Habilitation (Neurology and Psychiatry)
- 1994 - present Head, Division of Clinical Neuroscience, MPIEM
- 1995 - present Consultant & Professor (1998) of Neurology & Psychiatry, University of Göttingen
- 2000 - 2002 Vice President, University of Göttingen

Major Research Interests

Translational Neuroscience
(1) Molecular-cellular basis of neuropsychiatric disease
with focus on endogenous mechanisms of neuroprotection
(2) Clinical research on neuroprotection and neuroregeneration
in acute (ischemia/hypoxia, trauma) and chronic brain disease (schizophrenia, autism, ALS, MS)
(3) Clinical addiction research

Novel concepts for treatment of alcoholism, psychotherapeutic process-outcome research including kinetics and mechanisms of regenerationn

Selected Recent Publications

Begemann M, Klaus S, Papiol S, Malzahn D, Krampe H, Ribbe K, Friedrichs H, Radyushkin KA, El-Kordi A, Benseler F, Hannke K, Sperling S, Schwerdtfeger D, Thanhäuser I, Gerchen MF, Ghorbani M, Gutwinski S, Hilmes C, Leppert R, Ronnenberg A, Sowislo J, Stawicki S, Stödtke M, Szuszies C, Reim K, Riggert J, Falkai P, Bickeböller H, Nave KA, Brose N, Ehrenreich H (2010) Modification of cognitive performance in schizophrenia by complexin 2 gene polymorphisms. Arch Gen Psychiatry. 67:879-88

Wüstenberg T, Begemann M, Bartels C, Gefeller O, Stawicki S, Hinze-Selch D, Mohr A, Falkai P, Aldenhoff JB, Knauth M, Nave KA, Ehrenreich H (2010) Recombinant human erythropoietin delays loss of gray matter in chronic schizophrenia. MOL PSYCHIATRY 18. [Epub ahead of print]

Radyushkin K, El-Kordi A, Boretius S, Ronnenberg A, Castaneda S, Reim K, Bickeböller H, Frahm J, Brose N, Ehrenreich H (2010) Complexin2 knockout requires a “second hit” for induction of phenotypic changes relevant to schizophrenia. GENES BRAIN BEHAV, 9:592-602

El-Kordi A, Radyushkin K, Ehrenreich H (2009) Erythropoietin improves operant conditioning and stability of cognitive performance in mice. BMC BIOL 8:37

Ehrenreich H, Weissenborn K, Prange H, Schneider D, Weimar C, Wartenberg K, Schellinger PD, Bohn M, Becker H, Wegrzyn M, Jähnig P, Herrmann M, Knauth M, Bähr M, Heide W, Wagner A, Schwab S, Reichmann H, Schwendemann G, Dengler R, Kastrup A, Bartels C; EPO Stroke Trial Group (2009) Recombinant human erythropoietin in the treatment of acute ischemic stroke. STROKE 40: e647-56

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Stefan Eimer

Group Leader Molecular Neurogenetics / Neurodegeneration

- Ph.D. 2003 at the Gene Center of the Ludwig-Maximilian University (LMU in Munich
- 2003 Postdoc at the Ecole Normale Superieure in Paris, France
- since Oct 2005 independent group leader of the Center for Molecular Physiology of the Brain (CMPB) at the European Neuroscience Institute (ENI) in Göttingen

Major Research Interests

Neuotransmitter gated ion channels are involved in a large subset of neuronal events ranging from fast synaptic transmission to the modulation of neuronal circuits that lead to memory formation and cognition. En route to the cell surface these multimeric receptors have to undergo multiple assembly, quality control, and sorting steps to eventually reach the synapse.
Our group aims to understand the mechanisms and rules that control the trafficking and sorting of ligand gated ion channels within the secretory apparatus. In particular, we are focusing on the nicotinic acetylcholine receptor family of ligand gated ion channels, which have been implicated in numerous neurological and neurodegenerative diseases.
To find new molecules involved in these processes, we take advantage of the nematode *Caenorhabditis elegans* as a main model system, and use a combination of genetic, cell biological, and biochemical approaches as well as electro-physiology and electron-microscopy. As our main model system were are studying cholinergic neurotransmission at the neuro-muscular junction (NMJ) of *C. elegans*. Through genetic screens we have identified novel evolutionary conserved integral membrane proteins that regulate nAChR sorting at the Golgi-Endosomal interface. Further studies have implicated these molecules in the regulation and activation of small GTPases at Golgi complex. Based on these findings we have also started to study systematically how these GTPases are required for structure and function of the Golgi apparatus and how their activity affects the trafficking and neurotransmission at the NMJ of *C. elegans*.

Selected Recent Publications

Sumakovic M, Hegermann J, Luo L, Husson SJ, Schwarze K, Olendrowitz C, Schoofs L, Richmond J, Eimer S (2009) UNC-108/RAB-2 and its effector RIC-19 are involved in dense core vesicle maturation in *Caenorhabditis elegans*. J Cell Biol 186(6): 897-914

Marza E, Long T, Saiardi A, Sumakovic M, Eimer S, Hall DH, Lesa GM (2007) Polyunsaturated fatty acids influence synaptojanin localization to regulate synaptic vesicle recycling. Mol Biol Cell, in press

Eimer S, Gottschalk A, Richmond JE, Hengartner M, Schafer W, Bessereau J-L (2007) Regulation of nicotinic receptor trafficking by the transmembrane Golgi protein UNC-50. EMBO J 26: 4313-23

Yamasaki A, Eimer S, Okochi M, Smialowska A, Kaether C, Baumeister R, Haass C, Steiner H (2006) The GxGD motif of presenilin contributes to catalytic function and substrate identification of gamma-secretase. J Neurosci 26: 3821-8

Gally C, Eimer S, Richmond JE, Bessereau J-L (2004) A transmembrane protein required for acetylcholine receptor clustering in *C. elegans*. Nature 431: 578-582

Eimer S, Lakowski B, Donhauser R, Baumeister R (2002) Loss of spr-5 bypasses the requirement for the presenilin sel-12 by stage-specific derepression of hop-1. EMBO J 21: 5787-5796

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Wolfgang Engel

Professor of Human Genetics

- Dr. med., Universität Freiburg, 1967
- Physician, Hospital Schorndorf, 1966 - 1968
- Postdoc, Institute of Human Genetics and Anthropology, Universität Freiburg,1968 - 1977
- Habilitation (Human Genetics), Universität Freiburg, 1974
- Professor of Human Genetics and Director of the Institute, Universität Göttingen, 1977

Major Research Interests

Our research is focussed on the molecular analysis of normal human variability and genetic disturbances of development and differentiation.

Isolated genes are being analysed in detail with respect to their functional properties by animal models (transgenic and knock-out-mice). For suitable genetic diseases therapeutic strategies (substitution; gene therapy) are being developed and initial evaluation of such strategies is done in the mouse. - We are working on the genotype – phenotype correlations in neurological and cardiovascular diseases (e. g. Spastic paraplegia, Rett syndrome, mental retardation by subtelomeric microdeletions, molybdenum cofactor deficiency; cardiomypathies, Noonan syndrome) and several genetically determined malformation syndromes (e.g. Townes-Brocks syndrome, Okihiro syndrome, Morbus Osler).We are also engaged in the molecular and cellular basis of initiation events of cancer, specifically in prostate cancer, medulloblastoma and rhabdomyosarcoma. - One main interest in our institute is the analysis of structure, expression and function of genes involved in differentiation of male gametes. The knowledge of the function of those genes can help us to clarify the genetic causes of male infertility.

We have isolated spermatogonial stem cells (SSCs) from adult mouse testis and demonstrated that these cells are as pluripotent as embryonic stem cells (ESCs). Our main interest is now to isolate and proliferate SSCs from adult human testis. These cells would be of great interest for regenerative medicine.

Selected Recent Publications

Dressel R, Guan K, Nolte J, Elsner L, Monecke S, Nayernia K, Hasenfuss G, Engel W (2009) Multipotent adult germ-line stem cells, like other pluripotent stem cells, can be killed by cytotoxic T lymphocytes despite low expression of major histocompatibility complex class I molecules. Biology Direct 4: 31

Glaser T, Opitz T, Kischlat T, Konang R, Sasse P, Fleischmann BK, Engel W, Nayernia K, Brüstle O (2008) Adult germ line stem cells as a source of functional neurons and glia. Stem Cells 26: 2434-2443

Zovoilis A, Nolte J, Drusenheimer N, Zechner U, Hada H, Guan K, Hasenfuß G, Nayernia K, Engel W (2008) Multipotent adult germline stem cells and embryonic stem cells have similar microRNA profiles. Molecular Human Reproduction 14: 521-529

Guan K, Wagner S, Unsöld B, Maier LS, Kaiser D, Hemmerlein B, Nayernia K, Engel W, Hasenfuss G (2007) Generation of functional cardiomyocytes from adult mouse spermatogonial stem cells. Circulation Research 100: 1615-1625

Nayernia K, Nolte J, Michelmann HW, Lee JH, Rathsack K, Drusenheimer N, Dev A, Wulf G, Ehrmann IE, Elliott DJ, Okpanyi V, Zechner, Haaf T, MeinhardtA, Engel W (2006) *In vitro*-differentiated embryonic stem cells give rise to male gametes that can generate offspring mice. Developmental Cell 11: 125-132

Guan K, Nayernia K, Maier LS, Wagner S, Dressel R, Lee JH, Nolte J, Wolf, F, Li M, Engel W, Hasenfuß G (2006) Pluripotency of spermatogonial stem cells from adult mouse testis. Nature 440: 1199-1203

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André Fiala

Professor of Molecular Neurobiology of Behavior

- 2008 Professor of Molecular Neurobiology of Behavior, University of Göttingen
- 2008 Habilitation in Neurobiology and Genetics, University of Würzburg
- 2001 - 2008 Research Assistant, University of Würzburg
- 2000 - 2001 Research Fellow, Memorial Sloan-Kettering Cancer Center, New York
- 1996 - 1999 PhD student, Free University of Berlin
- 1996 Degree (Diploma) in Biology, Free University of Berlin

Major Research Interests

We study neuronal mechanisms underlying olfaction, learning and memory, and goal-directed behavior using the model organism Drosophila melanogaster. The fruit fly *Drosophila* offers the advantage of expressing transgenes in almost any population of it's about 100.000 neurons. Transgenes used by us are, for example, fluorescent sensor proteins that allow us to monitor the spatio-temporal activity of neurons, or light-sensitive proteins by which neuronal activity can be stimulated through illumination. Using these optogenetic techniques in combination with behavioral analyses we aim at unraveling the functioning of dedicated neuronal circuits, and how these circuits contribute to organizing behavior. In addition, molecular mechanisms underlying learning and memory processes are investigated.

Selected Recent Publications

Kamikouchi A, Inagaki HK, Effertz T, Hendrich O, Fiala A, Göpfert MC, Ito K (2009) The neural basis of *Drosophila* gravity-sensing and hearing. Nature 458: 165-171

Fiala A (2007) Olfaction and olfactory learning in *Drosophila*: recent progress. Curr Opin Neurobiol 17: 720-6

Suh GS, Ben-Tabou de Leon S, Tanimoto H, Fiala A, Benzer S, Anderson DJ (2007) Light activation of an innate olfactory avoidance response in *Drosophila*. Curr Biol 17: 905-8

Schroll C, Riemensperger T, Bucher D, Ehmer J, Völler T, Erbguth K, Gerber B, Hendel T, Nagel G, Buchner E, Fiala A (2006) Light-induced activation of distinct modulatory neurons triggers appetitive or aversive learning in *Drosophila* larvae. Curr Biol 16: 1741-7

Riemensperger T, Völler T, Stock P, Buchner E, Fiala A (2005) Punishment prediction by dopaminergic neurons in *Drosophila*. Curr Biol 15: 1953-60

Fiala A, Spall T, Diegelmann S, Eisermann B, Sachse S, Devaud JM, Buchner E, Galizia CG (2002) Genetically expressed cameleon in *Drosophila melanogaster* is used to visualize olfactory information in projection neurons. Curr Biol 12:1877-84

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André Fischer

Group Leader Laboratory for Aging and Cognitive diseases

- 2002: Dr. rer. nat.(PhD). University Goettingen/Max Planck Institute for Experimental Medicine, Germany
- 2003 - 2006: Postdoctoral Associate in the lab of Li-Huei Tsai; Harvard Medical School, Department of Pathology, Boston, USA; Picower Center for Learning and Memory, M.I.T, Cambridge, USA
- since 2006 independent group leader at the European Neuroscience Institute (ENI) in Goettingen

Major Research Interests

Our group aims to understand the molecular mechanisms underlying learning and memory processes under physiological and pathological conditions. To this end we combine molecular, biochemical, pharmacological and behavioral approaches using mice as model organisms.
We are particularly interested to understand cognitive impairment associated with normal aging as well as the pathogenesis of mental and neurodegenerative diseases, such as anxiety disorders and Alzheimer's disease.
Using animal models we deeply aim to identify therapeutic strategies that would help to reinstate neuroplasticity, learning behavior and the retrieval of lost long-term memories in patients suffering form such devastating diseases.

Selected Recent Publications

Fischer A, Sananbenesi F, Wang XY, Dobbin M, Tsai LH Recovery of learning and memory is associated with chromatin remodeling. Nature, doi:10.1038/nature05772

Fischer A, Radulovic M, Schrick C, Sananbenesi F, Godovac-Zimmermann J, Radulovic J (2006) Hippocampal Mek/Erk signaling mediates extinction of contextual freezing behavior. Neurobiology of Learning and Memory 87: 149-58

Shu T, Tseng HC, Zhou Y, Fischer A, Stern P, Coquelle F, Reiner O, Tsai LH (2006) Doublecortin-like Kinase Controls Neurogenesis by Regulating the Mitotic Spindle. Neuron, 49: 25-39

Fischer A, Sananbenesi F, Pang PT, Lu B, Tsai LH (2005) Opposing roles of transient and prolonged expression of p25 in synaptic plasticity and hippocampus dependent memory. Neuron, 48: 825-83

Park SK, Nguyen MD, Fischer A [shared co-authorship], Affar EB, Luke M, Dieffenbach B, Shi Y, Tsai LH (2005) Modulation of Dopamine Signaling by Prostate Apoptosis Response 4 via Direct Interaction with Dopamine D2 Receptor. Cell 122: 275-287

Fischer A, Sananbenesi F, Schrick C, Spiess J, Radulovic J (2004) Distinct roles of hippocampal protein synthesis and actin rearragnement in extinction of conditioned fear. J Neurosci 24: 1962-1966

Sananbenesi F, Fischer A, Schrick C, Spiess J, Radulovic J (2003) Corticotropin-releasing factor receptor 2 induces mitogen-activated protein kinase signaling in the hippocampus: A possible link between stress and fear memory. J Neurosci 36: 11436-11443

Fischer A, Sananbenesi F, Spiess J, Radulovic J (2003) Cdk5 in the adult non-demented brain. Current drug targets CNS 2: 61-72

Fischer A, Sananbenesi F, Spiess J, Radulovic J (2003) Cdk5: a novel role in learning and memory. NeuroSignals 12: 200-208

Fischer A, Sananbenesi F, Schrick C, Spiess J, Radulovic J (2003) Regulation of contextual fear conditioning by baseline and inducible septo-hippocampal cyclin-dependent kinase 5. Neuropharmacology 44: 1089-1099

Sananbenesi F, Fischer A [shared first-authorship], Schrick C, Spiess J, Radulovic J (2002) Phosphorylation of hippocampal Erk-1/2, Elk-1, and p90-Rsk-1 during contextual fear conditioning: interactions between Erk-1/2 and Elk-1. Mol Cell Neurosci 3: 463-476

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Gabriele Flügge

Apl. Professor, Experimental Neuroscience

- Dr. rer. nat., University of Munich, 1979
- Senior Scientist, Clinical Neurobiology Laboratory at the German Primate Center

Major Research Interests

In humans, stressful or traumatic life events such as death of a close relative often represent a strong psychological load that may induce psychopathologies such as depression. The central nervous mechanisms that lead to such diseases are still not clear. We therefore investigate processes that occur in the course of chronic psychosocial stress in the brains of animals that show similar symptoms as depressed patients. Using molecular techniques, we identify central nervous genes that are regulated by stress; quantitative real time PCR, in situ hybridization and immunocytochemistry serve to localize changes in neurotransmitter systems, receptors, transporters and other molecules in distinct neurons of the brain. Similar tools are used to clarify the mechanisms that underlie the beneficial effects of antidepressant drugs. In conjunction with behavioral studies we are able to find molecular factors that play a role in central nervous processes underlying depression.

Selected Recent Publications

Hu W, Zhang M, Czéh B, Flügge G, Zhang W (2010) Stress Impairs GABAergic Network Function in the Hippocampus by Activating Nongenomic Glucocorticoid Receptors and Affecting the Integrity of the Parvalbumin-Expressing Neuronal Network. Neuropsychopharmacology 35: 1693-1707

Perez-Cruz C, Simon M, Flügge G, Fuchs E, Czéh B (2009) Diurnal rhythm and stress regulate dendritic architecture and spine density of pyramidal neurons in the rat infralimbic cortex. Behav Brain Research (2009) 205: 406-413

Herzog CJ, Czéh B, Corbach S, Wuttke W, Schulte-Herbrüggen O, Hellweg R, Flügge G, Fuchs E (2009) Chronic social instability stress in female rats: A potential animal model for female depression. Neuroscience 159: 982-992

Perez-Cruz C, Simon M, Czéh B, Flügge G, Fuchs E (2009) Hemispheric differences in basilar dendrites and spines of pyramidal neurons in the rat prelimbic cortex: activity- and stress-induced changes. Eur J Neurosci 29: 738-747

Cooper B, Fuchs E, Flügge G (2009) Expression of the axonal membrane glycoprotein M6a is regulated by chronic stress. PLoS ONE 4(1): e3659

Cooper B, Werner HB, Flügge G (2008) Glycoprotein M6a is present in glutamatergic axons in adult rat forebrain and cerebellum. Brain Res 1197: 1-12

Abumaria N, Ribic A, Anacker C, Fuchs E, Flügge G (2008) Stress Upregulates TPH1 but not TPH2 mRNA in the Rat Dorsal Raphe Nucleus: Identification of Two TPH2 mRNA Splice Variants. Cell Mol Neurobiol 28(3): 331-42

Rygula R, Abumaria N, Havemann-Reinecke U, Rüther E, Hiemke C, Zernig G, Fuchs E, Flügge G (2008) Pharmacological validation of a chronic social stress model of depression in rats: effects of reboxetine, haloperidol and diazepam. Behav Pharmacol 19: 183-196

Abumaria N, Rygula R, Hiemke C, Fuchs E, Havemann-Reinecke U, Ruther E, Flügge G (2007) Effect of chronic citalopram on serotonin-related and stress-regulated genes in the dorsal raphe nucleus of the rat. Eur Neuropsychopharmacol 17: 417-429

Abumaria N, Rygula R, Havemann-Reinecke U, Rüther E, Bodemer W, Roos C, Flügge G (2006) Identification of genes regulated by chronic social stress in the rat dorsal raphe nucleus. Cell Mol Neurobiol 26: 145-162

Rygula R, Abumaria N, Flügge G, Hiemke C, Fuchs E, Rüther E, Havemann-Reinecke U (2006) Citalopram counteracts depressive symptoms evoked by chronic social stress in rats. Behav Pharm 17: 19-29

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Jens Frahm

Professor of Physical Chemistry

- 1974 Diploma in Physics, Univ. of Göttingen
- 1977 Doctorate in Physical Chemistry, Univ. of Göttingen
- 1977 - 1982 Postdoctoral Researcher, MPI for Biophysical Chemistry
- 1982 - 1992 Head, Independent Research Group 'Biomedizinische NMR' (BMFT grant)
- since 1993 Director, Biomedizinische NMR Forschungs GmbH (not-for-profit, based on group's patents)
- 1994 Habilitation, Faculty of Chemistry, Univ. of Göttingen
- since 1997 Adjunct Professor, Faculty of Chemistry, Univ. of Göttingen

Major Research Interests

- Development and application of magnetic resonance imaging (MRI): noninvasive studies of structure and function at the system level, animals and humans
- Methodology: non-Cartesian MRI, parallel MRI, numerical reconstruction techniques, real-time MRI, contrast agents (nanoparticles)
- Human neuroscience: functional neuroimaging, neuro-feedback, fiber tractography
- Animal studies: models of human brain disorders, nonhuman primates, genetically modified mice

Selected Recent Publications

Boretius S, Kasper L, Tammer R, Michaelis T, Frahm J (2009) MRI of cellular layers in mouse brain *in vivo*. Neuroimage, doi: 10.1016/j.neuroimage.2009.05.095

Boretius S, Michaelis T, Tammer R, Tonchev A, Ashery-Padan R, Frahm J, Stoykova A (2009) *In vivo* MRI of altered brain anatomy and fiber connectivity in adult Pax6 deficient mice. Cerebr Cortex, doi: 10.1093/cercor/bhp057

Lütcke H, Frahm J (2008) Lateralized anterior cingulate function during error processing and conflict monitoring revealed by high-resolution functional MRI. Cerebr Cortex 18: 508-515

Schweizer R, Voit D, Frahm J (2008) Finger representations in human primary somatosensory cortex as revealed by high-resolution functional MRI of tactile stimulation. Neuroimage 42: 28-35

Hofer S, Merboldt KD, Tammer R, Frahm J (2008) Rhesus monkey and human share a similar topography of the corpus callosum as revealed by diffusion tensor MRI *in vivo*. Cerebr Cortex 18: 1079-1084

Uecker M, Hohage T, Block KT, Frahm J (2008) Image reconstruction by regularized nonlinear inversion – Applications to parallel imaging. Magn Reson Med 60: 674-682

BlockKT, Uecker M, Frahm J (2007) Undersampled radial MRI with multiple coils. Iterative image reconstruction using a total variation constraint. Magn Reson Med 57: 1086-1098

Hofer S, Frahm J (2006) Topography of the human corpus callosum revisited – Comprehensive fiber tractography using magnetic resonance diffusion tensor imaging. NeuroImage 32: 989-994

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Eberhard Fuchs

Professor of Neurobiology

- 1977: Dr. rer. nat., University of München
- 1996 - 2000: Professor (Animal Physiology), University of Karlsruhe
- 2000 - 2003: Professor for Animal Physiology, University of Göttingen
- since 2003: Professor for Neurobiology, Department of Neurology, Medical School, University of Götting

Major Research Interests

The Clinical Neurobiology Laboratory (CNL) at the German Primate Center is an interdisciplinary research laboratory using neuroanatomical, neuropharmacological, behavioral and molecular techniques to investigate functioning of the brain in animal models of psychiatric and neurodegenerative diseases. The aim of our work is to elucidate brain structures, circuits, pathways and mechanisms that underlie normal and pathological behavior. This work integrates inputs from other research fields with the ultimate aim of developing new therapeutic strategies for psychiatric and neurodegenerative diseases.
The laboratory specializes in the development, validation and investigation of animal models to detect abnormal cognitive, motor and emotional expressions of brain pathology. Currently, we are engaged in the investigation of central nervous and behavioral phenomena associated with stress and depression. In addition, we provide service platforms to study Parkinson's disease and multiple sclerosis.

Selected Recent Publications

Mc Ewen BS, Chattarji S, Diamond D, Jay T, Reagan L, Svenningsson P, Fuchs E (2010) The neurobiological properties of Stablon: From monoamine hypothesis to glutamatergic modulation. Mol Psychiatry 15: 237-249

Czéh B, Abumaria N, Rygula R, Fuchs E (2010) Quantitative changes in hippocampal microvasculature of chronically stressed rats: No effect of fluoxetine treatment. Hippocampus 20: 174-185

Lucassen PJ, Meerlo P, Naylor AS, van Dam AM, Dayer AG, Oomen CA, Fuchs E, Czéh B (2010) Regulation of adult neurogenesis by stress, sleep and inflammation: Implications for depression and antidepressant action. Europ J Neuropsychopharmacol 20: 1-17

Ribic A, Zhang M, Schlumbohm C, Mätz-Rensing K, Uchanska-Ziegler B, Flügge G., Zhang W, Walter L, Fuchs E (2010) Neuronal MHC class I molecules are involved in excitatory synaptic transmission at the hippocampal mossy fiber synapses of marmoset monkeys. Cell Mol Neurobiol 30: 827-839

Czéh B, Abumaria N, Rygula R, Fuchs E (2009) Quantitative changes in hippocampal microvasculature of chronically stressed rats: No effect of fluoxetine treatment. Hippocampus Mar 27. [Epub ahead of print], 2009

Perez-Cruz C, Simon M, Czéh B, Flügge G, Fuchs E (2009) Hemispheric differences in basilar dendrites and spines of pyramidal neurons in the rat prelimbic cortex: activity- and stress-induced changes. Europ J Neurosci 29: 738-747

Czéh B, Müller-Keuker JIH, Rygula R, Abumaria N, Hiemke C, Domenici E, Fuchs E (2007) Chronic social stress inhibits cell proliferation in the adult medial prefrontal cortex: hemispheric asymmetry and reversal by fluoxetine treatment. Neuropsychopharmacology 32: 1490-1503

Czéh B, Simon M, Schmelting B, Hiemke C, Fuchs E (2006) Astroglial plasticity in the hippocampus after chronic psychosocial stress and concomitant fluoxetine treatment. Neuropsychopharmacology 31:1616-26

Fuchs E, Flügge G, Czéh B (2006) Remodeling of neuronal networks by stress. Front Biosci 11: 2746-2758

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Theo Geisel

Professor of Theoretical Physics
Director, Max Planck Institute for Dynamics and Self-Organization
Coordinator, Bernstein Center for Computational Neuroscience

- Dr. rer.nat., University of Regensburg (1975)
- Heisenberg fellow (1983 - 1987)
- Professor of Theoretical Physics, Universities of Würzburg (1988 - 1989), Frankfurt (1989 - 1996), and Göttingen (since 1996)
- Director, Max Planck Institute for Dynamics and Self-Organization, Göttingen (since 1996)

Major Research Interests

How do the myriads of neurons in our cortex cooperate when we perceive an object or perform another task? How do they self-organize in the preceding learning process? Questions like these address the complex dynamics of spatially extended and multicomponent nonlinear systems, which still reserve many surprises. In networks of sufficiently many spiking neurons e.g. we find unstable attractors, a phenomenon which would neither have been guessed nor understood without mathematical modelling and which many physicists consider an oxymoron. They can provide a neuronal network with a high degree of flexibility to adapt to permanently changing tasks. The tools and mathematical methods developed in studies of chaotic behaviour in the past can now help us clarify the dynamics and function of complex networks and spatially extended systems and reveal the biological role of dynamical phenomena like unstable attractors.
These methods lend themselves to applications in neuroscience from the level of single cells to the level of cell assemblies and large cortical networks, from the time scales of action potentials (milliseconds) to the time scales of learning and long-term memory (up to years). My work in the past has dealt among others with studies of stochastic resonance of single neurons under periodic and endogenous stimulation, detailed investigations of the properties, functions, and conditions of neuronal synchronization, and the development of neuronal maps in the visual cortex. We have elucidated the influence of the network topology on synchronization and other dynamical properties and demonstrated the existence of speed limits to network synchronization due to disordered connectivity. Besides, I am also focusing on other applications of nonlinear dynamics, e.g. for quantum chaos in semiconductor nanostructures and in mathematical models for the description and forecast of the spread of epidemics.

Selected Recent Publications

Levina A, Herrmann JM, Geisel T (2009) Phase transitions towards criticality in a neural system with adaptive interactions. Phys Rev Lett 102: 118110

Ng GS, Hennig H, Fleischmann R, Kottos T, Geisel T (2009) Avalanches of Bose-Einstein Condensates in Leaking Optical Lattices. New J Phys 11: 073045

Levina A, Herrmann JM, Geisel T (2007) Dynamical Synapses Causing Self-Organized Criticality in Neural Networks. Nature Physics 3: 857-860

Brockmann D, Hufnagel L, Geisel T (2006) The Scaling Laws of Human Travel. Nature 439: 462-465

Wolf F, Timme M, Geisel T (2004) Topological speed limits to network synchronization. Phys Rev Lett 92: 074101

Hufnagel L, Brockmann D, Geisel T (2004) Forecast and Control of Epidemics in a Globalized World. PNAS 101: 15124

Denker M, Timme M, Diesmann M, Wolf F, Geisel T (2004) Breaking Synchrony by Heterogeneity in Complex Networks. Phys Rev Lett 92: 974193

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Martin Göpfert

Professor for Cellular Neurobiology

- 2008 Full Professor for Cellular Neurobiology, University of Göttingen
- 2008 Associate Professor for Molecular Biology and Biophysics of Sensory Systems, University of Cologne
- 2003 - 2008 Independent group leader, Volkswagen Foundation Group 'Active auditory mechanics in insects', Dept. Animal Physiology, University of Cologne
- 2002 - 2003 Royal Society University Research Fellow, School of Biological Sciences, University of Bristol
- 1998 - 2002 DAAD and Leoplodina Research Fellow, Dept. Neurobiology, University of Zürich and School of Biological Sciences, University of Bristol
- 1998 Degree in Biology, University of Erlangen-Nürnberg

Major Research Interests

Our group studies fundamental processes in hearing. By combining mechanical measurements with genetics, molecular biology, immunohistochemistry, electrophysiology, calcium imaging, and biophysical modelling, we are trying to decipher how molecular processes shape the performance of an ear. Our preferred model system is the hearing organ of the fruit fly *Drosophila melanogaster*, the auditory sensory cells of which share conserved molecular modules with the hair cells in our ears.
Our work has uncovered striking parallels between fly and vertebrate hearing, including the functional equivalence of the auditory transduction and adaptation machineries, the motility of auditory sensory cells, transducer-based force generation, and the expression of homologous genes. Our work also provided first insights into the diverse roles of – and interactions between – transient receptor potential (TRP) ion channels in hearing, and a model of TRP-function in the fly's auditory system has been devised. Using a novel electrostatic actuation method, we were able to identify hair cell-like signatures of transducer gating and adaptation in the fly's auditory mechanics and could show that a simple transduction model as proposed to describe hair cell mechanics comprehensively explains the macroscopic behaviour of an ear. Based on these findings, we are currently devising a computational model that allows for the high-throughput characterization of genetic hearing defects. Candidate genes for hearing, in turn, are narrowed down by expression profiling using whole-genome microarrays. By testing how these genes contribute to auditory function and performance, we aim for a comprehensive molecules-to-system description of the functional workings of an ear.

Selected Recent Publications

Kamikouchi A, Wiek R, Effertz T, Göpfert MC, Fiala A (2010) Transcuticular optical imaging of stimulus-evoked neural activities in the Drosophila peripheral nervous system. Nature Protoc 5: 1229-1235

Bechstedt S, Albert JT, Kreil DP, Müller-Reichert T, Göpfert MC, Howard J (2010) A double-cortin-domain containing microtubule-associated protein (DCX-Emap) required for mechanotransduction in Drosophila sensory cilia. Nature Commun 1: 11

Nadrowski B, Göpfert MC (2009) Modeling auditory transducer dynamics. Curr Opin Otolaryngol Head Neck Surg 17: 400-406

Kamikouchi A, Inagaki HK, Effertz T, Hendrich O, Fiala A, Göpfert MC, Ito K (2009) The neural basis of *Drosophila* gravity-sensing and hearing. Nature 458: 65-171

Lu Q, Senthilan PR, Effertz T, Nadrowski B, Göpfert MC (2009) Using *Drosophila* for studying fundamental processes in hearing. Integr Comp Biol 49: 674-680

Nadrowski B, Albert JT, Göpfert MC (2008) Transducer-based force generation explains active process in *Drosophila* hearing. Curr Biol 18: 1365-72

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Uwe-Karsten Hanisch

Professor for Experimental Neurobiology

- 1986 Diploma Degree Biochemistry University of Leipzig, Germany
- 1990 Ph.D. (Dr. rer. nat.) University of Leipzig, Germany
- 1991 - 1993 Douglas Hospital Research Centre, McGill University, Montreal, Canada
- 1993 - 2002 Department of Cellular Neurosciences, Max Delbrück Center for Molecular Medicine (MDC) Berlin, Germany
- 1999 Habilitation (Biochemistry/Neurobiology) University of Leipzig, Germany
- 2002 - 2004 Professor for Biochemistry University of Applied Sciences Lausitz, Germany
- 2002 - 2004 Guest scientist and Project leader Molecular Medicine (MDC) Berlin, Germany
- since 2004 Professor for Experimental Neurobiology Institute for Neuropathology, University of Göttingen, Germany
- since 2007 Guest Professor Medical Physiology, University of Groningen, The Netherlands

Major Research Interests

Expression and functions of cytokines in the CNS
Mechanisms of microglial activation and consequences of microglial activities
Role of plasma factors as endogenous signals for microglial cells

Selected Recent Publications

Ribes S, Ebert S, Regen T, Agarwal A, Tauber S, Czesnik D, Spreer A, Bunkowski S, Eiffert H, Hanisch UK, Hammerschmidt S, Nau R, Toll-like receptor stimulation enhances phagocytosis and intracellular killing of nonencapsulated and encapsulated *Streptococcus pneumoniae* by murine microglia. Infect Immun (in press)

Wüst S, Tischner D, John M, Tuckermann JP, Menzfeld C, Hanisch UK, van den Brandt J, Lühder F, Reichardt HM, Therapeutic and adverse effects of anon-steroidal glucocorticoid receptor ligand in a mouse model of multiple sclerosis. PLoS One (in press)

Ribes S, Ebert S, Regen T, Czesnik D, Zeug A, Bukowski S, Eiffert H, Hanisch UK*, Hammerschmidt S, Nau R*, Fibronectin stimulates *Escherichia coli* phagocytosis by microglial cells. Glia [Epub ahead of print] *authors equally contributed to this work

Brecht S, Waetzig C, Hidding U, Hanisch UK, Walther M, Herdegen T, Neiss WF, FK506 protects against various immune responses and secondary degeneration following cerebral ischemia. Anat Rec [Epub ahead of print]

Ribes S, Ebert S, Czesnik D, Regen T, Zeug A, Bukowski S, Mildner A, Eiffert H, Hanisch UK, Hammerschmidt S, Nau R (2009) Toll-like receptor prestimulation increases phagocytosis of *Escherichia coli* DH5alpha and *Escherichia coli* K1 strains by murine microglial cells. Infect Immun 77: 557-564

Weinstein JR, Zhang M, Kutlubaev M, Lee R, Bishop C, Andersen H, Hanisch UK, Möller T (2009) Thrombin-Induced regulation of CD95(Fas) expression in the N9 microglial cell line: evidence for involvement of proteinase-activated receptor1 and extracellular signal-regulated kinase 1/2. Neurochem Res 34: 445-452

Hoffmann A, Hofmann F, Just I, Lehnardt S, Hanisch UK, Brück W, Kettenmann H, Ahnert-Hilger G, Markus Höltje M (2008) Inhibition of Rho-dependent pathways by *Chlostridium botulinum* C3 protein induces a proinflammatory profile in microglia. Glia 56: 1162-1175

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Ralf Heinrich

Juniorprofessor of Molecular Neuropharmacology of Behavior

- Dr. rer. nat., University of Göttingen, 1995
- Postdoctoral fellow, Harvard Medical School, Boston, USA, 1997 - 1999

Major Research Interests

Behavior results from integration of sensory information with internal physiological states involving complex interactions between various types of neurons. In order to study cellular and molecular mechanisms that contribute to the selection and control of situation-specific behavior, invertebrate preparations can offer unique advantages over more complex nervous systems of vertebrates, especially mammals. The nervous systems of invertebrates contain smaller numbers of neurons, many of which can be individually identified, and their behavioral repertoires are rather limited to combinations of genetically determined stereotyped components.
Studies are conducted with intact or partially dissected behaving animals (insects, crustaceans, annelids) and with isolated nervous systems or cultured organs and cells. Projects for experimental theses usually combine two or more of the following methods: neuroethology, pharmacology, electrophysiology, histology and immunocytochemistry, cell culture and molecular biology. Examples of current research projects are

- Acoustic communication in grasshoppers: control of sound production by con verging signaling pathways (transmitters and second messengers) in the central complex neuropil of the brain.
- Physiological characterization of neurosceretory neurons that mediate general physiological states e.g. serotonin-releasing neurons of leeches and crustaceans.
- Control of agonistic behavior and the formation of hierarchies in crusta ceans, crickets and fruitflies.
- Presence and function of erythropoietin in invertebrate nervous systems: development, regeneration and hypoxia-related functions

Selected Recent Publications

Heck C, Kunst M, Härtel K, Hülsmann S, Heinrich R (2009) *In vivo* labeling and *in vitro* characterisation of central complex neurons involved in the control of sound production. J Neuroscience Methods 183: 202-212

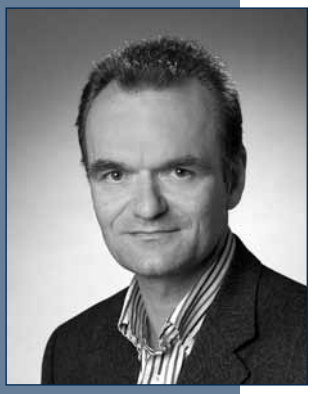
Gocht D, Wagner S, Heinrich R (2009) Recognition, presence and survival of locust central nervous glia *in situ* and *in vitro*. Microscopy Research and Technique 72: 385-397

Farca Luna AJ, Hurtado-Zavala JI, Reischig T, Heinrich R (2009) Circadian regulation of agonistic behaviour in groups of parthenogenetic marbled crayfish, *Procambarus spec*. J Biological Rhythms 24: 64-72

Weinrich A, Kunst M, Wirmer A, Holstein GR, Heinrich R (2008) Suppression of grasshopper sound production by nitric oxide-releasing neurons of the central complex. J Comp Physiol A 194: 763-776

Gocht D, Heinrich R (2007) Postactivation inhibition of spontaneously active neurosecretory neurons in the medicinal leech. J Comp Physiol A 193: 347-361

Wenzel B, Kunst M, Günther C, Ganter GK, Lakes-Harlan R, Elsner N, Heinrich R (2005) Nitric oxide/cyclic GMP-signaling in the central complex of the grasshopper brain inhibits singing behavior. J Comp Neurol, 488: 129-139



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Michael Hörner

Professor of Cellular Neurobiology

- Research Assistant, MPI for Ethology, Seewiesen, 1985/1986
- Dr. rer. nat., University of Göttingen, 1989
- 1989 - 1990 Postdoctoral Fellow, Medical University of Kiel, Dept. Physiology
- 1990 - 1997 Assistant Professor, Institute for Zoology and Anthropology, Göttingen
- 1992/1997 Research Fellow Marine Biological Labs, Woods Hole, USA
- 1993/1996 Research Fellow, Arizona Research Labs, Tucson, USA
- 1994 - 1995 Feodor-Lynen/Humboldt Fellow, Harvard Medical School, Boston, USA
- 1997 Habilitation (Zoology)
- 1997 - 2002 Associate Professor, Institute for Zoology and Anthropology, Göttingen
- 2002 - 2004 Guest Professor, University of Science & Technology, Hongkong
- Apl. Professor, J.-F. Blumenbach Institute for Zoology and Anthropology Göttingen, since 2004 and Scientific Coordinator International MSc/PhD/MD-PhD Program Neurosciences

Research Interests

Molecular Mechanisms Of Synaptic And Non-Synaptic Modulation
Biogenic amines such as serotonin, dopamine, histamine or octopamine (OA), the pendant of norepinephrine in invertebrates, are widely distributed within the animal kingdom. These evolutionary conserved neuroactive substances are involved in the control of vital functions in both vertebrates and invertebrates. Biogenic amines often initiate long-lasting neuro-modulatory effects in their targets, which is due to diffusion following non-synaptic release activating G-protein coupled to intracellular pathways. My work is focussed on the investigation of cellular and molecular mechanisms underlying the modulation of neuronal signaling in identified networks in invertebrate model systems. Using electrophysiological, pharmacological and immunocytochemical techniques in combination with behavioral measurements, I am investigating mechanisms of aminergic modulation in identified neurons of defined networks in insects and crustacea. To address both mechanistic and functional questions, a parallel approach has been developed, which allows to investigate single identified neurons both *in-vivo* with intact synaptic connections and *in-vitro* in primary "identified" cell culture, where neurons are separated from connections to other neurons. The functional meaning of aminergic modulation on the cellular level in behaviorally-relevant circuits is assessed by quantitative behavioral measurements. The investigations show that OA enhances the responsiveness of a neuronal network in insects ("giant fiber pathway") which triggers a fast escape reaction. The reaction to sensory stimuli in the postsynaptic giant interneurons, which are monosynaptically coupled to sensory neurons via excitatory cholinergic synapses, is significantly enhanced by OA application. Characteristic changes of the action potentials *in-vivo* ("spike broadening") and patch-clamp recordings *in-vitro* suggest, that OA selectively affects slow K^+-conductances in postsynaptic giant interneurons

Selected Recent Publications

Rose T, Gras H, Hörner M (2006) Activity-dependent suppression of spontaneous spike generation in the Retzius neurons of the leech, *Hirudo medicinalis* L. Invertebrate Neuroscience 6: 169-176 (DOI 10.1007/s10158-006-0030-2)

Hörner M, Heinrich R, Cromarty SI, Kravitz EA (2002) Synaptic connectivity of amine-containing neurosecretory cells of lobsters: inputs to 5HT- and OCT- containing neurons. in: The Crustacean Nervous System. (ed. K. Wiese) Springer Verlag, Berlin, Heidelberg, New York, pp156-172

Ferber M, Hörner M, Cepok S, Gnatzy W (2001) Digger wasp versus cricket: Mechanisms underlying the total paralysis caused by the predators venom. J Neurobiol 47: 207-2222

Heinrich R, Cromarty SI, Hörner M, Edwards DH, Kravitz EA (1999) Autoinhibition of serotonin cells: An intrinsic regulatory mechanism sensitive to the pattern of usage of the cells. Proc Natl Acad Sci USA 96: 2473-2478

Kloppenburg P, Hörner M (1998) Voltage-activated currents in identified giant interneurons isolated from adult crickets, *Gryllus bimaculatus*. J Exp Biol 201(17): 2529-2541

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Swen Hülsmann

Privatdozent, Department of Neurophysiology

- Dr. med., University of Münster, 1995
- Postdoctoral fellow, University of Münster Dept. of Neurosurgery, 1995 - 1996
- Postdoctoral fellow, University of Göttingen, Dept. of Neurophysiology, 1996 - 2001
- Group leader (Wissenschaftlicher Assistent) Neurophysiology, since 2001
- Principle Investigator at the DFG Research Center for Molecular Physiology of the Brain (CMPB) since 2002
- Habilitation, University of Göttingen, 2005

Major Research Interests

The majority of cells in the human brain are glial cells, outranging the number of neurons by a factor of 10. However, most behavioral aspects of life are attributed to neurons, leaving a rather white spot of knowledge about the function of the different types of glial cells. Our group aims to identify and clarify the mechanisms that allow glial cells, e.g. astrocytes to modulate and stabilize the most vital behavior of breathing.

Selected Recent Publications

Grass D, Pawlowski PG, Hirrlinger J, Papadopoulos N, Richter DW, Kirchhoff F, Hulsmann S (2004) Diversity of functional astroglial properties in the respiratory network. J Neurosci 24(6): 1358-65

Gomeza J, Ohno K, Hulsmann S, Armsen W, Eulenburg V, Richter DW, Laube B, Betz H (2003) Deletion of the mouse glycine transporter 2 results in a hyperekplexia phenotype and postnatal lethality. Neuron 40(4): 797-806

Gomeza J, Hulsmann S, Ohno K, Eulenburg V, Szoke K, Richter D, Betz H (2003) Inactivation of the glycine transporter 1 gene discloses vital role of glial glycine uptake in glycinergic inhibition. Neuron 40(4): 785-96

Hülsmann S, Oku Y, Zhang W, Richter DW (2000) Related Articles, Links Metabolic coupling between glia and neurons is necessary for maintaining respiratory activity in transverse medullary slices of neonatal mouse. Eur J Neurosci 12(3): 856-62

Hülsmann S, Oku Y, Zhang W, Richter DW (2000) Related Articles, Links Metabotropic glutamate receptors and blockade of glial Krebs cycle depress glycinergic synaptic currents of mouse hypoglossal motoneurons. Eur J Neurosci12(1): 239-46.

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Reinhard Jahn

Professor, Director at the Max Planck Institute for Biophysical Chemistry

- Dr. rer. nat. 1981, University of Göttingen
- Assistant Professor, The Rockefeller University, New York (USA) 1985
- Junior Group leader, Max Planck Institute for Psychiatry, Martinsried, 1986
- Associate Professor of Pharmacology and Cell Biology, Yale University, and Investigator, Howard Hughes Medical Institute, New Haven (USA) 1991
- Professor of Pharmacology and Cell Biology, Yale University, New Haven, 1995
- Director, Max Planck Institute for Biophysical Chemistry, Göttingen, 1997

Major Research Interests

Our group is interested in the mechanisms of membrane fusion, with the main emphasis on regulated exocytosis in neurons. Since recent years it is known that intracellular membrane fusion events are mediated by a set of conserved membrane proteins, termed SNAREs. For fusion to occur, complementary sets of SNAREs need to be present on both of the fusing membranes. The neuronal SNAREs are among the best characterized. They are the targets of the toxins responsible for botulism and tetanus. To understand how these proteins make membranes fuse, we studied their properties in detail using biochemical and biophysical approaches. We found that they assemble into a tight complex which ties the membrane closely together and thus probably initiates bilayer mixing.
In our current approaches, we study membrane fusion at the level of isolated proteins as well as in semi-intact and intact cells. Thus, we are investigating conformational changes of the SNARE proteins before and during fusion. Furthermore, we use reconstitution of membrane fusion in cell-free assays and in proteoliposomes. Other projects of the group include the study of neurotransmitter uptake by synaptic vesicles and the function of Rab-GTPases in neuronal exocytosis

Selected Recent Publications

Pavlos NJ, Grønborg M, Riedel D, Chua JJE, Boyken J, Kloepper TH, Urlaub H, Rizzoli SO, Jahn R (2010) Quantitative analysis of synaptic vesicle Rabs uncovers distinct yet overlapping roles for Rab3a and Rab27b in Ca^{2+} -triggered exocytosis. J Neurosci 30(40): 13441-13453

Chua JJ, Kindler S, Boyken J, Jahn R (2010) The architecture of an excitatory synapse. J Cell Sci 123: 819-823

Schmitt HD, Jahn R (2009) A tethering complex recruits SNAREs and grabs vesicles. Cell 139: 1053-1055

Barysch SV, Aggarwal S, Jahn R, Rizzoli SO (2009) Sorting in early endosomes: connections to docking and fusion-associated factors. Proc Natl Acad Sci USA 106: 9697-9702

Van den Bogaart G, Holt MG, Bunt G, Riedel D, Wouters FS, Jahn R (2009) One SNARE complex is sufficient for membrane fusion. Nat Struct Mol Biol 17: 358-364

Grønborg M, Pavlos NJ, Brunk I, Chua JJE, Münster-Wandowski A, Riedel D, Ahnert-Hilger G, Urlaub H, Jahn R (2009) Quantitative comparison of glutamatergic and GABAergic synaptic vesicles unveils selectivity for few proteins including MAL2, a novel synaptic vesicle protein. J Neurosci 30: 2-12

Stein A, Weber G, Wahl MC, Jahn R (2009) Helical extension of the neuronal SNARE complex into the membrane. Nature 460: 525-528

Holt M, Riedel D, Stein A, Schuette C, Jahn R (2008) Synaptic vesicles are constitutively active fusion machines, which function independently of Ca^{2+}. Curr Biol 18: 715-722

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Hubertus Jarry

Professor of Clinical and Experimental Endocrinology

- 1976 - 1980 University of Göttingen, study of biology, diploma degree in bio chemistry, microbiology, organic chemistry
- 1980 - 1983 PhD thesis, Department of Biochemistry, University of Göttingen,
- PhD degree in biochemistry, microbiology, organic chemistry (summa cum laude)
- Until February 1985 German Primate Center Göttingen, Dept. Reproductive Biology
- March 1985 until March 1986 Michigan State University, Dept. Pharmacology and Toxicology
- Since April 1986 Research Associate Dept. Clinical and Experimental Endocrinology University of Göttingen
- Januar 1991 Habilitation
- Dezember 1995 Promotion to Professor

Major Research Interests

The proper function of the GnRH pulse generator ist essential for reproduction of all mammals studied so far. GnRH pulses are a prerequisite for proper pituitary gonadotropin release. The neurochemical mechanisms leading to pulsatile GnRH release involve norepinephrine and gamma amino butyric acid (GABA) as most important neurotransmitters. In addition, other catecholamines, amino acid neurotransmitters and neuropeptides play a modulatory role in the function of the GnRH pulse generator. Many of the GABAergic neurons in the hypothalamus are estrogen-receptive. The mechanisms by which the estrogen receptors of the alpha and beta subtype regulate gene and protein expression of neurotransmitter-producing enzymes are at present a prime focus of interest. Induction of puberty is not a gonadal but a hypothalamic maturational process. The initiation of proper GnRH pulse generator function is the ultimate trigger signal for puberty which is currently investigated. Ageing involves also neuroendocrine mechanisms. The GnRH pulse generator function deteriorates in aged rats, mechanisms which involve a variety of catecholamines and amino acid neurotransmitters which are currently investigated. Steroidal feedback signals (of estradiol, progesterone, and glucocorticoids) are crucial for the development and proper function of the adult hypothalamus of which the molecular and neurochemical mechanisms are studied with cell biological and animal experimental tools. Proper function of the GnRH pulse generator is also of crucial importance for initiation of puberty and maintenance of normal menstrual cycles in women. Many of hitherto unexplained infertilities can be explained of malfunctioning GnRH pulse generators which are studied in a series of clinical experiments.

Selected Recent Publications

Bottner M, Leonhardt S, Wuttke W, Jarry H (2007) Changes of expression of genes related to the activity of the gonadotrophin-releasing hormone pulse generator in young versus middle-aged male rats. J Neuroendocrinol 19: 779-87

Zhou L, Lehan N, Wehrenberg U, Disteldorf E, von Lossow R, Mares U, Jarry H, Rune GM (2007) Neuroprotection by estradiol: a role of aromatase against spine synapse loss after blockade of GABA(A) receptors. Exp Neurol 203: 72-81

Breit A, Wolff K, Kalwa H, Jarry H, Buch T, Gudermann T (2006) The natural inverse agonist agouti-related protein induces arrestin-mediated endocytosis of melanocortin-3 and -4 receptors. J Biol Chem 281: 37447-56

Fester L, Ribeiro-Gouveia V, Prange-Kiel J, von Schassen C, Bottner M, Jarry H, Rune GM (2006) Proliferation and apoptosis of hippocampal granule cells require local oestrogen synthesis. J Neurochem 97: 1136-44

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Till Marquardt

Group Leader Developmental Neurobiology Laboratory

- Since 2007: independent research group leader, DFG Emmy Noether group leader at the European Neuroscience Institute, Göttingen
- 2001 - 2006: postdoctoral research associate and staff scientist with Samuel L. Pfaff at the Salk Institute for Biological Studies in La Jolla, California, USA
- 2001: Ph.D. with Peter Gruss at the Max-Planck Institute of Biophysical Chemistry, University of Göttingen

Major Research Interests

Adequate control of body motion and posture depends on elaborate circuitries that connect both motor and sensory neurons with the musculature. The central importance of these connections is illustrated by the debilitating consequences of diseases affecting motor neurons, such as Amyotrophic Lateral Sclerosis (ALS) and diabetic neuropathy. Our research aims at understanding the molecular mechanisms driving the assembly of functional neuromuscular circuitries during embryonic and postnatal development. This includes the study of cell surface-based signaling molecules that control motor and sensory axon connectivity in mice. Another research focus of the lab aims at identifying and characterizing novel mechanisms driving the functional specification of motor neurons within the context of operative neuromuscular circuitry. We extensively take advantage of mouse genetics in order to selectively trace and manipulate specific neuron populations. We combine this genetic approach with live 3D fluorescence (*spinning disk*) microscopy, as well as electrophysiological methods to elucidate the role of cell surface and nuclear receptor proteins in sensory-motor connectivity and functional neuron specification.

Selected Recent Publications

Gallarda B, Bonanomi D, Müller D, Brown A, Alaynick W A, Andrews S E, Lemke G, Pfaff S L, Marquardt T (2008) Segregation of axial motor and sensory pathways through heterotypic trans-axonal signaling. Science [accepted Feb 25, 2008]

Ghosh S, Marquardt T, Thaler J, Carter N, Pfaff S L, Hunter T (2008) Instructive role of aPKCζ subcellular localization in the assembly of adherens junctions in neural progenitors. Proc Natl Acad Sci USA 105(1): 335-40

Marquardt T, Shirasaki R, Ghosh S, Carter N, Andrews SE, Hunter T, Pfaff SL (2005) Co-expressed EphA receptors and ephrin-A ligands mediate opposing actions on growth cone navigation from distinct membrane sub-domains. Cell 121: 127-139

Marquardt T, Pfaff SL (2001) Cracking the transcriptional code for cell specification in the neural tube. Cell 106: 651-654

Marquardt T, Ashery-Padan RA, Andrejewski N, Scardigli R, Guillemot F, Gruss P (2001) Pax6 is required for the multipotent state of retinal progenitor cells. Cell 105: 43-55

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Tobias Moser

Professor of Experimental and Clinical Audiology

- Dr. med. (M.D.) 1995, University of Jena
- Postdoctoral fellow with E. Neher at the MPI for Biophysical Chemistry, 1994 - 1997
- Group leader at the Department of Otolaryngology, University of Göttingen since 1997

Major Research Interests

Our group focuses on the physiology and pathology of sound coding at the hair cell ribbon synapse. Molecular dissection and detailed physiological characterization of ribbon synapse function employ a spectrum of molecular and biophysical techniques such as single cell RT-PCR, immunohistochemistry of hair cells, auditory systems physiology (recordings of otoacoustic emissions, compound action potentials and auditory brainstem responses, single unit recordings), pre- or postsynaptic patch-clamp, optical methods (epifluorescence, evanescent wave and confocal imaging as well as flash photolysis of caged compounds).
The group has contributed to understanding normal hair cell ribbon synapse function (reviews in Nouvian et al., 2006 and Moser et al., 2006). In our previous work we have physiologically and in part morphologically characterized mutant mice with defects in hair cell synaptic coding (Brandt et al., 2003; Khimich et al., 2005, Roux et al., 2006) and auditory nerve function (Lacas-Gervais et al., 2004). The results demonstrated that defects of hair cell synaptic sound coding cause sensorineural hearing loss in animal models – auditory synaptopathy and confirmed impaired hearing in case of nerve disorders - auditory neuropathy.

Selected Recent Publications

Frank, T, Khimich, D, Neef, A, and Moser, T (2009) Mechanisms contributing to synaptic Ca^{2+} signals and their heterogeneity in hair cells. Proc Natl Acad Sci U S A, 106: 4483-8

Meyer AC, Frank T, Khimich D, Hoch G, Riedel D, Chapochnikov, NM, Yarin YM, Harke B, Hell S, Egner A, Moser, T (2009) Tuning of Synapse Number, Structure and Function in the Cochlea. Nat Neurosci 12: 444-53

Neef A, Khimich D, Pirih P, Wolf F, Moser T (2007) Probing the mechanism of exocytosis at the hair cell ribbon synapse. J Neurosci 27: 12933-12944

Nouvian R, Beutner D, Parsons TD, Moser T (2006) Structure and function of the hair cell ribbon synapse. J Membr Biol 209: 153-65

Roux I, Safieddine S, Nouvian R, Grati M, Simmler MC, Perfettini I, Le Gall M, Rostaing P, Hamard G, Triller A, Avan P, Moser T, Petit C (2006) Otoferlin, defective in DFNB9 deafness, is essential for the Ca^{2+}-triggered synaptic exocytosis at the auditory hair cell ribbon synapse. Cell 127: 277-89

Khimich D, Nouvian R, Pujol R, tom Dieck S, Egner A, Gundelfinger ED, Moser T (2005) Hair Cell Synaptic Ribbons are Essential for Synchronous Auditory Signaling. Nature 434: 889-94

Brandt A, Khimich D, Moser T (2005) Few Ca_V 1.3 channels regulate a synaptic vesicle's exocytosis at the hair cell ribbon synapse. J Neurosci 25: 11577-11585

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Klaus-Armin Nave

Professor of Molecular Biology, Director at the Max Planck Institute of Experimental Medicine

- 1987 PhD, University of California, San Diego
- 1987 - 1991 Postdoc, The Salk Institute, la Jolla, California
- 1991 Junior Group Leader, ZMBH, University of Heidelberg
- 1998 Professor of Molecular Biology (C4), ZMBH, University of Heidelberg
- 2000 Director, Department of Neurogenetics, Max Planck Institute for Experimental Medicine Göttingen and Professor of Biology, University of Heidelberg

Major Research Interests

We are interested in the mechanisms of neuron-glia interactions in the higher nervous system, and in the genes that are required for normal glial cell function. Here, transgenic and mutant mice have become important to study developmental processes as well as genetic diseases. For example, oligodendrocytes are glial cells highly specialized for enwrapping CNS axons with multiple layers of membranes, known to provide electrical insulation for rapid impulse propagation. We found that oligodendrocytes are also essential for maintaining the long-term integrity of myelinated axons, independent of the myelin function itself. The mechanisms by which oligodendrocytes support long-term axonal survival are still under investigation. The importance of glial cells as the “first line of neuroprotection”, however, is illustrated by several myelin-associated diseases in which axonal neurodegeneration contribute to progressive disability. These range in humans from peripheral neuropathies (CMT1) to spastic paraplegia (SPG2), and presumably multiple sclerosis (MS) and certain forms of psychiatric disorders. We are developing transgenic animal models for some of these diseases, in order to dissect the underlying disease mechanisms and, in the case of CMT1A, have used these models to design novel therapeutic strategies.
The glial “decision” to myelinate an axonal segment is partly controlled by the axon itself, but the signaling mechanism is not understood. We have found that axonal neuregulin-1 (NRG1) is the major determinant of myelination in the peripheral nervous system. We are now investigating NRG1 dysregulation also in CNS myelination, using quantifiable behavioural functions in mice. By combining genetics with enviromental risk factors for schizophrenia (in collaboration with H. Ehrenreich) we will explore the hypothesis that NRG1, a known human schizophrenia susceptibility gene, points to an important role of myelinating glia in some psychiatric disorders.

Selected Recent Publications

Nave KA (2010) Myelination and glial support of axonal integrity. Nature, in press

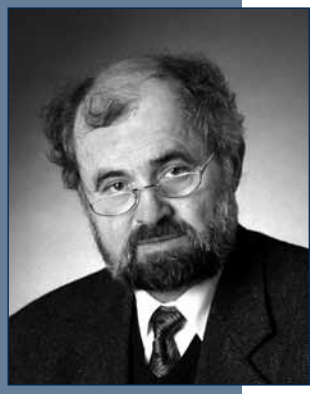
Goebbels S, Oltrogge JH, Kemper R, Heilmann I, Bormuth I, Wolfer S, Wichert SP, Möbius W, Liu X, Lappe-Siefke C, Rossner MJ, Groszer M, Suter U, Frahm J, Boretius S, Nave KA (2010) Elevated phosphatidylinositol 3,4,5-trisphosphate in glia triggers cell-autonomous membrane wrapping and myelination. J Neurosci 30: 8953-8964

Nave KA (2010) Myelination and the trophic support of long axons. Nat Rev Neurosci 11: 275-283

Saher G, Quintes S, Möbius M, Wehr MC, Krämer-Albers EM, Brügger B, Nave KA (2009) Cholesterol regulates the ER exit of the major adhesion protein P0 in peripheral myelination. J Neurosci 29, 6094-6104

Brinkmann BG, Agarwal A, Sereda MW, Garratt AN, Müller T, Wende H, Stassart RM, Nawaz S, Humml C, Velanac V, Radyuschkin K, Goebbels S, Fischer TM, Franklin RJ, Lai C, Ehrenreich H, Birchmeier C, Schwab MH, Nave, KA (2008) Neuregulin-1/ErbB signaling serves distinct functions in myelination of the peripheral and central nervous system. Neuron 59: 581-595

Kassmann CM, Lappe-Siefke C, Baes M, Brügger B, Mildner A, Werner HB, Natt O, Michaelis Th, Prinz M, Frahm J, Nave KA (2007) Axonal loss and neuroinflammation caused by peroxisome-deficient oligodendrocytes. Nat Genetics 39: 969-976



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Erwin Neher

Professor, Director at the Max Planck Institute for Biophysical Chemistry

- M.Sc. (Physics), University of Wisconsin, (1967)
- Ph.D. (Physics), Institute of Technology, Munich (1970)
- Research associate at the Max Planck Institute for Biophysical Chemistry in Göttingen, Germany (1972 - 1975 and 1976 - 1982) and as a guest in the laboratory of Dr. Ch.F. Stevens at Yale University, Dept. of Physiology, New Haven, Conn. (1975 - 1976)
- Fairchild Scholar, California Institute of Technology; Pasadena, USA (1989)
- Director of the Membrane Biophysics Department at the Max Planck Institute for Biophysical Chemistry, Göttingen, Germany, since 1983

Major Research Interests

Molecular Mechanisms of Exocytosis, Neurotransmitter Release, and Short Term Synaptic Plasticity

In order to understand how the brain handles its information flow and adjusts synaptic connections on the second and subsecond timescale, one has to understand all aspects of synaptic transmission ranging from availability of vesicles for exocytosis, presynaptic electrophysiology, Ca^{++} signalling, the process of exocytosis, and postsynaptic neurotransmitter action. Our work concentrates on presynaptic aspects.. We use neuronal cell cultures and brain slices for studying mechanisms of short term plasticity, such as depression and paired pulse facilitation. The Calyx of Held, a specialized synapse in the auditory pathway, offers unique possibilities for simultaneous pre- and postsynaptic voltage clamping. This allows a quantitative analysis of the relationship between $[Ca^{++}]$ and transmitter release. We recently developed techniques to express mutated synaptic proteins in the Calyx terminal, such that the functional role of specific molecules can be studied on the single-cell level.

A second line of research concerns the analysis of fluorescence images, particularly the separation of multiple labels.

Selected Recent Publications

Neher RA, Mitkovski M, Kirchhoff F, Neher E, Theis FJ, Zeug A (2009) Blind source separation techniques for the decomposition of multiply labeled fluorescence images. Biophys J 96:3791-3800

Young S. Jr, Neher E (2009) Synaptotagmin has an essential function in synaptic vesicle positioning for synchronous release in addition to its role as a calcium sensor. Neuron 63: 482-496

Neher E, Sakaba T (2008). Multiple roles of calcium ions in the regulation of neurotransmitter release. Neuron 59:861-872

Sakaba T, Stein A, Jahn R, Neher E (2005) Distinct kinetic changes in neurotransmitter release after SNARE protein cleavage. Science 309:491-494

Sakaba T, Neher E (2003) Direct modulation of synaptic vesicle priming by GABAB receptor activation at a glutamatergic synapse. Nature 424:775-778

Soerensen J, Nagy G, Varoqueaux F, Nehring RB, Brose N, Wilson MC, Neher E (2003) Differential control of the releasable vesicle pools by SNAP-23. Cell 114:75-86

Rettig J, Neher E (2002) Emerging roles of presynaptic proteins in Ca^{++}-triggered exocytosis. Science 298:781-785

Schneggenburger R, Neher E (2000) Intracellular calcium dependence of transmitter release rates at a fast central synapse. Nature 406:889-893

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Luis A. Pardo

Group Leader, Max Planck Institute for Experimental Medicine

- 1986 M.D., University of Oviedo, Spain
- 1990 Ph.D. University of Oviedo, Spain
- 1991 - 1993 Postdoctoral fellow, Max-Planck Institute of Biophysical Chemistry
- 1994 - 1996 Researcher, University of Oviedo, Spain
- 1997 - 2000 Senior researcher, Max-Planck Institute of Experimental Medicine
- 2001 - 2003 Chief Scientific Officer, iOnGen AG
- since 2004 group leader at the Max-Planck Institute of Experimental Medicine

Major Research Interests

Our research interest focuses on the role of ion channels in the initiation and progression of tumors. For this, we take advantage of the knowledge of the physiology and molecular biology of channels and use electrophysiological techniques along with advanced microscopy, protein engineering and animal models. Most of our work has been on a particular potassium channel frequently expressed (75%) in human tumors. We try to take advantage of the particular features of ion channels (for example, their surface expression) to design novel diagnostic and therapeutic procedures.
We also try to understand the mechanisms underlying the role of ion channels in tumors, regarding both permeation properties as well as non-canonical functions.

Selected Recent Publications

Wulf H, Castle N, Pardo LA (2009) Voltage-gated potassium, chanels as therapeutic drug targets. Nature Reviews Drug Discovery

Downie BR, Sanchez A, Knotgen H, et al. (2008) Eag1 expression interferes with hypoxia homeostasis and induces angiogenesis in tumors. J Biol Chem 283: 36234-40

Pardo LA, Stuhmer W (2008) Eag1: an emerging oncological target. Cancer Res 68: 1611-3

Gomez-Varela D, Zwick-Wallasch E, Knotgen H, et al. (2007) Monoclonal antibody blockade of the human Eag1 potassium channel function exerts antitumor activity. Cancer Res 67: 7343-9

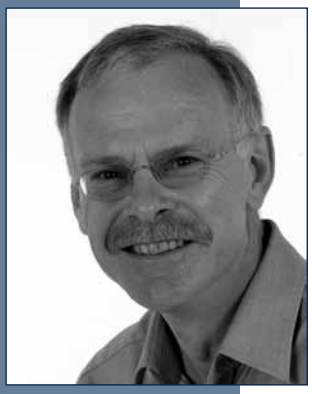
Weber C, Mello de Queiroz F, Downie BR, Suckow A, Stuhmer W, Pardo LA (2006) Silencing the activity and proliferative properties of the human EagI Potassium Channel by RNA Interference. Journal of Biological Chemistry 281: 13030-7

Mello de Queiroz F, Suarez-Kurtz G, Stühmer W, Pardo LA (2006) Ether à go-go potassium channel expression in soft tissue sarcoma patients. Mol Cancer 5: 42

Hemmerlein B, Weseloh RM, Queiroz FMd, et al. (2006) Overexpression of Eag1 potassium channels in clinical tumour specimens. Mol Cancer 5: 41

Garcia-Ferreiro RE, Kerschensteiner D, Major F, Monje F, Stuhmer W, Pardo LA (2004) Mechanism of block of hEag1 K^+ channels by imipramine and astemizole. Journal of General Physiology 124: 301-17

Jenke M, Sanchez A, Monje F, Stuhmer W, Weseloh RM, Pardo LA (2003) C-terminal domains implicated in the functional surface expression of potassium channels. EMBO Journal 22: 395-403



Walter Paulus

Professor of Clinical Neurophysiology

- Dr. med., University of Düsseldorf, 1978
- Training in Neurology at the Universities of Düsseldorf, UCL London and Munich
- Habilitation (Neurology and Clinical Neurophysiology) in Munich
- Prof. and Head of the Department of Clinical Neurophysiology 1992

Major Research Interests

Our main research goal is to development new neurophysiologically based therapies for neurological diseases incorporating excitability changes of the brain. For this we use repetitive transcranial magnetic stimulation (rTMS) and transcranial direct current stimulation (TDCS). TMS induces a short electric current in the human brain. Both rTMS and TDCS offer the prospect of inducing LTD and LTP like effects in the human brain. Diseases in our focus are Parkinson's disease, epilepsy, migraine, stroke and dystonia.

Both methods may also be used to measure excitability changes in the motor cortex or alterations in visual perception thresholds. We also evaluate rTMS and TDCS induced changes in motor cortex excitability by functional MR imaging.

Selected Recent Publications

Trenkwalder C, Paulus W (2010) Restless legs syndrome: pathophysiology, clinical presentation and management. Nature Reviews Neurology 6:337-346

Bachmann CG, Rolke R, Scheidt U, Stadelmann C, Sommer M, Pavlakovic G, Happe S, Treede RD, Paulus W (2010) Thermal hypoaesthesia differentiates secondary restless legs syndrome associated with small fibre neuropathy from primary restless legs syndrome.Brain 133(Pt 3):762-70

Polanía R, Nitsche MA, Paulus W (2010) Modulating functional connectivity patterns and topological functional organization of the human brain with transcranial direct current stimulation. Hum Brain Mapp [Epub ahead of print]

Nitsche MA, Kuo MF, Karrasch R, Wächter B, Liebetanz D, Paulus W (2009) Serotonin affects transcranial direct current-induced neuroplasticity in humans. Biol Psychiatry 66(5):503-8. Epub 2009 May 9.PMID: 19427633 [PubMed - indexed for MEDLINE]

Kuo MF, Paulus W, Nitsche MA (2007) Boosting Focally-Induced Brain Plasticity by Dopamine. Cereb Cortex

Nitsche MA, Roth A, Kuo MF, Fischer AK, Liebetanz D, Lang N, Tergau F, Paulus W (2007) Timing-dependent modulation of associative plasticity by general network excitability in the human motor cortex. J Neurosci 27(14): 3807-12

Nitsche MA, Doemkes S, Karakose T, Antal A, Liebetanz D, Lang N, Tergau F, Paulus W (2007) Shaping the effects of transcranial direct current stimulation of the human motor cortex. J Neurophysiol 97(4): 3109-17. Epub 2007 Jan 24

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Diethelm W. Richter

Professor of Physiology
Chairman of the II. Department of Physiology, University of Göttingen
Speaker of the European Neuroscience Institute Göttingen

- 1969 - 1970 Wiss. Angestellter, I. Physiol. Inst., University of Saarland
- 1970 - 1972 Wiss. Assistent, I. Physiol. Inst., University of Saarland
- 1972 - 1974 Wiss. Assistent, I. Physiol. Inst., University of Munich
- 1974 Universitätsdozent, I. Physiol. Inst., University of Munich
- 1975 - 1976 Universitätsdozent, I. Physiol. Inst., University of Heidelberg
- 1976 - 1988 C-3 Professor, I. Physiol. Inst., University of Heidelberg
- 1988 C-4 Professor, II. Physiol. Inst., University of Göttingen

Major Research Interests

Neurotransmitters, neuromodulators, and peptide hormones are known to activate metabotropic receptor proteins that control ion channels or second messenger cascades. These receptors regulate an intracellular network of interacting signal transduction pathways by means of G-proteins. Thus, receptors transmit extracellular signals to intracellular proteins and other chemical factors. These signals are normally not transduced in a stereotype manner, but they are integrated in a space- and time-dependent manner, resulting in highly dynamic and variable cellular responses. The specific nature of the cellular response depends on individual cell types that may differ in the expression pattern of receptor subtypes or of intracellular signaling factors. Our research group concentrates on the spatial organization of various subtypes of serotonin receptors and targets an understanding of the highly localized regulation of molecular interactions occurring simultaneously at many sites of a neuron. The goal is to achieve a refined understanding of the parallel signal processing within networks of chemical signal pathways and to clarify their effects on the properties of the neuron as a whole.
Another task addressing complex brain functions is to transfer this knowledge about molecular signaling within cells to the integrated function of neuronal networks. The problem is that modulation of network systems cannot be predicted simply on the basis of cellular reactions, because subgroups of diversely wired neurons mostly express heterogeneous receptor profiles.

Selected Recent Publications

Kvachnina E, Dumuis A, Wlodarczyk J, Renner U, Cohet M, Richter DW, Ponimaskin EG (2009) Constitutive Gs-, but not G12-mediated activity of the 5-hydroxytryptamine(7a) receptor is modulated by the palmitoylation of its C-terminal domain. Biochim Biophys Acta 793(11): 1646-55

Manzke T, Dutschmann M, Schlaf G, Mörschel M, Koch UR, Ponimaskin E, Bidon O, Lalley PM, Richter DW (2009) Serotonin targets inhibitory synapses to induce modulation of network functions. Philos Trans R Soc Lond B Biol Sci 364(1529): 2589-602

Kobe F, Renner U, Woehler A, Wlodarczyk J, Papuseva E, Bao G, Zeug A, Richter DW, Erwin Neher E, Ponimaskin EG (2008) Stimulation- and palmitoylation-dependent changes in oligomeric conformation of serotonin 5-HT1A receptors. Biochim Biophys Acta 1783(8): 1503-16

Stettner GM, Huppke P, Gärtner J, Richter DW, Dutschmann M (2008) Disturbances of breathing in Rett syndrome: results from patients and animal models. Adv Exp Med Biol 605: 503-7

Manzke T, Preusse S, Hülsmann S, Richter DW (2008) Developmental Changes of Serotonin 4(a) Receptor Expression in the Rat Pre-Bötzinger Complex. J Comp Neurol 506: 775–790

Ponimaskin E, Voyno-Yasenetskaya T, Richter DW, Schachner M, Dityatev A (2007) Morphogenic Signaling in Neurons Via Neurotransmitter Receptors and Small GTPases. Mol Neurobiol 35(3): 278-87

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Silvio O. Rizzoli

Group Leader STED Microscopy of Synaptic Function

- 2000 - 2004 Research assistant with William Betz at the Dep. of Physiology and Biophysics, University of Colorado Health Sciences Center (USA)
- 08/2004 PhD degree (Physiology) awarded by the University of Colorado
- 2004 - 2007 Post doctoral fellow with Reinhard Jahn at the Neurobiology
- Department of the Max Planck Institute for Biophysical Chemistry in Göttingen (Germany)
- since 2007 Group Leader (STED Microscopy) at the European Neuroscience Institute Göttingen (ENI-G)

Major Research Interests

Conventional fluorescence microscopy is limited by the diffraction of light: fluorescent objects that are close together cannot be discerned. Stimulated emission depletion (STED) is a recent advancement in optical physics that breaks the diffraction barrier, allowing microscopes to obtain much clearer images.

The diffraction barrier has been particularly problematic for imaging synaptic vesicles, which are among the smallest known organelles (30-50 nm in diameter). They are located in small areas in the synapses (about 1 micron in diameter). The group takes advantage of the increased imaging resolution provided by STED to investigate synaptic vesicle function, with an emphasis on synaptic vesicle recycling. Since STED microscopy also allows imaging of protein domains, the group aims at studying the patterning of protein domains in the synapse, in order to understand its molecular architecture.

Selected Recent Publications

Bethani I, Werner A, Kadian C, Geumann U, Jahn R, Rizzoli SO (2009). Endosomal fusion upon SNARE knockdown is maintained by residual SNARE activity and enhanced docking. Traffic 10: 1543-1559

Barysch SV, Aggarwal S, Jahn R, Rizzoli SO (2009). Sorting in early endosomes reveals connections to docking- and fusion-associated factors. Proc Natl Acad Sci USA 106: 9697-9702

Denker A, Kröhnert K, Rizzoli SO (2009) Revisiting synaptic vesicle pool localization in the *Drosophila* neuromuscular junction. J Physiol 587: 2919-2926

Geumann U, Barysch SV, Hoopmann P, Jahn R, Rizzoli SO (2008) SNAREs are not involved in endosome docking. Mol Biol Cell 19: 5327-5337

Westphal* V, Rizzoli* SO, Lauterbach M, Kamin D, Jahn R, Hell SW (2008) Video-rate far-field optical nanoscopy dissects synaptic vesicle movement. Science 320: 246-249

Bethani I, Lang T, Geumann U, Sieber JJ, Jahn R, Rizzoli SO (2007) The specificity of SNARE pairing in biological membranes is mediated by both proof-reading and spatial segregation. EMBO J 26: 3981-3992

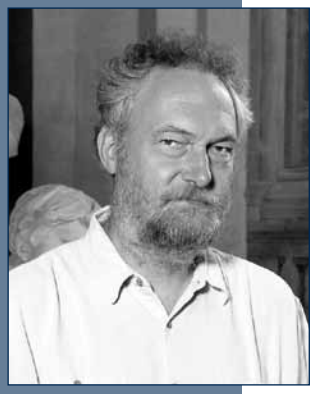
Willig* KI, Rizzoli* SO, Westphal V, Jahn R, Hell SW. (2006). STED microscopy reveals that synaptotagmin remains clustered after synaptic vesicle exocytosis. Nature 44: 935-939

Brandhorst* D, Zwilling* D, Rizzoli* SO, Lippert U, Lang T, Jahn R (2006). Homotypic fusion of early endosomes: SNAREs do not determine fusion specificity. Proc Natl Acad Sci USA 103: 2701-2706

Rizzoli SO, Bethani I, Zwilling D, Wenzel D, Siddiqui TJ, Brandhorst D, Jahn R (2006) Evidence for early endosome-like fusion of recently endocytosed synaptic vesicles. Traffic 7: 1163-1176

Rizzoli SO, Betz WJ (2004) The structural organization of the readily releasable pool of synaptic vesicles. Science 303: 2037-2039

*equal contribution



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Detlev Schild

Professor of Physiology

- 1979 Diplom in Physics, University of Göttingen
- 1982 M.D., University of Göttingen
- 1985 Dr. rer.nat., University of Göttingen
- 1987 Dr. med., University of Göttingen
- 1997 Appointed head of the Department of Molecular Neurophysiology in the Center of Physiology and Pathophysiology, Medical School, University of Göttingen

Major Research Interests

We are trying to understand how the sense of smell works. Olfactory systems are able to detect and distinguish thousands of molecules in our environment. Receptor neurons are endowed with hundreds of different receptor molecules to bind odorants and transduce the chemical signals into electrical ones. Chemosensory information is thus represented in a rather high-dimensional space. The receptor neurons, which code the hitting probability of odor molecules binding to their molecular receptors, eventually generate trains of action potentials, a one-dimensional vector of stochastic processes. They convey their information onto the brain, in particular the olfactory bulb, where the receptor neuron signals are transformed into a two-dimensional neuronal image of firing activities. Glomerula, small skeins of receptor nerve fibers and synapses in the olfactory bulb, appear to be the heart of olfactory coding.
Using a combination of electrophysiological techniques, single molecule detection, photochemical and high resolution imaging techniques as well as computational and modeling methods, we are studying the biophysical and physicochemical details of

- the primary coding processes,
- the synaptic transmission in glomerula
- the generation of the neuronal chemotopic map as well as
- the processes and mechanism of odor learning and memory.

Selected Recent Publications

Junek S, Kludt E, Wolf F, Schild D (2010) Olfactory coding with patterns of response latencies. Neuron 67: 872-884

Breunig E, Manzini I, Piscitelli F, Gutermann B, Di Marzo V, Schild D, and Czesnik D (2010) The endocannabinoid 2-AG controls odor sensitivity in larvae of *Xenopus laevis*. J Neurosci 30: 8965-8973

Hassenklöver T, Schwartz P, Schild D, Manzini I (2009) Purinergic signaling regulates cell proliferation of olfactory epithelium progenitors. Stem Cells 27: 2022-2031

Chen T-W, Lin B-J, Schild D (2009) Odor coding by modules of coherent mitral/tufted cells in the vertebrate olfactory bulb. PNAS 106: 2401-2406

Junek S, Chen T-W, Alevra M, Schild D Activity Correlation Imagin (2009) Visualizing Function and Structure of Neuronal Populations. Biophys J 96: 3801-3809

Czesnik D, Schild D, Kuduz J, Manzini I (2007) Endocannabinoid actions in the olfactory epithelium. Proc Natl Acad Sci USA 104: 2967-2972

Franze K, Grosche J, Skatchkov SN, Schinkinger S, Schild D, Uckermann O, Travis K, Reichenbach A, Guck J (2007) Spotlight on Glial Cells: Living Optical Fibers in the Vertebrate Retina. Proc Natl Acad Sci USA 104: 8287-8292

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Oliver Schlüter

Group Leader Molecular Neurobiology

- 1995 - 2001M.D. Ph.D. with Thomas C. Südhof at the Max-Planck-Institute for Experimental Medicine in Göttingen (Germany)
- Dr. rer. nat. (PhD) 2000, University of Hannover
- Dr. med. (Medical thesis), University of Göttingen
- 2002 - 2006 Postdoc with Robert C. Malenka at Stanford University Medical Center (USA)
- Independent group leader (Emmy-Noether/DFG) at the European Neuroscience Institute Göttingen (ENI-G), since 2006

Major Research Interests

Activity-dependent modulations of synaptic transmission are important mechanisms of information processing and storage in neuronal circuits. A variety of related but mechanistically distinct forms of synaptic plasticity have been described in in vitro preparations of brain slices.
A major goal of my laboratory is to elucidate the underlying molecular events, leading to and regulating changes in synaptic efficacy. Newly developed techniques of molecular replacement, using mouse genetics and/or viral-mediated gene transfer allow us to manipulate the molecular composition of single neurons in a spatial and temporal controlled manner.
In particular, we are able to investigate the effects of heterologously expressed proteins on the background of wild-type neurons, or neurons, in which the endogenous protein expression is diminished. We combine this technique with simultaneous dual whole cell patch clamp recordings from rodent brain slices to monitor changes in synaptic efficacy in the manipulated cell in comparison to the neighboring control cell.
Knowledge gained from the understanding of molecular mechanisms of synaptic transmission and plasticity will ultimately provide important clues for the function of neuronal circuits and potentially the functioning of the brain

Selected Recent Publications

Schlüter* OM, Xu* W, Malenka RC (2006) Alternative N-terminal domains of PSD-95 and SAP97 govern activity-dependent regulation of synaptic AMPA receptor function. Neuron 51(1): 99-111

Schlüter OM, Basu J, Südhof TC, Rosenmund C (2006) Rab3 superprimes synaptic vesicles for release: implications for short-term synaptic plasticity. J Neurosci 26(4): 1239-46

Chandra S, Gallardo G, Fernandez-Chacon R, Schlüter OM, Südhof TC (2005) Alpha-synuclein cooperates with CSPalpha in preventing neurodegeneration. Cell 123(3): 383-96

Fornai F, Schlüter OM, Lenzi P, Gesi M, Ruffoli R, Ferrucci M, Lazzeri G, Busceti CL, Pontarelli F, Battaglia G, Pellegrini A, Nicoletti F, Ruggieri S, Paparelli A, Südhof TC (2005) Parkinson-like syndrome induced by continuous MPTP infusion: convergent roles of the ubiquitin-proteasome system and alpha-synuclein. PNAS 102(9): 3413-8

Schlüter OM, Schmitz F, Jahn R, Rosenmund C, Südhof TC (2004) A complete genetic analysis of neuronal Rab3 function. J Neurosci 24(29): 6629-37

Schlüter OM, Fornai F, Alessandri MG, Takamori S, Geppert M, Jahn R, Südhof TC (2003) Role of alpha-synuclein in 1-methyl-4-phenyl-1,2,3,6-tetrahydropyridine-induced parkinsonism in mice. Neuroscience 118(4): 985-1002

Schlüter* OM, Khvotchev* M, Jahn R, Südhof TC (2002) Localization versus function of Rab3 proteins. Evidence for a common regulatory role in controlling fusion. J Biol Chem 277(43): 40919-29

Schlüter OM, Schnell E, Verhage M, Tzonopoulos T, Nicoll RA, Janz R, Malenka RC, Geppert M, Südhof TC. Rabphilin knock-out mice reveal that rabphilin is not required for rab3 function in regulating neurotransmitter release. J Neurosci. 1999; 19(14): 5834-46

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Mikael Simons

Group Leader of Centre for Biochemistry and Molecular Cell Biology

- 1991 - 1997 Medical School, University of Heidelberg
- 1993 - 1996 MD thesis (Laboratory of K. Beyreuther, ZMBH, University of Heidelberg)
- 1997 - 1999 Residency in Neurology, Department of Neurology, University of Tübingen
- 1999 - 2000 Post-Doc (Laboratory of J. Trotter, Department of Neurobiology, University of Heidelberg)
- 2000 - 2004 Residency in Neurology, Department of Neurology, University of Tübingen
- 2004 Facharzt/Specialty qualification in Neurology
- 2005 Habilitation in Neurology, University of Tübingen
- 2004 Junior group leader, Centre for Biochemistry and Molecular Cell Biology, University of Göttingen
- Junior research group leader (SFB 523), Max Planck Institute for Experimental Medicine

Major Research Interests

Mechanisms of myelin biogenesis; neuron and glia interactions; membrane trafficking in oligodendrocytes; mechanisms of remyelination in multiple sclerosis; amyloid precursor protein processing in Alzheimer's disease

Selected Recent Publications

Nawaz S, Kippert A, Saab A, Werner HB, Lang T, Nave K.-A., Simons M (2009) Phosphatidylinositol (4,5) bisphosphate dependent interaction of MBP with the plasma membrane in oligodendroglial cells and its rapid perturbation by elevated calcium. J Neurosci 29(15): 4794-4807

Simons A, Raposo G (2009) Exosomes-vesicular carriers for intercellular communication. Curr Opin Cell Biol 21(4): 575-81

Trajkovic K, Hsu C, Chiantia S, Rajendran L, Wenzel D, Wieland F, Schwille P, Brügger B, Simons M (2008) Ceramide triggers budding of exosome vesicles into multivesicular endosomes. Science 319(5867):1244-7. PMID: 18309083 [PubMed - in process]

Trajkovic K, Dhaunchak A S, Goncalves J, Wenzel D, Bunt G, Nave K A, Simons M (2006) Neuron to glia signalling triggers myelin membrane exocytosis from endosomal storage sites. J Cell Biol 172: 937-48

Fitzner D, Schneider A, Kippert A, Möbius W, Willig K I, Hell S W , Bunt G, Gaus K, Simons M (2006) Myelin basic protein-dependent plasma membrane reorganization in the formation of myelin. EMBO J 25(21): 5037-48

Simons M, Schwärzler F, Lütjohann D, von Bergmann K, Beyreuther K, Dichgans J, Wormstall H, Hartmann T, Schulz J B (2002) Treatment with simvastatin in normocholeserolemic patients with Alzheimer's disease: a 26-week randomised, placebo-controlled, double-blind trial. Annals of Neurology 52: 346-350

Fassbender K, Simons* M, Bergmann C, Stroick M, Lütjohann D, Keller P, Runz H, Kühl S, Bertsch T, von Bergmann K, Hennerici M, Beyreuther K, Hartmann T (2001) Simvastatin strongly reduces levels of Alzheimer's disease amyloid peptides Aß40 and Aß42 *in vitro* and *in vivo*. Proc Natl Acad Sci USA 98: 5856-5861; *equal contribution to first authorship

Simons M, Krämer EM, Thiele C, Stoffel W, Trotter J (2000) Assembly of myelin by association of the proteolipid protein to galactosylceramide and cholesterol rich membrane domains. J Cell Biol 151: 143-153

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Judith Stegmüller

Group leader, Max Planck Institute for Experimental Medicine

- 1998 Diploma, University of Heidelberg
- 2002 Ph.D. University of Heidelberg
- 2003 - 2008 Postdoc, Harvard Medical School, Boston
- Since 2008 Independent group leader at the Max Planck Institute for Experimental Medicine

Major Research Interests

Growing evidence implicates intrinsic mechanisms such as the ubiquitin proteasome systems (UPS) in brain development and disease. Our focus lies on the role of the UPS in axon growth and regeneration. We are particularly interested how E3 ubiquitin ligases regulate these processes. To further enhance our understanding of the UPS in the central nervous system, we are also seeking to identify novel brain-specific E3 ligases and to determine their role in various aspects of neuronal development.
To address these research objectives, we apply molecular and cell biological and biochemical techniques. We also use mouse models to gain comprehensive insight into the ligases of interest and to complement *in vitro* studies with meaningful *in vivo* experiments.

Selected Recent Publications

Stegmüller J, Huynh MA, Yuan Z, Konishi Y, Bonni A (2008) TGFbeta-Smad2 signaling regulates the Cdh1-APC/SnoN pathway of axonal morphogenesis. J Neurosci. Feb 20;28(8): 1961-9

Stegmüller J, Konishi Y, Huynh MA, Yuan Z, Dibacco S, Bonni A (2006) Cell-intrinsic regulation of axonal morphogenesis by the Cdh1-APC target SnoN, Neuron 50(3): 389-400

Lasorella A, Stegmüller J, Rothschild G, Gardavaccaro D, de la Torre-Ubieta L, Pagano M, Bonni A, Iavarone A (2006) Degradation of Id2 by the anaphase promoting complex couples control of cell cycle exit and axonal growth, Nature 442(7101): 471-4

Stegmüller J, Bonni A (2005) Moving past proliferation: new roles for Cdh1-APC in postmitotic neurons, Trends Neurosci. 28(11): 596-601

Konishi Y, Stegmüller J, Mastuda T, Bonni S, Bonni A (2004) Cdh1-APC controls axonal outgrowth and patterning in the mammalian brain, Science Feb13;303(5660): 1026-30

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Nicole von Steinbüchel-Rheinwall

Professor, Director of the Department of Medical Psychology and Medical Sociology

- 1993: Professor of Medical Psychology, Institute of Medical Psychology (IMP), Munich University (LMU)
- 1998 - 2002 Vice-chairperson of the German Society of Medical Psychology
- since 1998 editorship of the section “Quality of life and disease coping” of the “Zeitschrift für Medizinische Psychologie”
- 1999 Professor of the Dorothea-Erxleben Foundation, Magdeburg University
- 2001 Associate Professor of Gerontopsychology at Geneva University and Head of the Department of Neurogerontopsychology at the Unit of Psychogeriatrics at Geneva University Hospital
- 2001 - 2005 Member of the board of the Swiss Society of Psychology
- 2004 Director of the Department of Medical Psychology, Georg August University of Göttingen
- 2004 - 2005 Member of the board and vice-treasurer of the Academia Multidisciplinaria Neurotraumatologica
- since 2004 editor of the series “Psychomed Compact”, UTB textbooks series
- 2005 Director of the Department of Medical Psychology and Medical Sociology, Georg August University of Göttingen

Major Research Interests

Medical Psychology

- Cross-cultural Outcome
- Cognitive Neuroscience
- Neuropsychology
- Quality and communication improvement in medicine

Medical Sociology

- Assessment of the Consequences of Technology in Medicine
- Professionalisation

Selected Recent Publications

Bruggimann L, Annoni JM, Staub F, v. Steinbüchel N, van der Linden M, Bogousslavsky J (2006) Chronic posttraumatic stress symptoms after nonsevere stroke. Neurology 66(4): 513-516

v. Steinbüchel N, Lischetzke T, Gurny M, Eid M (2006) Assessing quality of life in older people: Psychometric properties of the WHOQOL-BREF. European Journal of Ageing 3: 116-122

v. Steinbüchel N, Petersen C, Bullinger M, and the QOLIBRI Group (2005) Assessment of health-related quality of life in persons after traumatic brain injury – development of the Qolibri, a specific measure. Acta Neurochirurgica 93: 43-49

v. Steinbüchel N, Richter S, Morawetz C, Riemsma R (2005) Assessment of subjective health and health-related quality of life in persons with acquired or degenerative brain injury. Current Opinion in Neurology 18: 681-691

Wittmann M, Burtscher A, Freis W, von Steinbüchel N (2004) Effects of brain-lesion size and location on temporal-order judgement. Neuroreport, 15 (15): 2401-2405

Kagerer F, Wittmann M, Szelag E, v. Steinbüchel N (2002) Cortical involvement in temporal reproduction: Evidence for differential roles of the hemispheres. Neuropsychologia 40 (3): 357-66

Wittmann M, v. Steinbüchel N, Szelag E (2001) Hemispheric specialisation for self-paced motor sequences. Cognitive Brain Research 10 (3): 341-344

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- 1973 - 1988 Research Associate, Bulgarian Academy of Sciences, Sofia
- 1987 PhD, Institute Molecular Biology, Bulg. Acad. Sci., Sofia
- 1989 Habilitation (neurochemistry), Sofia
- 1989 - 1991 Assistant Research Professor, Inst. Mol. Biol., Bulg. Acad. Sci., Sofia
- 1991 - 2002 Senior Research Scientist, Max Planck Institute for Biophysical Chemistry, Dept. Molecular Cell Biology, Göttingen
- 1989 Habilitation (developmental biology), Faculty of Medicine, University Göttingen
- 2002 - 2008 Research Group Leader, Dept. Mol Cell Biol, MPIPBC, Göttingen
- since 2008 Independent Research Group Leader MPI-bpc (W2, MPG Minerva Program)

Major Research Interests

Composed of six cellular layers, the mammalian neocortex is a modular structure with many functional areas in which the neurons have specific morphology, number, connections and unique physiological properties. Our group is interested in understanding the molecular and cellular mechanisms involved in specification of the immense diversity of the cortical neurons in order to be generated in a correct time, number and place during development. We have recently identified sets of genes with a differential expression between distinct domains and layers of the embryonic mouse cortex. To study the function of selected candidates in the transcriptional control of neurogenesis, we combine approaches for targeted gene inactivation or gene activation in transgenic mice using the conventional and conditional knock-out strategies with biochemical, morphological, gene expression, tissue culture methods and techniques for gene transfer in isolated brain or living mouse embryos.
With one gene, the transcription factor Pax6, we are further ahead in understanding its function. Pax6 is a critical gene for neocortical development, endowing the pluripotent radial glial progenitors with neurogenic ability and controlling the cortical patterning, including layer and area formation. Our current research focuses in unraveling genetic mechanisms by which Pax6 regulates these developmental processes with a special emphasis on its role in the control of neuronal subtype identity. We address these questions by stuyding the function of genes recently identified by us to act as Pax6 targets or Pax6 protein partners controlling its neurogenic function. We further aim to get insight into Pax6 dependent mechanisms involved in generation of stem/progenitors cells and their regenerative properties in neurogenic zones of the adult brain.

Selected Recent Publications

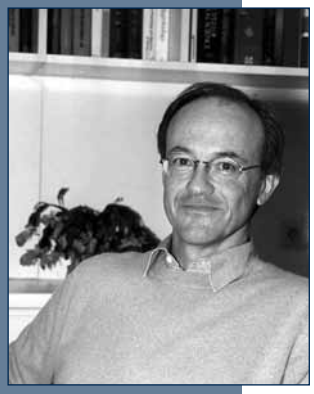
Tuoc TC, Radyushkin K, Tonchev A, Pinon MC, Ashery-Padan R, Molnar Z, Davidoff MS, Stoykova A (2009) Selective cortical layering abnormalities and behavioral deficits in cortex-specific Pax6 knock-out mice. J Neurosci 29: 8349-8335

Pinon MC, Tuoc TC, Ashery-Padan R, Molnar Z, Stoykova A (2008) Altered molecular regionalization and normal thalamocortical connections in cortex-specific Pax6 knock-out mice. J Neurosci 28: 8724-8734

Tuoc TC, Stoykova A (2008) Trim11 modulates the function of neurogeneic transcription factor Pax6 through ubiquitin proteosome system. Genes & Development 22: 1972-1986

Fimia GM, Stoykova A, Romagnoli A, Giunta L, Di Bartolomeo S, Nardacci R, Corazzari F, Fuoco C, Ucar A, Schwartz P, Gruss P, Piacentini M, Chowdhury K, Cecconi F (2007) Ambra1 regulates autophagy and development of the nervous system. Nature 447: 1121-1125

Berger J, Eckert S, Tuoc TC, Cecconi F, Gorski J, Jones K, Gruss P, Stoykova A (2007) Conditional activation of Pax6 in the developing cortex of transgenic mice causes progenitor apoptosis. Development 134: 1311-1322



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Walter Stühmer

Professor of Neurophysiology, Director at the Max Planck Institute for Experimental Medicine

- 1978 - 1980 PhD with Dr. F. Conti in Camogli, Italy
- 1980 - 1983 Post Doc in the Department of Physiology and Biophysics in Seattle, USA, with Dr. W. Almers
- 1983 - 1992 group leader at the Max Planck Institute for Biophysical Chemistry in Göttingen with Dr. E. Neher
- 1992 - present Director of the Department Molecular Biology of Neuronal Signals at the Max Planck Institute for Experimental Medicine in Göttingen

Major Research Interests

The principal aim of the department “Molecular Biology of Neuronal Signals” is the study of signaling within cells and between cells. To this end, molecular biology, genetics and electrophysiology are used to elucidate structure-function relationships of membrane-bound proteins, expecially ion channels and receptors. Specific tools such as antibodies and toxins are developed and used to interfere with signaling pathways relevant for cell cycle control, ion selectivity and the secretion of cells in culture and in primary cells.

Selected Recent Publications

Gonçalves JT, Stühmer W (2010) Calmodulin interaction with hEAG1 visualized by FRET microscopy. PLoS ONE 5(5): e10873

Gómez-Varela D, Kohl T, Schmidt M, Rubio ME, Kawabe H, Nehring R, Schäfer S, Stühmer W, Pardo L (2010) Characterization of Eag1 channel lateral mobility in rat hippocampal cultures by single-particle-tracking with quantum dots. PLoS ONE 5: e8858

Alves F, Dullin C, Napp J, Missbach-Guentner J, Jannasch K, Mathejczyk J, Pardo LA, Stühmer W, and Tietze L-F (2009) Concept of a selective tumour therapy and its evaluation by near-infrared flurorescence imaging and flat-panel volume computed tomography in mice. Eur J Radiology 70: 286-293

Downie BR, Sánchez A, Knötgen H, Contreras-Jurado C, Gymnopoulos M, Weber C, Stühmer W, and Pardo LA (2008) Eag1 expression interferes with hypoxia homeostasis and induces angiogenesis in tumors. J Biol Chem 283: 36234-36240

Martin S, Lino de Oliveira C, Mello de Queiroz F, Pardo LA, Stühmer W, and Del Bel E (2008) Eag1 potassium channel immunohistochemistry in the CNS of adult rat and selected regions of human brain. Neuroscience 155: 833-844

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Andreas Stumpner

Professor of Neuroethology

- Dr. rer. nat., University of Erlangen, Germany, 1988
- Postdoctoral fellow, Andrews University, Berrien Springs, USA, 1990 - 1991
- Habilitation, University of Göttingen, 1997
- Guest professor, University of Zurich, Switzerland, 2002 - 2003
- Since April 2003 Professor of Zoology at the University of Göttingen

Major Research Interests

My research focuses on how a small nervous system recognises specific frequencies and temporal patterns (in the context of acoustic communication in insects, mainly in Orthoptera). Understanding these processes bears implications also for understanding function and evolution of the same performances of the vertebrate brain. I see the strength of the acoustic and invertebrate system *a*) in the precise temporal and spectral stimuli one can deliver and the clear (innate) responses on the behavioural and neuronal level, *b*) in the comparative potential (song recognition in groups of related species and differences in neuronal layout to related non-singing or non-hearing groups) allowing to understand what mechanisms might have played a role in evolution and how evolution of songs and recognition systems depend on each other, *c*) in the identified neurone-approach allowing to find homologous neurones in related species and indicating evolutionary changes on the cellular level and *d*) the potential to directly test hypotheses in behavioural experiments.
Recent findings from intracellular studies in bushcrickets are: Central neurons receive lateral frequency-dependent inhibitions. After blocking such inhibitions the frequency tuning broadens considerably. Species-specificity of a neuron in related species depends on specific inhibitions, not on specific excitations. And homologous neurons in more distantly related species may differ considerably in their properties..

Selected Recent Publications

Stritih N, Stumpner A (2009) Vibratory interneurons in the non- hearing cave cricket indicate evolutionary origin of sound processing elements in *Ensifera*. Zoology 112: 48-68

Neuhofer D, Wohlgemuth S, Stumpner A, Ronacher B (2008) Evolutionarily conserved coding properties of auditory neurons across grasshopper species. Proc R Soc B 275: 1965-1974

Stumpner A, Allen GR, Lakes-Harlan R (2007) Hearing and frequency dependence of auditory interneurons in the parasitoid fly *Homotrixa alleni* (Tachinidae: Ormiini). J Comp Physiol A 193: 113-125

Stumpner A, Molina J (2006) Diversity of intersegmental auditory neurons in a bush cricket. J Comp Physiol A 192: 1359-1376

Molina J, Stumpner A (2005) Effects of pharmacological treatment and photoinactivation on the directional responses of an insect neuron. J Exp Zool 303A: 1085-1103

Hennig M, Franz A, Stumpner A (2004) Processing of auditory information in insect. Microsc Res Tech 63: 351-374

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Victor Tarabykin

Group Leader at the Max Planck Institute for Experimental Medicine

- MD, Russian State Medical University, Moscow 1993
- PhD in Molecular Biology with S.Lukyanov, Russian Academy of Sciences, Moscow 1996
- Postdoctoral fellow with P.Gruss at the Max Planck Institute for Biophysical Chemistry, 1996 - 2001
- since 2002 Research Group Leader at the Max Planck Institute for Biophysical Chemistry; Department Molecular Cell Biology, Göttingen

Major Research Interests

During development, several populations of progenitor cells in the dorsal telencephalon generate a large variety of neurons. These neurons acquire distinct morphologies and physiological properties and serve distinct functions in the mammalian cerebral cortex.
We are interested in the cellular and molecular mechanisms underlying cell fate specification in the mouse cerebral cortex. We focus on the mechanisms controlling the generation of neurons of different cortical layers. We apply a combination of genetic, molecular and cell biological approaches. We have identified several genes that control cortical development. One of them, Sip1 is a transcription factor implicated in Mowat-Wilson syndrome (MWS) in humans. MWS patients suffer from intellectual disability, microcephaly and seizures. We inactivated the gene specifically in cortical precursors. This resulted in the degeneration of the entire hippocampus. We have shown that in the hippocampus Sip1 controls activity of non-canonical Wnt pathway.
Another gene we identified, Satb2 is a transcription factor of a novel type that interacts with special chromosomal regulatory elements, Matrix Attachment Regions. Satb2 is an important determinant of neurons of superficial cortical layers. In order to study its role in neural development we produced several mouse mutants where Satb2 expression is altered. There are several other genes that have been identified in the lab whose function in the cortical development remains to be revealed.

Selected Recent Publications

Seuntjens E, Nityanandam A, Miqualajauregui A, Debruyn J, Stryjewska A, Goebbels S, Nave K, Huylebroeck D., Tarabykin V (2009) Sip1 regulates sequential fate decisions by feedback signaling from postmitotic neurons to progenitors. Nature Neuroscience 12(11): 1373-80

Britanova O, de Juan Romero C, Cheung A, Kwan KY, Schwark M, Gyorgy A, Vogel T, Akopov S, Mitkovski M, Agoston D, Sestan N, Molnár Z, Tarabykin V (2008). Satb2 is a postmitotic determinant of upper layer neurons specification in the neocortex. Neuron 57(3): 378-92

Miquelajauregui A, Van de Putte T, Polyakov A, Nityanandam A, Boppana S, Karabinos A, Higasi Y, Seuntjens E, Huylebroeck D, Tarabykin V (2007). Smad-interacting protein-1 (Sip1/Zfhx1b) acts upstream of Wnt signaling in the mouse hippocampus and controls its formation. PNAS 104 (31): 12919-12924

Britanova O, Depew MJ, Schwark M, Thomas BL, Miletich I, Sharpe P, Tarabykin V (2006). Satb2 haploinsufficiency phenocopies 2q32-q33 deletions while loss suggests a fundamental role in the coordination of jaw development. Am J Hum Genet 79(4): 668-78

Britanova O, Alifragis P, Johnes K, Gruss P, Tarabykin V (2006). Tangential migration of cortical projection neurons: a novel mode of migration. Dev Biol. 298(1): 299-311

Britanova O, Akopov S, Lukyanov S, Gruss P, Tarabykin V (2005). Novel transcription factor Satb2 interacts with matrix attachment region DNA elements in a tissue-specific manner and demonstrates cell-type-dependent expression in the developing mouse CNS. Eur J Neurosci 21: 658-68 (Cover)

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Professor, Director of the German Primate Center

- Head of the Cognitive Neuroscience Laboratory
- Ph.D. 1992, Massachusetts Institute of Technology
- Postdoctoral Fellow, MIT, 1992 - 1993
- Postdoctoral Fellow, Baylor College of Medicine, Houston, Texas, 1993 - 1995
- Work Group Leader, Laboratory of Cognitive Neuroscience, University of Tübingen, 1995 - 2001
- Professor of Animal Physiology, University of Tübingen, 2000 - 2001
- Professor of Cognitive Neuroscience and Biological Psychology, University of Göttingen, 2001

Major Research Interests

Research at the Cognitive Neuroscience Laboratory is aimed at understanding the neural basis of visual perception. Vision is an active process that is far more than a passive registration of our environment. Rather, on its way from the eyes to and through the cortex, visual information is modulated by numerous processes that enhance some aspects while diminishing others. One of these processes is attention, i.e. the ability to filter out unwanted information and concentrate the brain´s processing abilities on relevant information.
The accurate representation of visual motion in the environment is one of the most important tasks of the visual system. Correspondingly, research in the laboratory concentrates on this ability as a model for sensory information processing in general.
We use various techniques. While our emphasis is on electrophysiology, i.e. the recording of the activity of neurons in the visual cortex of macaque monkeys and measuring human perceptual abilities with psychophysical methods, we also use theoretical approaches and functional brain imaging.
Using these techniques, we have been able to elucidate how motion information is represented in primate cortical area MT and how attention changes that representation and correspondingly the percept of the visual environment.

Selected Recent Publications

Busse L, Katzner S and Treue S (2008) Temporal dynamics of neuronal modulation during exogenous and endogenous shifts of visual attention in macaque area. MT Proceedings of the National Academy of Sciences (PNAS) 105: 16380-16385

Womelsdorf T, Anton-Erxleben K, Pieper F, Treue S (2006) Dynamic shifts of visual receptive fields in cortical area MT by spatial attention. Nature Neuroscience 9: 1156-1160

Martinez-Trujillo JC, Treue S (2004) Feature-based attention increases the selectivity of population responses in primate visual cortex. Current Biology 14: 744-751

Martinez-Trujillo JC, Treue S (2002) Attentional modulation strength in cortical area MT depends on stimulus contrast. Neuron 35: 365-370

Treue S (2001) Neural correlates of attention in primate visual cortex. Trends in Neurosciences 24 (5): 295-300

Treue S, Hol K, Rauber HJ (2000) Seeing multiple directions of motion - Physiology and psychophysics. Nature Neuroscience 3 (3): 270-276

Treue S, Martinez Trujillo JC (1999) Feature-based attention influences motion processing gain in macaque visual cortex. Nature 399 (6736): 575-579

Treue S, Maunsell JHR (1996) Attentional modulation of visual motion processing in cortical areas MT and MST. Nature 382 (6591): 539-541

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Andreas Wodarz

Professor of Stem Cell Biology

- Diploma Biology, University of Cologne, 1990
- Dr. rer. nat. Developmental Biology, University of Cologne, 1993
- Postdoc, Howard Hughes Medical Institute, Stanford University, 1994 - 1997
- Junior Group Leader, Heinrich Heine University Düsseldorf, 1997 - 2004
- Habilitation in Genetics, Heinrich Heine University Düsseldorf, 2001
- Appointed as Head of the Department of Stem Cell Biology at the University of Göttingen, 2004

Major Research Interests

At the center of my research interests is the question of how neural stem cells divide asymmetrically to produce another stem cell and a progenitor cell that will differentiate and give rise to neurons and glia cells. One important aspect of asymmetric cell division is the establishment of an intrinsic polarity which is the prerequisite for the asymmetric localization of proteins and mRNAs that serve as cell fate determinants. Our model system for the asymmetric division of stem cells is the embryonic neuroblast of Drosophila. Here we study the function of genes that control cell polarity, asymmetric localization of cell fate determinants and orientation of the mitotic spindle. The knowledge obtained in the Drosophila system has stimulated intense research on the participation of the orthologous genes and proteins in the asymmetric division of vertebrate stem cells.

Selected Recent Publications

Krahn MP, Bückers J, Kastrup L, Wodarz A (2010) Formation of a Bazooka-Stardust complex is essential for plasma membrane polarity in epithelia. J Cell Biol 190: 751-760

Krahn MP, Klopfenstein D, Fischer N, Wodarz A (2010) Membrane targeting of Bazooka/PAR-3 is mediated by direct binding to phosphoinositide lipids. Curr Biol 20: 636-642

Koch CM, Honemann-Capito M, Egger-Adam D, Wodarz A (2009) Windei, the *Drosophila* homolog of mAM/MCAF1, is an essential cofactor of the H3K9 methyl transferase dSETDB1/Eggless in germ line development. PLoS Genetics 5: e1000644

Kim S, Gailite I, Moussian B, Luschnig S, Goette M, Fricke K, Honemann-Capito M, Grubmüller H, Wodarz A (2009) Kinase activity independent functions of atypical protein kinase C in *Drosophila*. J Cell Sci 122: 3759-3771

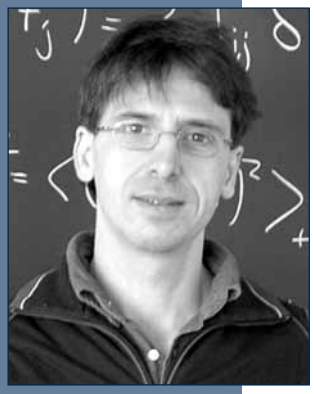
Krahn MP, Egger-Adam D, Wodarz A (2009) PP2A antagonizes phosphorylation of Bazooka by PAR-1 to control apical-basal polarity in dividing embryonic neuroblasts. Dev Cell 16: 901-908

Zhang G, Breuer M, Förster A, Egger-Adam D, Wodarz A (2009) Mars, a *Drosophila* protein related to vertebrate HURP, is required for the attachment of centrosomes to the mitotic spindle during syncytial nuclear divisions. J Cell Sci 122: 535-545

Wodarz A, Näthke IS (2007) Cell polarity in development and cancer. Nat Cell Biol 9: 1016-1024

Wodarz A (2005) Molecular control of cell polarity and asymmetric cell division in *Drosophila* neuroblasts. Curr Opin Cell Biol 17: 475-481

von Stein W, Ramrath A, Grimm A, Müller-Borg M, Wodarz A (2005) Direct association of Bazooka/PAR-3 with the lipid phosphatase PTEN reveals a link between the PAR/aPKC complex and phosphoinositide signaling. Development 132: 1675-1686



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Fred Wolf

Group Leader at the Max Planck Institute for Dynamics and Self-Organization

- Head of the Research Group “Theoretical Neurophysics”, Department of Nonlinear Dynamics, Max-Planck-Institut für Strömungsforschung, Göttingen, since 2004.
- Visiting Scholar, Kavli Institute for Theoretical Physics, UC Santa Barbara (USA), Fall 2001, 2003, 2004
- Research Associate, Max-Planck-Institut für Strömungsforschung, Göttingen, 2001 - 2004
- Amos de Shalit Fellow, Racah Institute of Physics and Interdisciplinary Center for Neural Computation, Hebrew Univ., Jerusalem (Israel), 2000
- Dr. phil. nat., J.W. Goethe Universität, Frankfurt , 1999

Major Research Interests

- Theoretical neuroscience and nonlinear dynamics
- Dynamics and synchronization in cortical neural networks
- Function and development of the visual cortex
- Sensory processing in the auditory system

The brains of humans and animals arguably are among the most complex systems in nature. Over the past decade, theoretical neuroscience - the use of quantitative theories, mathematical modelling and advanced quantitative data analysis methods for the study of brain function - has started to provide powerfull new approaches for understanding the neuronal basis of preception, learning, memory, and other higher brain functions. This is because, even during the neuronal processing of the most elementary sensory stimulus large ensembles of interacting nerve cells distributed throughout the brain are activated, the collective operations of which are often hard to understand by means of purely qualitative reasoning.
The primary focus of our research in theoretical neuroscience is self-organisation in the dynamics of cortical networks. In particular, we have developed novel approches to model and predict the dynamics and and neuronal plasticity of the visual cortex. To quantitatively connect theory and experiment in this system, we recently also designed methods that enable to quantify the organization of visual cortical functional architecture with high precision. Another important focus of our work is the mathematical analysis of the dynamics of large and complex networks of pulse-coupled neuron models. The concepts and tools for the representation of the dynamics of cortical circuits developed enable a rational and transparent design of models of higher cortical functions such as the processes underlying perceptual learning phenomena.

Selected Recent Publications

Tchumatchenko T, Malyshev A, Geisel T, Volgushev M, Wolf F (2010)Correlations and synchrony in threshold neuron models. Phys Rev Lett 104(5): 058102

Junek S, Kludt E, Wolf F, Schild D (2010) Olfactory Coding with Patterns of Response Latencies. Neuron 67(5): 872-884

Baranauskas G, Mukovskiy A, Wolf F, Volgushev M (2010) The determinants of the onset dynamics of action potentials in a computational model. Neuroscience 167(4): 1070-90

Tchumatchenko T, Geisel T, Volgushev M, Wolf F (2010) Signatures of synchrony in pairwise count correlations. Front Comput Neurosci 4: 1

Kaschube M, Schnabel M, Wolf F, Löwel S (2009) Interareal coordination of columnar architectures during visual cortical development. Proceedings of the National Academy of Sciences of the United States of America 106: 17205-17210

Reichl L, Lowel S, Wolf F (2009) Pinwheel Stabilization by Ocular Dominance Segregation. Physical Review Letters 102: 208101

Timme M, Wolf F (2008) The simplest problem in the collective dynamics of neural networks: is synchrony stable? Nonlinearity 21: 1579-1599

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Fred Wouters

Professor, Laboratory for Molecular and Cellular Systems

- Dr. (Ph. D.) 1997, Faculty of Chemistry, University of Utrecht, The Netherlands
- Postdoctoral fellow, Imperial Cancer Research Fund (ICRF), London UK, 1997 - 2000
- Postdoctoral fellow, European Molecular Biology laboratory (EMBL), Heidelberg, 2000 - 2001
- Appointed as group leader at the European Neuroscience Institute, Göttingen 2001
- PD (habilitation) 2006, Physiology, Göttingen University

Major Research Interests

The focus of our research is the regulation and role of the neuronal cytoskeleton in the modulation of neuronal shape and motility during chemotactic processes. The growing neuronal growth cone probes its environment for the chemical composition of its substrate and the presence of neighbouring cells. The former information is sampled by cell adhesion receptors in focal adhesion structures that, next to their sensing function also perform a structural function in that they provide the cell with a means to exert force on its substrate. We are primarily interested in the signal transduction processes that regulate these effects and the cross-talk between the different motility systems.
The main interest areas in this question are; 1. The role and molecular mechanism of lipid raft-resident cell adhesion molecules in the remodelling of the membrane cytoskeleton, 2. Dynamic control of growth cone protein content by local proteolysis and chaperone function during chemotactic responses, 3. Role and mechanism of the neuronal exocyst complex as critical landmarks for dendritic/axonal neuritogenesis.
Our group has a related interest in the pathophysiological mechanism of neurodegeneration by intracellular aggregation of the tau protein, as occurs in Alzheimer's disease. As tau is an intrinsically unstructured protein that can undergo remarkable conformational changes upon binding to microtubules and in the Alzheimer-related aggregation condition, it presents an ideal model system for the biophysical analysis of protein conformational change and protein interactions.
Our research depends on the development and application of advanced microscopy techniques, primarily; fluorescence lifetime imaging microscopy (FLIM), and Förster resonance energy transfer (FRET) microscopy, in combination with a range of GFP-based optical biosensors and novel bioconjugation approaches for organic dyes, and protein biochemical/molecular biological techniques to resolve and quantify biochemical reactions and conditions in living cells.

Selected Recent Publications

Iliev AI, Djannatian JR, Nau R, Mitchell TJ, Wouters FS (2007) Cholestrol-dependent actin remodeling via RhoA and Rac1 activation by the *Streptococcus pneumoniae* toxin pneumolysin. Proc Natl Acad Sci USA 104: 2897-2902

Esposito A, Dohm CP, Kermer P, Bahr M, Wouters FS (2007) alpha-Synuclein and its disease-related mutants interact differentially with the microtubule protein tau and associate with the actin cytoskeleton. Neurobiol Dis 26: 521-531

Esposito A, Dohm CP, Bahr M, Wouters FS (2007) Unsupervised fluorescence lifetime imaging microscopy for high content and high throughput screening Mol Cell Proteomics 6: 1446-1454

Hillebrand M, Verrier SE, Ohlenbusch A, Schafer A, Soling HD, Wouters FS, Gartner J (2007) Live cell FRET Microscopy: homo- and heterodimerization of two human peroxisomal ABC transporters, the adrenoleukodystrophy protein (ALDP, ABCD1) and PMP70 (ABCD3). J Biol Chem 282: 26997-27005

Pommereit D, Wouters FS. (2007) An NGF-induced Exo70-TC10 complex locally antagonises Cdc42-mediated activation of N-WASP to modulate neurite outgrowth. J Cell Sci 120: 2694-2705

Esposito A, Gerritsen HC, Wouters FS (2007) Optimizing frequency-domain fluorescence lifetime sensing for high-throughput applications: photon economy and acquisition speed. J Opt Soc Am A 24: 3261-3273

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PD Dr. Swen Hülsmann
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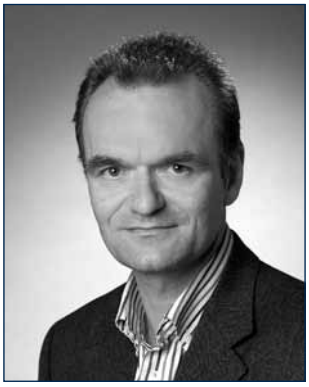

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