GEORG-AUGUST-UNIVERSITÄT
GÖTTINGEN / GERMANY

International Max Planck Research School

Neurosciences

MSc/PhD/MD-PhD Program

YEARBOOK 2012 / 2013

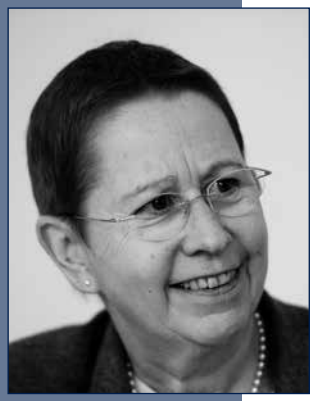
Yearbook 2012/2013

MSc/PhD/MD-PhD Neuroscience Program

at the University of Göttingen

International Max Planck Research School

Index / Imprint



Letter from the President

Success for a comprehensive research university such as our Georg-August University of Göttingen is rooted in excellent science and its integration into an optimal learning environment to educate competent and critical young academics. I am very glad that our university in cooperation with the local Max-Planck Institutes and the German Primate Center has been able to establish conditions, which make top interdisciplinary science possible in an international setting enabling us all to feel the Göttingen Spirit.

The two international MSc/PhD programs in Neurosciences and Molecular Biology truly have contributed to our continued strive for excellence in science-oriented training both by integrating faculty members from university and non-university institutes across institutional borders and by providing comprehensive services especially for international students on the Göttingen Research Campus. Based on the proven concepts and the experience of these programs the Göttingen Graduate School for Neurosciences, Biophysics and Molecular Biosciences (GGNB) was established, which is continuously supported by the federal Excellence Initiative since 2007.

The Neuroscience and Molecular Biology programs remain unique within the Graduate School GGNB in offering integrated MSc/PhD curricula with a fast track option which allow excellent BSc graduates to directly enter the PhD phase after successfully absolving the initial 1st year training phase. For over a decade these international programs have been particularly successful in attracting high numbers of worldwide applicants of good academic quality providing the basis for the selection of the very best candidates. New ideas introduced by these programs have meanwhile been adopted by the Georg-August University School of Science (GAUSS) and other graduate schools for the benefit of the entire university.

While maintaining their successful structure the content and focus of the training curriculum of the programs has continuously been adapted to the changing research topics. Consequently, new faculty members are integrated to reflect novel developments in research. They will further ensure optimal individual supervision and up-to-date research-oriented training. Beyond academia both programs keep close contact with the relevant industries to enhance the opportunities of the graduates for a successful professional career in the private sector.

I would very much like to thank all colleagues and institutions for their committed support of 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 will continue to support these programs to promote international exchange at all levels and for further interaction with our partners worldwide.

Prof. Dr. Ulrike Beisiegel

(President of the Georg August University Göttingen)

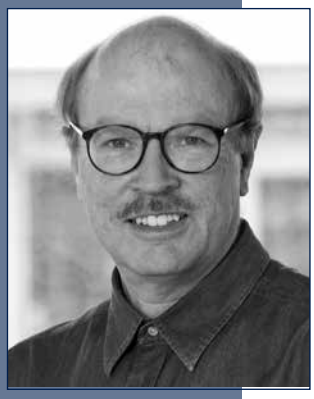
Letter from the Max Planck Society

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, 63 International Max Planck Research Schools have been established involving 82 Max Planck Institutes, 34 German universities and 25 universities abroad. About 2,830 PhD students from 112 countries are presently enrolled.

More than 3,100 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 Neurosciences and Molecular Biology 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, Biophysics, and Molecular Biosciences, thus being instrumental for the continued support by the German Excellence Initiative provided to the University. 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

Gregor Eichele
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.

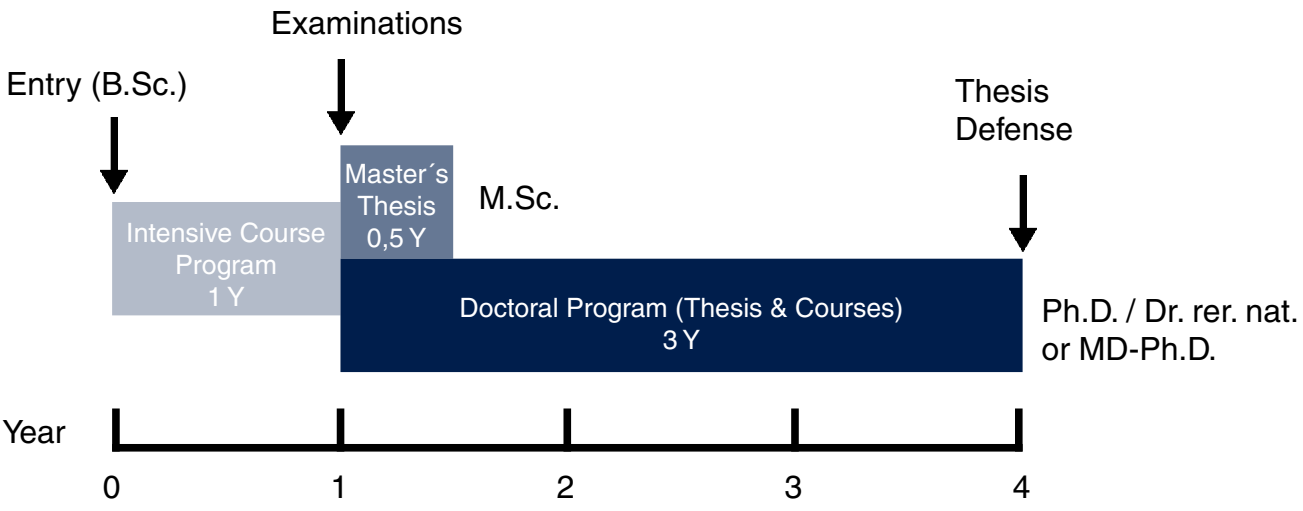
The program is a member of the Göttingen Graduate School for Neurosciences, Biophysics and Molecular Biosciences (GGNB), which is funded by the Excellence Initiative of the German Federal and State Governments. It is offered by the University of Göttingen, the Max Planck Institute for Biophysical Chemistry (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 2012

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.

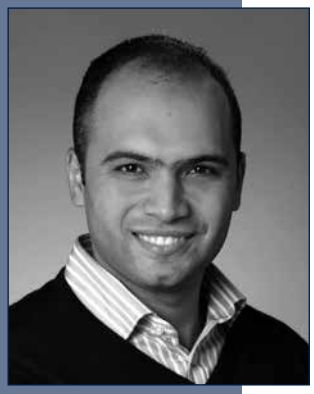
In the year 2012, the coordination office received 256 applications from 48 countries

Continent	Applications	Admissions
Europe (total)	**64**	**7**
Germany	33	5
other West Europe	15	1
East Europe	16	1
America (total)	**20**	**5**
North America	5	1
Central/South America	15	4
Africa (total)	**39**	**2**
North Africa	16	1
Central/South Africa	23	1
Asia (total)	**133**	**7**
Near East	53	2
Central Asia/ Far East	80	5
Australia	**0**	**0**

Students 2012/2013

Name		Home Country
Tamer	Abdelaal	Egypt
Andrea	Adden	Germany
Erika	Avendaño Guzmán	Mexico
Mariana	Cerdeira	Brazil
Chi	Chen	P.R. China
Guergana Ivanova	Dontcheva	Bulgaria / Canada
Alina	Gellerer	Germany
Laura	Geurts	Netherlands
Diego Alejandro	Giraldo Sánchez	Colombia
Sindhuja	Gowrisankaran	India
Sabitha	Joseph	Germany
Sarah	Lam	Canada
Amr	Maamoun	Syria
Florentin	Masurat	Germany
Sharlen Yared	Moore Corona	Mexico
Pratibha	Narayanan	India
Ahmad	Nazzal	Jordan
Sneha	Shashidhara	India
Julia	Sondermann	Germany
Aarti	Swaminathan	India
King Faisal	Yambire	Ghana

Tamer Abdelaal



Egypt

Tamer Abdelaal

EDUCATION

College / University:

Faculty of Science, Al Azhar University of Cairo

Highest Degree:

M.Sc. (Science).

Major Subjects:

Microbiology (Antibiotics), Protein Biochemistry

Lab Experience:

Chemical and biochemical characterization of the antimicrobial agents produced by new bacterial isolates. Cloning, cell-free and cell-based expression of recombinant protein, protein purification by different chromatographic techniques on a state-of-the-art Akta platform, SDS-PAGE, Western blot, protein staining and manual crystallization trials setup. Protein-protein interaction by surface plasmon resonance

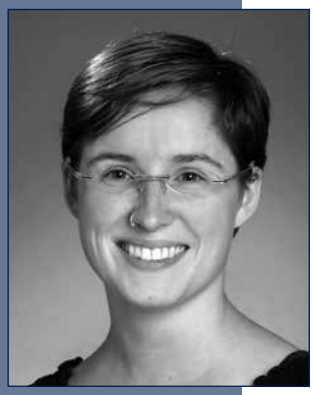
Scholarships:

2012 – 2014: Erasmus Mundus Scholarship

2011: Internship at LUBEM institute, Quimper, France funded by Scientific Sector, French Centre for Culture and Cooperation (CFCC), Embassy of France in Egypt

2010 – 2011: Internship at VIB Department of Molecular and Cellular Interactions, Brussel, Belgium, funded by Ministry of Higher Education

Andrea Adden



Germany

Andrea Adden

EDUCATION

College / University:

Georg August University Göttingen

Highest Degree:

B.Sc.

Major Subjects:

Biology

Lab Experience:

Electrophysiological techniques (e.g. extracellular and intracellular recordings), behavioural analysis

Projects / Research:

2012: The role of NompC in the thermoreceptive cells of Drosophila melanogaster. Bachelor thesis, Dept. for Cellular Neurobiology (Martin Göpfert)

2012: Research internship at Uppsala University, Dept. of Neuroscience, Neurophysiology of Motion Vision (Karin Nordström)

Scholarships:

2012 – 2013: International Max Planck Research School support

Mexico

Erika Avendaño Guzmán

EDUCATION

College / University:

Universidad Nacional Autónoma de México (UNAM)

Highest Degree:

B.Sc. (Biology)

Major Subjects:

Neurosciences, Cell Physiology

Lab Experience:

Cell culture, epifluorescence microscopy, cell viability assays, neurite outgrowth measuring, quantification of reactive oxygen species assays

Projects / Research:

Aug 2010 – Feb 2012: "The role of the reactive oxygen species in the throphic actions of BDNF and NMDA in cerebellar granule cells", UNAM, DF, Mexico

Mar – Sep 2011: "Mechanisms or neuronal death". Social Service. Cell Physiology Institute, UNAM, DF, Mexico

Scholarships:

2012 – 2013: Stipend of the Excellence Foundation for the Promotion of the Max Planck Society

Aug 2011 – Jan 2012: PAPIIT Scholarship "Support Program for Research and Technological Innovation"

Feb – July 2011: Professor assistant scholarship. National Researchers System

2010: Scholarship for higher education programs, Secretariat of Public Education (SEP) of Mexican Federal Government

Brazil

Mariana Cerdeira

EDUCATION

College / University:

Universidade Federal Fluminense (UFF)

Highest Degree:

B.Sc. (honours)

Major Subjects:

Biomedical Sciences

Lab Experience:

Basic techniques in cellular and molecular biology, microbiology, immunohistochemistry, cell culture, PCR, retinal dissection, ELISA, DNA and protein extraction, mice handling

Projects / Research:

Bachelor's thesis: "Immunohistochemical detection of the cellular marker Ki-67 in human glioblastoma"

2010 – 2012: Analysis of the immune response to AAV vectors after injection in mouse retina

2009 – 2010: Study of the physiological roles of the Cellular Prion Protein

Scholarships:

2012 – 2014: Erasmus Mundus Scholarship

2009 – 2012: Scholarship from the National Council for Scientific and Technological Development (CNPQ, an agency linked to the Brazilian Ministry of Science and Technology)

P.R. China

Chi Chen

EDUCATION

College / University:

Tsinghua University

Highest Degree:

B.Sc.

Major Subjects:

Biological Sciences

Lab Experience:

Oct 2010 – June 2012: Centre of Learning and Memory (Lab Research Assistant), School of Medicine, Tsinghua University, China

2011 (Summer Innovative Program): Prof. Yule Liu's Lab, School of Life Sciences, Tsinghua University, China

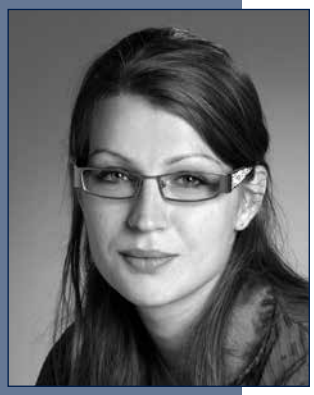
Projects / Research:

Bachelor thesis: Effects of Intra-Hippocampal Magnesium Infusion on Object Recognition Memory

July – Sep 2011: Summer Research "Engineering of viral RNA replicons *in planta*: Efficient assembly by recombination of DNA modules delivered by *Agrobacterium*"

Scholarships:

2012 – 2013: Stipend of the Excellence Foundation for the Promotion of the Max Planck Society



Bulgaria,
Canada

Guergana Ivanova Dontcheva

EDUCATION

College / University:

University of British Columbia

Highest Degree:

B.Sc.

Major Subjects:

Cell Biology and Genetics

Lab Experience:

Standard techniques in Cell Physiology, Molecular Biology, Physics, inorganic and organic Chemistry and Ecology

Projects / Research:

Research project on the physiological adaptations of Killifish to different environments, involving designing of primers, cloning and sequencing of the housekeeping PMCA protein and its isoforms

Summary paper entitled "Importance of the Visual System as an Experimental Model for the Discovery of Multiple Developmental Processes in the Nervous System"

Scholarships:

2012 – 2013: Stipend of the Excellence Foundation for the Promotion of the Max Planck Society

Germany

Alina Gellerer

EDUCATION

College / University:

Philipps University Marburg

Highest Degree:

B.Sc.

Major Subjects:

Biology

Lab Experience:

Basic techniques in molecular and cellular biology, immunocytochemistry, CLSM, MALDI-TOF mass spectrometry

Projects / Research:

Bachelor thesis: “Immunocytochemical Distribution and Identification of SIFamide-like Peptide in the Desert Locust *Schistocerca gregaria*”, Philipps-Universität Marburg

Scholarships:

2012 – 2013: International Max Planck Research School support

Netherlands

Laura Geurts

EDUCATION

College / University:

University College Utrecht, Utrecht University

Highest Degree:

B.Sc. (honours)

Major Subjects:

Cognitive Neuroscience

Lab Experience:

Basic methods in experimental psychology, basic techniques in microbiology

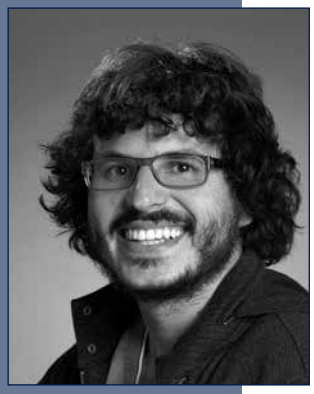
Projects / Research:

Feb – Aug 2012 (Bachelor thesis): “Developmental dyslexia: the search for the second deficit – On the relationship between reading skills, naming speed, and visual attention”. Utrecht Institute of Linguistics OTS, Utrecht University

June 2011 (internship): “Non-adjacent dependency learning in infants at familial risk of dyslexia: the role of attention”. Babylab, Utrecht Institute of Linguistics OTS, Utrecht University

Scholarships:

2012 – 2013: Stipend of the Excellence Foundation for the Promotion of the Max Planck Society



Colombia

Diego Alejandro Giraldo Sánchez

EDUCATION

College / University:

Universidad de los Andes, Bogota

Highest Degree:

B.Sc.

Major Subjects:

Biology

Lab Experience:

Behavioral biology, arthropod neurophysiology, insect neuroethology, VSM magnetometry in insect tissues

Projects / Research:

2012: Behavioral effects of low power radio frequencies on Chagas disease vector *Rhodnius prolixus*

2011: Magnetoreception in *Rhodnius prolixus*: Behavioral experiments and VSM magnetometry

Scholarships:

2012 – 2013: Stipend of the Excellence Foundation for the Promotion of the Max Planck Society

India

Sindhuja Gowrisankaran

EDUCATION

College / University:

SASTRA University

Highest Degree:

B.Tech.

Major Subjects:

Biotechnology

Lab Experience:

Cell culture, basic molecular biology techniques, immunohistochemistry and imaging, *Drosophila* behavior studies

Projects / Research:

Jan – July 2012: B.Tech Thesis: The role of miRNA-31 and -148a in Glioblastoma multiforme (GBM) under the guidance of Dr. Anna Krichevsky, RNA Biology Lab, BWH, Boston

May – July 2010 & 2011 Study of neurodegenerative disease (Huntington chorea) using *Drosophila* animal model under the guidance of Dr. Sheeba Vasu, JNCASR, Bangalore, India

Scholarships:

2012 – 14 Erasmus Mundus Scholarship

2012 Internship at BWH, Harvard Medical School.

2010, 11 J Nehru Center for Advanced Scientific Research (JNCASR) summer fellowship

2011 Rajiv Gandhi Science Talent Research Fellow award

Germany

Sabitha Joseph

EDUCATION

College / University:

Georg August University Göttingen

Highest Degree:

B.Sc.

Major Subjects:

Molecular Medicine

Lab Experience:

Basic techniques in molecular and cell biology, experience in drug trial lab, in hematology and oncology lab and in neurophysiology and psychiatric lab

Projects / Research:

Bachelor thesis: “Molecular characterization of an antibody against Amyloid-ß peptide”, Dept. of Molecular Psychiatry, Georg August University Göttingen

Scholarships:

2012 – 2013: International Max Planck Research School support

Canada

Sarah Lam

EDUCATION

College / University:

University of Toronto

Highest Degree:

B.Sc. (honours)

Major Subjects:

Neuroscience, Psychology

Lab Experience:

Basic techniques in molecular and cellular biology, neurosurgery, and animal models (*C. elegans*, rats)

Projects / Research:

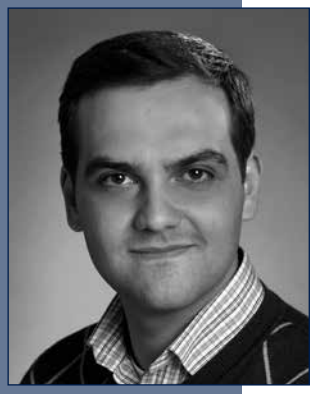
2011: Studying the effects of neomycin on the ECoG recordings of the primary auditory cortex of the rat brain. Dr. Tzai-Wen Chiu, College of Biological Science and Technology, National Chiao Tung University, Taiwan

Scholarships:

2012 – 2013: Stipend of the Excellence Foundation for the Promotion of the Max Planck Society

2011 – 2012: The Mary Mounfield Scholarship

2011: Woodsworth College Summer Abroad Bursary



Syria

Amr Maamoun

EDUCATION

College / University:

2005 – 2011: Damascus University

Highest Degree:

M.D.

Major Subjects:

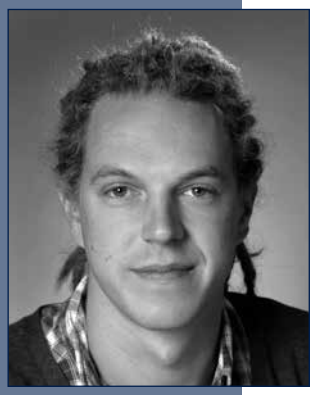
Medicine

Lab Experience:

Basic lab techniques

Scholarships:

2012 – 2013: Stipend of the Excellence Foundation for the Promotion of the Max Planck Society



Germany

Florentin Masurat

EDUCATION

College / University:

Georg August University Göttingen

Highest Degree:

B.Sc.

Major Subjects:

Molecular Medicine

Lab Experience:

Biomolecular and chemical methods and experience in clinical studies

Projects / Research:

Bachelor Thesis: “Modulating human cortex plasticity using Transcranial Near-Infrared Laser Stimulation (tILS)”, Prof. Dr. Andrea Antal, Clinical Neurophysiology, University Hospital Göttingen

Scholarships:

2012 – 2013: International Max Planck Research School support

Mexico

Sharlen Yared Moore Corona

EDUCATION

College / University:

Universidad Nacional Autónoma de México (UNAM)

Highest Degree:

B.Sc.

Major Subjects:

Basic Biomedical Research

Lab Experience:

Basic techniques in molecular and cellular biology. Experience in primary cultures from rat cortical neurons, synaptosomes purification and ROS determination

Projects / Research:

2009 – 2012: Thesis project: “ROS generation and apoptotic neuronal death induced by beta amyloid-copper(II) complexes in cortical primary cultures”

2008 – 2009: “Comparative analysis of the immune response to three PE_PGRS proteins from *Mycobacterium tuberculosis*”

2007 – 2008: “Phenotypic characterization of *Streptomyces coelicolor* impaired at the protein glycosylation system”

Scholarships:

2012 – 2013: Stipend of the Excellence Foundation for the Promotion of the Max Planck Society

India

Pratibha Narayanan

EDUCATION

College / University:

Sri Venkateswara College, Delhi University

Highest Degree:

B.Sc. (honours) Biochemistry

Major Subjects:

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

Lab Experience:

Various techniques in Cell and Molecular Biology, Immunology, Clinical Biochemistry, Microbiology and Enzymology including Chromatography, ELISA, PCR, Recombinant DNA Technology, and Flow Cytometry. Add on course in “Bioinformatics and Computational Biology”

Projects / Research:

2011: “Purification of enzyme Lactate dehydrogenase from goat liver and preliminary analysis of the effect of natural compounds on Lactate dehydrogenase enzyme activity“, Dept. of Biochemistry, Sri Venkateswara College

Scholarships:

2012 – 2013: Stipend of the Excellence Foundation for the Promotion of the Max Planck Society

Jordan

Ahmad Nazzal

EDUCATION

College / University:

University of Jordan

Highest Degree:

B.Sc.

Major Subjects:

Medicine

Lab Experience:

Basic lab techniques

Scholarships:

2012 – 2013: Stipend of the Excellence Foundation for the Promotion of the Max Planck Society

2005 – 2011: Scholarship from Her Royal Majesty Queen Rania Al-Abdullah office for studying Medicine at the University of Jordan

2004 – 2005: Academic excellence scholarship for studying computer engineering at H.R.H. Princess Sumaya University for Technology

India

Sneha Shashidhara

EDUCATION

College / University:

Fergusson College (affiliated to University of Pune), Pune

Highest Degree:

B.Sc.

Major Subjects:

Physics

Lab Experience:

2011: Summer project at National Centre for Biological Sciences (Prof. Sumantra Chatterji), Bangalore, India

2008: Summer project at the Centre for Cellular and Molecular Biology (Dr. Rakesh Mishra), Hyderabad, India

Projects / Research:

2011: Study of “the galaxy spectra in general and calculate the star formation rate and metallicity of a particular galaxy” at IUCCA, Pune, India

2011: Study of “the cellular memory though LTP in rat hippocampus using ex-vivo electrophysiological techniques” at NCBS, Bangalore, India

2008: Study of “the aggression behavior in male *Drosophila* and the effect of genetic constitution of self and of the opponent” at CCMB, Hyderabad, India

Scholarships:

2012 – 2013: Stipend of the Excellence Foundation for the Promotion of the Max Planck Society

Germany

Julia Sondermann

EDUCATION

College / University:

Georg August University Göttingen

Highest Degree:

B.Sc.

Major Subjects:

Molecular Medicine

Lab Experience:

Basic cellular and molecular biology techniques, electron microscopy

Projects / Research:

Bachelor thesis: “Analysis of CNS Myelination in Dynamin 3-Knockout Mice”, Prof. Mikael Simons, Max Planck Institute for Experimental Medicine Göttingen

Scholarships:

2012 – 2013: International Max Planck Research School support

India

Aarti Swaminathan

EDUCATION

College / University:

Mepco Schlenk Engineering College / Anna University Chennai

Highest Degree:

B.Tech. (Biotechnology)

Major Subjects:

Biochemistry, Cell Biology, Molecular Biology, Genetic Engineering, Protein Engineering, Immunology, Bioinformatics

Lab Experience:

Real time PCR, *in situ* hybridization, cloning, cell culture, molecular & cell biology techniques

Projects / Research:

Dec 2011 – May 2012: Bachelor’s thesis “Potential role of Serotonin in maintenance of pluripotency in Mouse Embryonic Stem cells”, Dr. Mitradas Panicker, National Centre for Biological Sciences, India

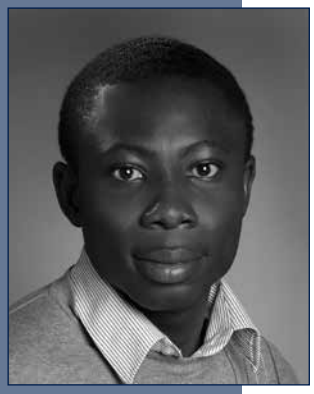
June – July 2010: “Cloning and characterization of telomerase gene in Hydra”, Dr. Yashoda Ghanekar, Institute for Stem Cell and Regenerative Medicine, India

May – June 2009: “Effect of Turmeric (*Curcuma longa*) on NMDA Receptor activity”, Dr. RV Omkumar, Rajiv Gandhi Centre for Biotechnology, India

Scholarships:

2012 – 2013 : Stipend of the Excellence Foundation for the Promotion of the Max Planck Society

2009 – 2011: National Science Fellowship for Students (KVPY, Government of India) Summer Fellowship



Ghana

King Faisal Yambire

EDUCATION

College / University:

University of Ghana

Highest Degree:

B.Sc.

Major Subjects:

Clinical Chemistry and Molecular Biology

Lab Experience:

Basic techniques in Chemical Pathology, Microbiology, Haematology and Molecular Biology in the clinical diagnosis and monitoring of disease

Projects / Research:

Metallothionein, Trace Element and Oxidative Stress Status in Diabetics

Scholarships:

2012 – 2013: Stipend of the Excellence Foundation for the Promotion of the Max Planck Society

2008: Alumni Prize for Best Second year student in Science

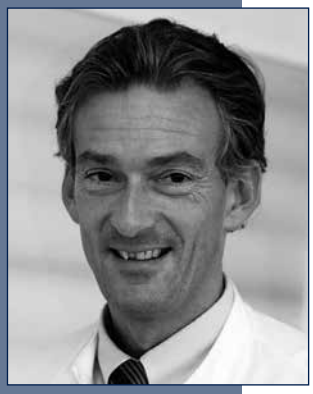
2008: Shell Prize for Best Second year student in Science

2008: Academic Excellence Award for Best B.Sc. student of Commonwealth Hall

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
Camin	Dean	Trans-synaptic Signaling	ENI
Thomas	Dresbach	Anatomy and Embryology	U Göttingen
Hannelore	Ehrenreich	Clinical Neurosciences	MPI em
Gregor	Eichele	Genes and Behavior	MPI bpc
André	Fiala	Molecular Neurobiology of Behavior	U Göttingen
André	Fischer	Laboratory for Aging and Cognitive Diseases	ENI
Alexander	Flügel	Neuroimmunology	U Göttingen
Jens	Frahm	Biomedical NMR Research / Physical Chemistry	MPI bpc
Tim	Friede	Medical Statistics	U Göttingen
Eberhard	Fuchs	Animal Physiology / Neurobiology	DPZ
Theo	Geisel	Nonlinear Dynamics	MPI ds
Martin	Göpfert	Cellular Neurobiology	U Göttingen
Robert	Gütig	Theoretical Neuroscience	MPI em
Uwe-Karsten	Hanisch	Neuropathology	U Göttingen
Ralf	Heinrich	Neurobiology	U Göttingen
Stefan	Hell	NanoBiophotonics	MPI bpc
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
Siegrid	Löwel	Systems Neuroscience	U Göttingen
Till	Marquardt	Developmental Neurobiology	ENI
Ira	Milosevic	Synaptic Vesicle Dynamics	ENI
Tobias	Moser	Otolaryngology	U Göttingen
Klaus-Armin	Nave	Neurogenetics	MPI em
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
Moritz	Rossner	Gene Expression	MPI em
Detlev	Schild	Molecular Neurophysiology	U Göttingen
Oliver	Schlüter	Molecular Neurobiology	ENI
Manuela	Schmidt	Somatosensory Signaling	MPI em
Michael	Sereda	Molecular and Translational Neurology	MPI em
Mikael	Simons	Biochemistry and Molecular Cell Biology	MPI em
Jochen	Staiger	Neuroanatomy	U Göttingen
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
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
- Since 2001 Director of the Department of Neurology, University of Göttingen

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 -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 - 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

Krumova P, Meulmeester E, Garrido M, Tirard M, Hsiao HH, Bossis G, Urlaub H, Zweckstetter M, Kügler S, Melchior F, Bähr M, Weishaupt JH (2011) Sumoylation inhibits α-synuclein aggregation and toxicity. J Cell Biol. 194(1):49-60

Rau CR, Hein K, Sättler MB, Kretzschmar B, Hillgruber C, McRae BL, Diem R, Bähr M (2011) Anti-inflammatory effects of FTY720 do not prevent neuronal cell loss in a rat model of optic neuritis. Am J Pathol. 178(4):1770-81

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

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Thomas Bayer

Professor of Molecular Psychiatry

- 1984 – 1989 Diploma in biology, University of Stuttgart and Whitney Lab Florida
- 1989 – 1993 PhD at the University of Cologne (PhD Thyssen Graduate School)
- 1993 Postdoctoral Research Fellow, University of Cologne, Cologne
- 1993 – 1997 Postdoctoral Research Fellow, Institute of Neuropathology, University of Bonn Medical Center, Bonn
- 1997 – 2002 Lab leader, Department of Psychiatry, University of Bonn Medical Center, Bonn
- 2002 – 2007 Head of Neurobiology Lab, University of Saarland Medical Center, Homburg
- 2004 Appointment to apl Professor at the University Medical Center Saarland
- 2007 – present University Professor in “Molecular Psychiatry” at the Georg-August-University Göttingen, University Medicine Göttingen
- 2006 – 2011 Coordinator of the European Commission funded International Alzheimer PhD School «Neurodegeneration in Alzheimer’s disease – mechanism, consequence and therapy»
- Personal tutor of the Studienstiftung at the Georg-August-University Göttingen

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

Marcello A, Wirths O, Schneider-Axmann T, Degerman-Gunnarsson M, Lannfelt L, Bayer TA (2011) Reduced levels of IgM autoantibodies against N-truncated pyroglutamate Aβ in plasma of patients with Alzheimer’s disease. Neurobiol Aging 32: 1379-1387

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

Wirths O, Erck E, Martens H, Harmeier A, Geumann C, Jawhar S, Kumar S, Multhaup G, Walter J, Ingelsson M, Degerman-Gunnarsson M, Kalimo H, Huitinga I, Lannfelt L, Bayer TA (2010) Identification of low molecular weight pyroglutamate Abeta oligomers in Alzheimer disease: a novel tool for therapy and diagnosis pyroglutamate Abeta oligomers in Alzheimer disease: a novel tool for therapy and diagnosis. Journal of Biological Chemistry 53: 41517-24

Jawhar S, Wirths O, Schilling S, Graubner S, Demuth HU, Bayer TA (2011) Overexpression of glutaminyl cyclase, the enzyme responsible for pyroglutamate abeta formation, induces behavioral deficits and glutaminyl cyclase knock-out rescues the behavioral phenotype in 5XFAD mice. Journal of Biological Chemistry 286(6): 4454–4460

Wittnam JL, Portelius E, Zetterberg H, Gustavsson MK, Schilling S, Koch B, Demuth H-U, Blennow K, Wirths O, Bayer TA (2012) Pyroglutamate Amyloid ß (Aß) Aggravates Behavioral Deficits in Transgenic Amyloid Mouse Model for Alzheimer Disease. J Biol Chem 287 (11): 8154-8162

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Nils Brose

Professor, Director at the Max Planck Institute for Experimental Medicine

- Undergraduate studies in Biochemistry, Eberhard Karls University, Tübingen, Germany (1981 – 1985)
- MSc in Physiology with Marianne Fillenz, University of Oxford, Oxford, UK (1987)
- PhD in Biology with Reinhard Jahn, Ludwig Maximilians University, Munich, Germany (1990)
- Postdoctoral training with Stephen F. Heinemann (Salk Institute, La Jolla, CA, USA) and Thomas C. Südhof (University of Texas Southwestern Medical Center, Dallas, TX, USA) (1991 – 1995)
- Research Group Leader, Max Planck Institute of Experimental Medicine, Göttingen, Germany (1995 – 2001)
- Director, Department of Molecular Neurobiology, Max Planck Institute of Experimental Medicine, Göttingen, Germany (since 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

Kawabe H, Brose N (2011) The role of ubiquitylation in nerve cell development. Nat Rev Neurosci 12: 251-268

Kawabe H, Neeb A, Dimova K, Young SMJr, Takeda M, Katsurabayashi S, Mitkovski M, Malakhova OA, Zhang DE, Umikawa M, Kariya K, Goebbels S, Nave KA, Rosenmund C, Jahn O, Rhee JS, Brose, N (2010) Regulation of Rap2A by the ubiquitin ligase Nedd4-1 controls neurite development in cortical neurons. Neuron 65: 358-372

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

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Further Information

http://www.uni-goettingen.de/en/57922.html

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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Camin Dean

Group Leader Trans-synaptic Signaling

- 2003: Ph.D. University of California, Berkeley, and Columbia University
- 2004 – 2010: Postdoctoral Fellow, University of Wisconsin, Madison
- since 2010: Group Leader, European Neuroscience Institute- Göttingen

Major Research Interests

Our lab is interested in the mechanisms by which individual synapses, neurons and circuits dynamically adjust their transmission properties in response to changes in neuronal network activity. To accomplish this, neurons signal to eachother not only unidirectionally via classical pre to post-synaptic transmission, but also bidirectionally via pre or post-synaptic release of neuropeptides and neurotrophins. This bidirectional channel of communication is essential for the modulation of synapse and circuit strength, via regulation of distinct membrane fusion events on both sides of the synapse, including synaptic vesicle exocytosis, post-synaptic receptor recycling, and adhesion molecule recycling. We investigate the mechanisms by which these trans-synaptic signaling events are regulated, at the level of single synapses, single neurons and neuronal networks, using a combination of live imaging approaches, electrophysiology, and biochemistry in neuronal cell culture and brain slices. Our overall goal is to understand how neurons communicate changes in activity to affect circuit function, and ultimately behavior, during learning and memory acquisition, or to counteract aberrant brain states such as seizure activity.

Selected Recent Publications

Zhang G, Bai H, Zhang H, Dean C, Wu Q, Li J, Guariglia S, Meng Q, Cai D (2011) Neuropeptide exocytosis involving synaptotagmin-4 and oxytocin in hypothalamic programming of body weight and energy balance. Neuron 69(3): 523-35

Lee H, Dean C, Isacoff E (2010) Alternative splicing of neuroligin regulates the rate of presynaptic differentiation. J Neurosci 30(34): 11435-46

Arthur CP, Dean C, Pagratis M, Chapman ER, Stowell MH (2010) Loss of synaptotagmin IV results in a reduction in synaptic vesicles and a distortion of the Golgi structure in cultured hippocampal neurons. Neuroscience 167(1): 135-42

Dean C, Scheiffele P (2009) Imaging synaptogenesis by measuring accumulation of synaptic proteins. In Imaging in Developmental Biology: A Laboratory Manual. Cold Spring Harbor Protocols. R. Wong, J. Sharpe and R. Yuste eds. (11): pdb.prot5315

Liu, H, Dean, C, Arthur, CP, Dong, M, Chapman, ER (2009) Autapses and networks of hippocampal neurons exhibit distinct synaptic transmission phenotypes in the absence of synaptotagmin I. J. Neurosci 29(23): 7395-403

Dean C, Liu H, Dunning FM, Chang PY, Jackson, MB, Chapman, ER (2009) Synaptotagmin-IV modulates synaptic function and LTP by regulating BDNF release. Nature Neurosci (6): 767-76

Zhang Z, Bhalla A, Dean C, Chapman ER, Jackson MB (2009) Synaptotagmin IV: a multifunctional regulator of peptidergic nerve terminals. Nat. Neurosci 12(2): 163-71

Dong M, Yeh F, Tepp WH, Dean C, Johnson EA, Janz R, Chapman ER (2006) SV2 is the protein receptor for botulinum neurotoxin A. Science 312(5773): 592-6

Dean C, Dresbach T. Neuroligins and neurexins: linking cell adhesion, synapse formation and cognitive function (2006) Trends Neurosci 29(1): 21-9. Review

Baksh MM, Dean C, Pautot S, Demaria S, Isacoff E, Groves JT (2005) Neuronal activation by GPI-linked neuroligin-1 displayed in synthetic lipid bilayer membranes. Langmuir 21(23): 10693-8

Dean, C, Scheiffele, P (2004) Imaging synaptogenesis by measuring accumulation of synaptic proteins in transfected neurons. In Imaging in Neuroscience and Development, R. Yuste & A. Konnerth eds.

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Thomas Dresbach

Professor of Anatomy

- Dr.rer.nat. (Biology), 1996, University of Bonn
- DFG research fellow and postdoctoral Fellow with E. Gundelfinger at the Leibniz Institute for Neurobiology, 1997 – 2003
- Teacher and independent research group leader at the University of Heidelberg, Institute for Anatomy and Cell Biology (Dept. Prof. Dr. J. Kirsch), 2003 – 2010
- Professor at the School of Medicine, University of Göttingen, 2010

Major Research Interests

Our group studies synapse formation with particular focus on the biogenesis of presynaptic nerve terminals. Our goal is to understand the mechanisms of synaptogenesis in enough detail to pinpoint molecular causes of synaptopathies. We study neuronal cultures to unravel fundamental mechanisms operating at the heart of synaptogenesis, and we have begun to study specialized synapses such as the giant synapses of the mammalian auditory system to determine how these mechanisms act together to generate the remarkable specification and heterogeneity of synapses in the brain.
Using live imaging, molecular biological and ultrastructural approaches, we currently analyze
- the role of novel, vertebrate-specific presynaptic proteins in synaptic function
- the trafficking and assembly of synaptic organelles and protein complexes
- the transsynaptic signalling events controlling presynaptic differentiation.
These efforts should help us understand both the common principles by which the various types of synapses are generated, and how they are fine-tuned for specific tasks, such as a particular strength, reliability or adaptivity.

Selected Recent Publications

Stan A, Pielarski K N, Brigadski T, Wittenmayer N, Fedorchenko O, Gohla A, Lessmann V, Dresbach T, Gottmann K (2010) Essential co-operation of N-Cadherin and Neuroligin-1 in the transsynaptic control of vesicle accumulation. Proc Natl Acad Sci U S A 107: 11116-21

Wittenmayer N, Korber C, Liu H, Kremer T, Varoqueaux F, Chapman ER, Brose N, Kuner T, Dresbach T (2009) Postsynaptic Neuroligin1 regulates presynaptic maturation. Proc Natl Acad Sci U S A 106: 13564-13569

Fairless R, Masius H, Rohlmann A, Heupel K, Ahmad M, Reissner C, Dresbach T, Missler M (2008) Polarized targeting of neurexins to synapses is regulated by their C-terminal sequences. J Neurosci 28: 12969-12981

Tsuriel S, Fischer A, Wittenmayer N, Dresbach T, Garner CC, Ziv NE (2008) Exchange and redistribution dynamics of the cytoskeleton of the active zone molecule Bassoon. J Neurosci 29: 351-358

Kremer T, Kempf C, Wittenmayer N, Nawrotzki R, Kuner T, Kirsch J, Dresbach T (2007) Mover is a novel vertebrate-specific presynaptic protein with differential distribution at subsets of CNS synapses. FEBS Lett 581: 4727-4733

Dresbach T, Torres V, Wittenmayer N, Altrock WD, Zamorano P, Zuschratter W, Nawrotzki R, Ziv NE, Garner CC, Gundelfinger ED (2006) Assembly of active zone precursor vesicles: obligatory trafficking of presynaptic cytomatrix proteins Bassoon and Piccolo via a trans-Golgi compartment. J Biol Chem 281: 6038-6047

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

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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
- 2008 Adjunct Professor of Biology and Psychology, University of Göttingen

Major Research Interests

Translational Neuroscience
(1) Molecular-cellular basis of neuropsychiatric diseases with focus on endogenous mechanisms of neuroprotection and neuroregeneration
(2) Clinical research on neuroprotection/neuroregeneration and phenotype-based genetic association studies (PGAS) in acute (ischemia/hypoxia, neurotrauma) and chronic brain diseases (schizophrenia, autism, MS, ALS, alcoholism)

Selected Recent Publications

Treiber H, Hagemeyer N, Ehrenreich H, Simons M (2012) BACE1 in central nervous system myelination revisited. Mol Psychiatry 17(3): 237-9

Hagemeyer N, Goebbels S, Papiol S, Kästner A, Hofer S, Begemann M, Gerwig UC, Boretius S, Wieser GL, Ronnenberg A, Gurvich A, Heckers SH, Frahm J, Nave KA, Ehrenreich H. A myelin gene causative of a catatonia-depression syndrome upon aging. EMBO Mol Med 4(6): 528-39

Ribbe K, Ackermann V, Schwitulla J, Begemann M, Papiol S, Grube S, Sperling S, Friedrichs H, Jahn O, Sillaber I, Gefeller O, Krampe H, Ehrenreich H (2011) Interaction of common genetic variants in the corticotropin releasing factor system predicts the risk of comorbid alcoholism in schizophrenia. Arch Gen Psych 68(12): 1247-56

Papiol S, Malzahn D, Kästner A, Sperling S, Begemann M, Bickeböller H, Nave KA, Ehrenreich H (2011) Dissociation of accumulated genetic risk and disease severity in patients with schizophrenia. Translational Psychiatry 4;1: e45

Grube S, Gerchen MF, Adamcio B, Pardo LA, Martin S, Malzahn D, Papiol S, Begemann M, Ribbe K, Friedrichs H, Radyushkin KA, Müller M, Benseler F, Riggert J, Falkai P, Bickeböller H, Nave KA, Brose N, Stühmer W, Ehrenreich H (2011) A CAG repeat polymorphism of KCNN3 predicts SK3 channel function and cognitive performance in schizophrenia. EMBO Molecular Medicine 3(6): 309-19

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 (2011) Recombinant human erythropoietin delays loss of gray matter in chronic schizophrenia. Molecular Psychiatry 16: 26-36

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- 1976 – 1980 Ph.D. protein crystallography (J. N. Jansonius, Biocenter, University of Basel, Switzerland)
- 1981 – 1984 Postdoctoral training in Developmental Biology (B. M. Alberts, University of California, San Francisco)
- 1985 – 1989 Assistant Professor of Cellular and Molecular Physiology, Harvard Medical School, Boston, USA
- 1989 – 1990 Associate Professor of Cellular and Molecular Physiology, Harvard Medical School, Boston, USA
- 1991 – 1992 Associate Professor of Biochemistry, Baylor College of Medicine, Houston, USA
- 1992 – 1998 Professor of Biochemistry and Neuroscience, Baylor College of Medicine, Houston, USA
- 1998 – 2006 Director at the Max Planck Institute of Experimental Endocrinology, Dept. of Molecular Embryology, Hanover, Germany
- 2006 – Director at the Max Planck Institute of Biophysical Chemistry, Dept. Genes and Behavior, Goettingen, Germany

Major Research Interests

Dynamic interplay between gene expression, brain development and architecture and behaviour.

Selected Recent Publications

Zheng B, Albrecht U, Kaasik K, Sage M, Lu W, Vaishnav S, Li Q, Su ZS, Eichele G, Bradley A, Lee CC (2001) Nonredundant roles of the mPer1 and mPer2 genes in the mammalian circadian clock. Cell 105: 683-694

Carson JP, Ju T, Lu HC, Thaller C, Xu M, Pallas SL, Crair MC, Warren J, Chiu W, Eichele G (2005) A Digital Atlas to characterize the mouse brain transcriptome. PLoS Comput Biol 1: 289-296

Oster H, Damerow S, Kiessling S, Jakubcakova V, Abraham D, Tian J, Hoffmann MW, Eichele G (2006) The circadian rhythm of glucocorticoids is regulated by a gating mechanism residing in the adrenal cortical clock. Cell Metabolism 4: 163-173

Lein ES et al. (2007) Genome-Wide Atlas of Gene Expression in the Adult Mouse Brain. Nature 445: 168-176

Jakubcakova V, Oster H, Tamanini F, Cadenas C, Leitges M, van der Horst GT, Eichele G (2007) Light entrainment of the mammalian circadian clock by a PRKCA-dependent posttranslational mechanism. Neuron 54: 831-43

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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

Riemensperger T, Pech U, Dipt S, Fiala A (2012) Optical calcium imaging in the nervous system of *Drosophila melanogaster*. Biochim Biophys Acta 1820: 1169-78

Christiansen F, Zube C, Andlauer TF, Wichmann C, Fouquet W, Owald D, Mertel S, Leiss F, Tavosanis G, Luna AJ, Fiala A, Sigrist SJ (2011) Presynapses in Kenyon cell dendrites in the mushroom body calyx of *Drosophila*. J Neurosci 31: 9696-707

Störtkuhl KF, Fiala A (2011) The Smell of Blue Light: A new approach toward understanding an olfactory neuronal network. Front Neurosci 5: 72

Fiala A, Suska A, Schlüter OM (2010) Optogenetic approaches in neuroscience. Curr Biol 20: 897-903

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: 1229-35

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: 165-71

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

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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 nondemented 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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Alexander Flügel

Professor, Neuroimmunology

- 1993 MD Ludwig-Maximilians-University (LMU) Munich
- 2002 – 2007 Group leader at the Institute of Neuroimmunology, Max-Planck-Institute for Neurobiology, Martinsried, Munich
- 2008 Associate professor for Experimental Immunology at the Institute for Immunology, LMU Munich
- since 12/2008 Full professor and director of the Department of Neuroimmunology / Institute for Multiple Sclerosis Research, University of Göttingen

Major Research Interests

- Neuroimmunology
- T cell biology
- Intravital imaging

The focus of my interest lies on the mechanisms and factors that allow T cells to enter the central nervous system, to communicate in this milieu and to influence the brain tissue.
My colleagues and I pursue the following aims, i) development of new models and tools to study CNS autoimmunity; ii) revealing the basics of pathogenesis in (auto-)immune diseases of the nervous system; iii) deducing and developing new therapeutical approaches; and iv) analyzing the mechanisms of action for (adverse) effects of new therapeutical procedures.

Selected Recent Publications

Cordiglieri C, Odoardi F, Zhang B, Nebel M, Kawakami N, Klinkert WE, Lodygin D, Lühder F, Breunig E, Schild D, Ulaganathan VK, Dornmair K, Dammermann W, Potter BV, Guse AH, Flügel A (2010) Nicotinic acid adenine dinucleotide phosphate-mediated calcium signalling in effector T cells regulates autoimmunity of the central nervous system. Brain 133: 1930-1943

Bartholomäus I, Kawakami N, Odoardi F, Schläger C, Miljkovic D, Ellwart JW, Klinkert WE, Flugel-Koch C, Issekutz TB, Wekerle H, Flügel A (2009) Effector T cell interactions with meningeal vascular structures in nascent autoimmune CNS lesions. Nature 462: 94-98

Dammermann W, Zhang B, Nebel M, Cordiglieri C, Odoardi F, Kirchberger T, Kawakami N, Dowden J, Schmid F, Dornmair K, Hohenegger M, Flügel A*, Guse AH*, Potter BV* (2009) NAADP-mediated Ca^{2+} signaling via type 1 ryanodine receptor in T cells revealed by a synthetic NAADP antagonist. Proc Natl Acad Sci USA 106: 10678-10683

Odoardi F, Kawakami N, Klinkert WE, Wekerle H, Flügel A (2007) Blood-borne soluble protein antigen intensifies T cell activation in autoimmune CNS lesions and exacerbates clinical disease. Proc Natl Acad Sci USA 104: 18625-18630

Odoardi F, Kawakami N, Li Z, Cordiglieri C, Streyl K, Nosov M, Klinkert WE, Ellwart JW, Bauer J, Lassmann H, Wekerle H, Flügel A (2007) Instant effect of soluble antigen on effector T cells in peripheral immune organs during immunotherapy of autoimmune encephalomyelitis. Proc Natl Acad Sci USA 104: 920-925

Kawakami N, Nägerl UV, Odoardi F, Bonhoeffer T, Wekerle H, A. Flügel A. (2005) Live imaging of effector cell trafficking and autoantigen recognition within the unfolding autoimmune encephalomyelitis lesion. Journal of Experimental Medicine 201(11): 1805-14

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Jens Frahm

Director, Biomedizinische NMR Forschungs GmbH (not-for-profit) at the Max Planck Institute for Biophysical 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
- since 2011 External Scientific Member, MPI for Dynamic and Self-Organization

Major Research Interests

- Development and biomedical applications 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, cardiovascular MRI
- 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, R. Tammer, T. Michaelis, J. Brockmöller, J. Frahm (2013) Halogenated volatile anesthetics alter brain metabolism as revealed by proton magnetic resonance spectroscopy of mice *in vivo*. NeuroImage 69: 244-255

Uecker M, S Zhang, D Voit, KD Merboldt, J Frahm (2012) Real-time MRI – Recent advances using radial FLASH. Imaging Med 4: 461-476

Joseph AA, KD Merboldt, D Voit, S Zhang, M Uecker, J Lotz, J Frahm (2012) Real-time phase-contrast MRI of cardiovascular blood flow using undersampled radial fast low-angle shot and nonlinear inverse reconstruction. NMR Biomed 25: 917-924

Schweisfurth MA, R Schweizer, J Frahm (2011) Functional MRI indicates consistent intra-digit topographic maps for the little but not the index finger within the human primary somatosensory cortex. NeuroImage 56: 2138-2143

Watanabe T, J Frahm, T Michaelis (2012) Myelin mapping in the central nervous system of living mice using contrast-enhanced magnetization transfer MRI. NeuroImage 63: 812-817

Fünfschilling U, LM Supplie, D Mahad, S Boretius, A Saab, J Edgar, BG Brinkmann, CM Kassmann, ID Tzvetanova, W Möbius, F Diaz, D Meijer, U Suter, B Hamprecht, MW Sereda, CT Moraes, J Frahm, S Goebbels, KA Nave (2012) Glycolytic oligodendrocytes maintain myelin and long-term axonal integrity. Nature 485: 517-521

Merboldt KD, M Uecker, D Voit, J Frahm (2011) Spatially encoded phase-contrast MRI – 3D MRI movies of 1D and 2D structures at millisecond resolution. Magn Reson Med 66: 950-956

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Tim Friede

Professor of Biostatistics

- 1998 Dipl.-Math. (Master degree in Mathematics), University of Karlsruhe, Germany
- 2001 Dr.sc.hum. (PhD), University of Heidelberg, Germany
- 2001 – 2004 PostDoc / lecturer, Dept. of Mathematics and Statistics, Lancaster University, UK
- 2004 – 2006 Expert Statistical Methodologist, Novartis Pharma AG, Basel, Switzerland
- 2006 – 2009 Associate Professor of Medical Statistics, University of Warwick, UK
- since 1/2010 Professor of Biostatistics and Director, Dept. of Medical Statistics, University Medical Center Göttingen

Major Research Interests

Design and analysis of clinical trials, with a particular interest in so-called adaptive designs.
Clinical biostatistics including designs for clinical trials (in particular flexible adaptive designs) and systematic reviews / meta-analyses.

Selected Recent Publications

Nicholas R, Straube S, Schmidli H, Pfeiffer S, Friede T (2012) Time-patterns of annualized relapse rates in randomized placebo-controlled clinical trials in relapsing multiple sclerosis: A systematic review and meta-analysis. Multiple Sclerosis Journal 18: 1290-1296

Nicholas R, Straube S, Schmidli H, Schneider S, Friede T (2011) Trends in annualized relapse rates in relapsing remitting multiple sclerosis and consequences for clinical trial design. Multiple Sclerosis Journal 2011; 17: 1211-1217

Friede T, Parsons N, Stallard N, Todd S, Valdés-Márquez E, Chataway J, Nicholas R (2011) Designing a seamless phase II/III clinical trial using early outcomes for treatment selection: An application in multiple sclerosis. Statistics in Medicine 30: 1528-1540

Nicholas R, Giannetti P, Alanousi A, Friede T, Muraro PA (2011) Development of oral immunomodulatory agents in the management of multiple sclerosis. Drug Design, Development and Therapy 5: 255-274

Chataway J, Nicholas R, Todd, S, Parsons N, Todd S, Miller D, Valdés-Márquez E, Stallard N, Friede T (2011) A novel adaptive design strategy increases the efficiency of clinical trials in secondary progressive multiple sclerosis. Multiple Sclerosis 17: 81-88

Nicholas R, Young C, Friede T (2010) Bladder symptoms in Multiple Sclerosis: a review of pathophysiology and management. Expert Opinion on Drug Safety: 905-915

Friede T, Nicholas R, Stallard N, Todd S, Parsons N, Valdés-Márquez E, Chataway J (2010) Refinement of the Clinical Scenario Evaluation Framework for Assessment of Competing Development Strategies With an Application to Multiple Sclerosis. Drug Information Journal 44: 713-718

Friede T, Schmidli H (2010) Blinded sample size reestimation with count data: Methods and applications in multiple sclerosis. Statistics in Medicine 29: 1145-1156

Nicholas RS, Friede T, Hollis S, Young CA (2009) Anticholinergics for urinary symptoms in multiple sclerosis. Cochrane Database of Systematic Reviews 2009, Issue 1. Art. No.: CD004193. DOI: 10.1002/14651858.CD004193

Friede T, Stallard N (2008) A comparison of methods for adaptive treatment selection. Biometrical Journal 50: 767-781

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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

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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

Hennig H, Fleischmann R, Fredebohm A, Hagmayer Y, Nagler J, Witt A, Theis F, Geisel T (2011) The nature and perception of fluctuations in human musical rhythms. PLoS ONE 6(10): e26457.

Belik V, Geisel T, Brockmann D (2011) Natural Human Mobility Patterns and Spatial Spread of Infectious Diseases. PHYSICAL REVIEW X 1(011001):1--5.

Metzger JJ, Fleischmann R, Geisel T (2010) Universal Statistics of Branched Flows. Phys. Rev. Lett. 105(2): 020601

Tchumatchenko T, Geisel T, Volgushev M, Wolf F (2010) Signatures of synchrony in pairwise count correlations. Front Comput Neurosci doi:10.3389/neuro.10.001.2010.

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

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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

Effertz T, Wiek R, Göpfert MC (2011) NompC TRP channel is essential for *Drosophila* sound receptor function. Curr Biol 21, 592-597

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

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Robert Gütig

Max Planck Research Group Leader

- Undergraduate studies in Physics and Psychology, FU Berlin, University of Cambridge and Heidelberg University (1993 – 1999)
- MPhil in Theoretical Pysics, University of Cambridge, UK (1997)
- PhD in Computational Neuroscience with Ad Aertsen, University of Freiburg (1999 – 2002)
- Postdoctoral training with Andreas Hertz, Institute of Theoretical Biology, HU Berlin (2003 – 2005)
- Postdoctoral training with Haim Sompolinsky, Interdisciplinary Center for Neural Computation, Hebrew University of Jerusalem, Israel (2005 – 2011)
- Max Planck Research Group Leader, Theoretical Neuroscience (since 2011)

Major Research Interests

We use analytical and numerical modeling techniques to identify the computational principles underlying spike based information processing and learning in central nervous systems and to understand how these principles are implemented by biological processes. Specifically, we focus on the role of action potential timing in subserving sensory neuronal representations and computation as well as in controlling synaptic plasticity. Projects center around the recently developed tempotron family of spiking neuronal network models and cover a broad range of topics including mathematical analyzes of information processing in spiking neuronal networks, spike-based learning in single and multi-layer neuronal networks, sensory spike data analysis, temporal processing with short term synaptic dynamics, as well as applied development of visual and speech processing systems.

Selected Recent Publications

Gütig R, Sompolinsky H (2009) Time-warp-invariant neuronal processing. PLoS Biol 7: e1000141-e1000141

Gütig R, Sompolinsky H (2006) The tempotron: a neuron that learns spike timing-based decisions. Nat Neurosci 3: 420-428

Gütig R, Aertsen A, Rotter S (2003) Analysis of higher-order neuronal interactions based on conditional inference. Biol Cybern 88: 352-359

Gütig R, Aharonov R, Rotter S, Sompolinsky H (2003) Learning input correlations through nonlinear temporally asymmetric Hebbian plasticity. J Neurosci 23: 3697-3714

Gütig R, Aertsen A, Rotter S (2002) Statistical significance of coincident spikes: count-based versus rate-based statistics. Neural Comput 14: 121-153

Betsch T, Plessner H, Schwieren C & Gütig R (2001) I like it but I don't know why: A value-account approach to implicit attitude formation. Personality and Social Psychology Bulletin 27: 242-253

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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 is the product of complex interactions between various types of neurons that integrate external sensory information with internal physiological states. Motivational systems in general bias an organism to perform most useful actions to secure survival and reproduction by influencing the initiation, intensity, direction and persistence of behaviors. Our lab is especially interested in central nervous and humoral mechanisms underlying the selection and adaptation of actions that are most appropriate for the particular situation an animal encounters. We study the neurochemical mechanisms underlying motivational states in behavior with a combination of neuroethological, pharmacological, electrophysiological, histochemical and immunocytochemical methods and apply these to intact animals, reduced preparations and cultured cells of various invertebrate species.
Our research interests include questions on the evolution of pharmacological signals, central nervous and humoral systems and sensory organs by comparison of various invertebrate and vertebrate species. Since invertebrates offer unique advantages over more complex nervous systems of vertebrates and especially mammals (e.g. a smaller number of neurons in the central nervous system, individually identifiable neurons and rather limited repertoires of behaviors), we select the most suitable and experimentally accessible preparation from various phylogenetic groups including insects (locusts, grasshoppers, fruitflies), crustaceans (marbled crayfish) and annelids (medicinal leech).

Selected Recent Publications

Ostrowski D, Ehrenreich H, Heinrich R (2011) Erythropoietin promotes survival and regeneration of insect neurons *in vivo* and *in vitro*. Neuroscience 188: 95-108

Johnsson T, Kravitz EA, Heinrich R (2011) Sound production during agonistic behaviour of male *Drosophila melanogaster*. Fly 5: 29-38

Wirmer A, Heinrich R (2011) Nitric oxide/cGMP signaling in the corpora allata of female grasshoppers. J Insect Physiology 57: 94-107

Farca Luna AJ, Heinrich R, Reischig T (2010) The circadian biology of the marbled crayfish. Frontiers in Bioscience E2(4): 1414-1431

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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Stefan Hell

Professor, Director at the Max Planck Institute for Biophysical Chemistry

- 1987 Diploma in Physics, Univ. of Heidelberg (1.0)
- 1990 Doctorate in Physics, Univ. of Heidelberg (summa cum laude)
- 1991 – 1993 Postdoctoral Researcher, EMBL (European Molecular Biology Laboratory)
- 1993 – 1996 Principal Investigator, Laser Microscopy Group; Univ. of Turku, Finland
- 1996 Habilitation in Physics, Univ. Heidelberg; Physics teaching since 02/1996
- 1997 – 2002 Head, Max-Planck Junior Group High Resolution Optical Microscopy, at the Max-Planck-Institute for Biophysical Chemistry Göttingen, Germany
- since 10/2002 Director at the Max Planck Institute for Biophysical Chemistry, Head of Department of NanoBiophotonics
- since 12/2003 Apl. Prof., Faculty of Physics, Univ. of Heidelberg
- since 12/2003 Head of High Resolution Optical Microscopy Division, DKFZ Heidelberg
- since 01/2004 Hon. Prof., Faculty of Physics, Univ. of Göttingen

Major Research Interests

Optical microscopy beyond the diffraction barrier with far-field optics
Invention of STED, RESOLFT, GSDIM and 4Pi microscopy and related techniques

Selected Recent Publications

Berning S, Willig KI, Steffens H, Dibaj P, Hell SW (2012) Nanoscopy in a Living Mouse Brain. Science 335: 551

Testa, I., N. T. Urban, S. Jakobs, C. Eggeling, K. I. Willig, S. W. Hell (2012) Nanoscopy of Living Brain Slices with Low Light Levels. Neuron 75: 992-1000

Grotjohann T, Testa I, Leutenegger M, Bock H , Urban NT, Lavoie-Cardinal F, Willig KI, Eggeling C, Jakobs S, Hell SW (2012) Diffraction-unlimited all-optical imaging and writing with a photochromic GFP. Nature 478: 204-208

Vicidomini, G., Moneron, G., Han, K. Y., Westphal V., Ta H., Reuss M., Engelhardt J., Eggeling C., Hell S. W. (2011) Sharper low-power STED nanoscopy by time gating. Nature Meth 8: 571-573

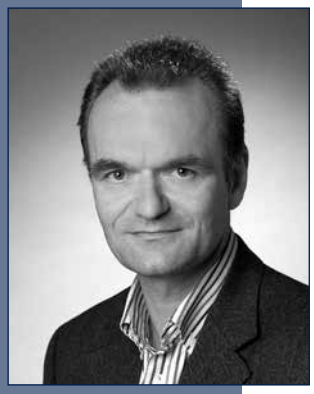
Liu KSY, Siebert M, Mertel S, Knoche E, Wegener S, Wichmann C, Matkovic T, Muhammad K, Depner H, Mettke C, Bückers J, Hell SW, Müller M, Davis GW, Schmitz D, Sigrist SJ (2011) RIM-Binding Protein, a Central Part of the Active Zone, Is Essential for Neurotransmitter Release. Science 334: 1565-1569

Maurer PC, Maze JR, Stanwix PL, Jiang L, Gorshkov AV, Zibrov AA, Harke B, Hodges JS, Zibrov AS, Yacoby A, Twitchen D, Hell SW, Walsworth RL, Lukin MD (2010) Far-field optical imaging and manipulation of individual spins with nanoscale resolution. Nature Phys 6: 912-918

Eggeling C, Ringemann C, Medda R, Schwarzmann G, Sandhoff K, Polyakova S, Belov VN, Hein B, von Middendorff C, Schönle A, Hell SW (2009) Direct observation of the nanoscale dynamics of membrane lipids in a living cell. Nature 457: 1159-1163

Hell SW, Rittweger E (2009) Light from the dark. Nature 461: 1069-1070

Westphal V, Rizzoli SO, Lauterbach MA, Kamin D, Jahn R, Hell SW (2008) Video-Rate Far-Field Optical Nanoscopy Dissects Synaptic Vesicle Movement. Science 320: 246-249



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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 Neurosci 12(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 of the Department of Neurobiology, Max Planck Institute for Biophysical Chemistry, Göttingen, Germany, 1997

Major Research Interests

Our group is interested in the mechanisms of membrane fusion, with the main emphasis on regulated exocytosis in neurons. 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, which then assemble in a zipper-like fashion to initiate membrane merger. The neuronal SNAREs are among the best characterized. They are the targets of the toxins responsible for botulism and tetanus, and they are regulated by several addtional proteins including synaptotagmin, the calcium sensor for neurotransmitter release. To understand how these proteins mediate fusion, we study their properties *in vitro* with biochemical and biophysical approaches using native and artificial membranes.
In a second set of projects, we use modern techniques such as quantitative proteomics to better understand supramolecular protein complexes involved in synaptic function. Using our quantitative description of synaptic vesicles as point of departure we aim at unraveling presynaptic protein networks involved in synaptic vesicle docking and fusion. Furthermore, we are studying regulation of presynaptic function by small GTPases and by protein phosphorylation.

Selected Recent Publications

Park Y, Hernandez JM, van den Bogaart G, Ahmed S, Holt M, Riedel D, Jahn R (2012) Controlling synaptotagmin activity by electrostatic screening. Nature Struct Mol Biol 19: 991-997

Jahn R, Fasshauer D (2012) Exocytosis of synaptic vesicles – molecular machines, calcium, and beyond (review). Nature, 490(7419):201-7

Hernandez JM, Stein A, Behrmann E, Riedel D, Cypionka A, Farsi Z, Walla PJ, Raunser S, Jahn R (2012) Membrane fusion intermediates via directional and full assembly of the SNARE complex. Science 336: 1581-1584

Chua JJ, Butkevich E, Worseck JM, Kittelmann M, Gronborg M, Behrmann E, Stelzl U, Pavlos NJ, Lalowski M, Eimer S, Wanker EE, Klopfenstein DR*, Jahn R* (2012) Phosphorylation-regulated axonal dependent transport of syntaxin 1 is mediated by a Kinesin-1 adapter. Proc Natl Acad Sci USA 109, 5862-5867

van den Bogaart G, Meyenberg K, Risselada JH, Amin H, Willig KI, Hubrich BE, Dier M, Hell SW, Grubmüller H, Diederichsen U, Jahn R (2011) Membrane protein sequestering by ionic protein-lipid interactions. Nature 479, 552-555

van den Bogaart G, Thutupalli S, Risselada JH, Meyenberg K, Holt M, Riedel D, Diederichsen U, Herminghaus S, Grubmüller H, Jahn R (2011) Synaptotagmin-1 may be a distance regulator acting upstream of SNARE nucleation. Nat Struct Mol Biol 18, 805-812

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

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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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Siegrid Löwel

Professor of Systems Neuroscience

- Prof. of Systems Neuroscience, BFNT and Johann-Friedrich-Blumenbach Institute for Zoology and Anthropology, Georg-August-Universität Göttingen, since 2010
- Professor of Neurobiology, Friedrich-Schiller-Universität Jena, 2005 – 2010
- Scholarship in the Hertie-Excellency Program “Neurosciences” (www.ghst.de), 2004 - 2005
- Dorothea-Erxleben-Guest Professorship, Otto-von-Guericke-Universität
- Magdeburg (http://www.unimagdeburg.de/gleichstellungsbuero/gleich/erxleb.htm), 2003 – 2004
- Associate Research Physiologist/Research Associate Professor, School of Medicine, Dept. Physiology, University of California in San Francisco, USA, 2002 – 2003
- Head of the Research Group “Visual Development and Plasticity”, Leibniz Institute for Neurobiology, Magdeburg, 1997 – 2002 & 2004 – 2005
- Research Assistant, Dept. Neurophysiology (Prof. Dr. Wolf Singer), Max-Planck-Institut für Hirnforschung, Frankfurt am Main,1990 – 1997
- Dr. phil. nat. (Ph.D.), 1988, Johann-Wolfgang-Goethe-Universität Frankfurt am Main

Major Research Interests

The Löwel lab is focussed on understanding the development and plasticity ofneuronalcircuits in the mammalian cortex. We use a combination of techniques,including optical imaging, electrophysiology and neuroanatomy to explore how experience and learning influence the structure and function of nerve cell networksand how activity patterns and genetic factors influence these processes.We hope that answering these key questions not only helps to understand therules underlying brain development, functioning and learning but additionally willopen up new avenues to develop clinically relevant concepts to promote regenerationand rehabilitation for diseased and injured brains.
The Löwel lab has made major contributions to experience-dependent changesin nerve cell networks: We were the first to demonstrate that the learning rulefor the development of long-range cortical circuits is correlated activity. “neuronswire together if they fire together” (Löwel& Singer, 1992, Science 255: 209-212). We also provided evidence that these connections play a major role for context dependent effects in visual perception (Crook et al., 2002, Exp. BrainRes. 143: 295-302; Schmidt et al., 1997, Europ. J. Neurosci. 5: 1083-1089).
We were also the first to demonstrate a major effect of genetic factors on thelayout of cortical maps (Kaschube et al., 2002, J. Neurosci. 22: 7206-7217) andprovided evidence that long-range connections between neurons coordinate thedevelopment of different brain regions and even of the two brain hemispheres(Kaschube et al., 2009, PNAS 106: 17205-17210). Recently, we helped to establishoptical imaging of intrinsic signals as a screening tool for cortical plasticity in mice (Cang et al., 2005, Vis. Neurosci. 685-691) and started characterizingvarious mutant mice (e.g. Goetze et al., 2010, Thygarajan et al., 2010).

Selected Recent Publications

Kaschube M, Schnabel M, Löwel S, Coppola DM, White LE and Wolf F (2010) Universality in the evolution of orientation columns in the visual cortex. Science 330: 1113-1116 (published online Nov. 4, 2010, DOI: 10.1126/science.1194869)

Thygarajan S, van Wyk M, Lehmann K, Löwel S, Feng G and Wässle H (2010) Visual function in retinal degeneration mice and transgenic expression of channelrhodopsin 2 in ganglion cells. J Neurosci 30: 8745-8758

Keil W, Schmidt K-F, Löwel S and Kaschube M (2010) Reorganization of columnar architecture in the growing visual cortex. Proc Natl Acad Sci USA 107: 12293-12298

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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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- 2006 – 2012: PostDoc, HHMI and Yale University School of Medicine, Dept. of Cell Biology, New Haven, CT, USA (advisor: Prof. Pietro De Camilli)
- 2006: Ph.D., IMPRS Neurosciences, Georg August University Göttingen, Germany; thesis work performed at Max Planck Institute for Biophysical Chemistry, Dept. of Membrane Biophysics and Dept. of Biochemistry (advisors: Prof. Erwin Neher, Prof. Reinhard Jahn)
- 2003: M.Sc., IMPRS Neurosciences, Georg August University Göttingen, Germany; thesis work performed at Max Planck Institute for Biophysical Chemistry, Dept. of Membrane Biophysics and Dept. of Biochemistry (advisors: Prof. Erwin Neher, Prof. Reinhard Jahn)
- 2001: Diploma (Dipl. Ing.) in Molecular Biology University of Zagreb, Zagreb, Croatia; thesis work performed at Eötvös Lorand University, Dept. of Biochemistry, Budapest, Hungary and Ruder, Boskovic Institute, Dept. of Molecular Genetics, Zagreb, Croatia (advisors: Prof. Ivana Weygand-Durasevic, Prof. Laszlo Nyitray)

Major Research Interests

The laboratory investigates fundamental aspects of synaptic vesicle recycling that have relevance to neurological and neurodegenerative diseases, using mouse and mammalian cells as a model system. A cutting edge genomic engineering is combined with the latest techniques of imaging and cell biology to study the processes that regulate synaptic vesicle formation. In a distinct but related strand of work, we are exploring the signaling processes that originate from altered neurotransmission and lead to neurodegeneration.

Selected Recent Publications

Milosevic I*, Giovedi S*, Lou X, Raimondi A, Collesi C, Shen H, Paradise S, O'Toole E, Ferguson S, Cremona O, De Camilli P (2011) Recruitment of endophilin to clathrin coated pit necks is required for efficient vesicle uncoating after fission. Neuron 72 (4), 587-601 *equal contribution de Wit H, Walter A, Milosevic I, Gulyás-Kovács A, Sørensen JB,Verhage M (2009) Four proteins that dock secretory vesicles to the target membrane. Cell 138 (5): 935-946

Nagy G*, Milosevic I*, Mohrmann R, Wiederhold K, Walter AM, Sørensen JB (2008) The SNAP-25 linker as an adaptation toward fast exocytosis. Mol Biol Cell 19 (9): 3769-3781 *equal contribution

Gulyás-Kovács A, de Wit H, Milosevic I, Kochubey O, Toonen R, Klingauf J, Verhage M, Sørensen JB. (2007) Munc18-1: sequential interactions with the fusion machinery stimulate vesicle docking and priming. J Neurosci 27(32): 8676-8686 (accompanied by an editorial comment in J Neurosci 27 (32), i)

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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

Stassart RM, Fledrich R, Velanac V, Brinkmann BG, Schwab MH, Meijer D, Sereda MW, Nave K-A (2012) A role for Schwann cell derived neuregulin-1 in remyelination. Nat Neurosci 16: 48-54

Saher G, Rudolphi F, Corthals K, Ruhwedel T, Schmidt KF, Löwel S, Dibaj P, Barrette B, Möbius W, Nave K-A (2012) Therapy of Pelizaeus-Merzbacher disease in mice by feeding a cholesterol-enriched diet. Nat Med 18: 1130-1135

Fünfschilling U, Supplie LM, Mahad D, Boretius S, Saab AS, Edgar J, Brinkmann BG, Kassmann CM, Tzvetanova ID, Möbius W, Diaz F, Meijer D, Suter U, Hamprecht B, Sereda MW, Moraes CT, Frahm J, Goebbels S, Nave K-A (2012). Glycolytic oligodendrocytes maintain myelin and long-term axonal integrity. Nature 485: 517-521

Goebbels S, Oltrogge JH, Wolfer S, Wieser GL, Nientiedt T, Pieper A. Ruhwedel T, Groszer M, Sereda MW, Nave K-A (2012) Genetic disruption of Pten in a novel mouse model of tomaculous neuropathy. EMBO Mol Med 4: 486-499

Dhaunchak AS, Colman DR, Nave K-A (2011) Misalignment of PLP/DM20 transmembrane domains determines protein misfolding in Pelizaeus-Merzbacher disease. J Neurosci 31: 14961-14971

Nave K-A (2010) Myelination and support of axonal integrity by glia. Nature 468: 244-252

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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

Kohl T, Lörinczi E, Pardo LA, Stühmer W (2011) Rapid internalization of the oncogenic K^+ channel Kv10.1 PLoS ONE 6: e26329

Hartung F, Stühmer W, Pardo LA (2011) Tumor cell-selective apoptosis induction through targeting of kv10.1 via bifunctional trail antibody. Mol Cancer 10: 109

Chen Y, Sánchez A, Rubio ME, Kohl T, Pardo LA, Stühmer W (2011) Functional Kv10.1 channels localize to the inner nuclear membrane. PLoS ONE 6: e19257

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

Agarwal J, Griesinger F, Stühmer W, Pardo L (2010) The potassium channel ether a go-go is a novel prognostic factor with functional relevance in acute myeloid leukemia. Molecular Cancer 9: 18

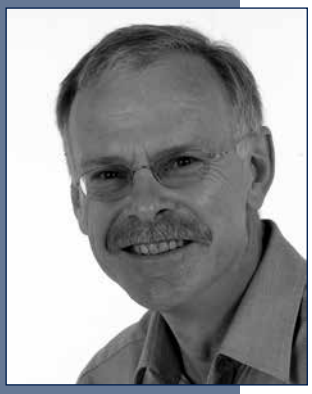
Wulf H, Castle N, Pardo LA (2009) Voltage-gated potassium, chanels as therapeutic drug targets. Nature Reviews Drug Discovery

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



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

We intend to understand and modulate cortical plasticity in man. This is mainly done on a behavioural, imaging and electrophysiological level. We use (motor) learning paradigms, evaluate them by behavioural techniques and by recording EMG; EEG or fMRI data in the context with connectivity analyses. We develop and/or apply stimulation techniques such as repetitive transcranial magnetic stimulation (rTMS), transcranial direct current stimulation, alternating current stimulation or random noise stimulation (tDCS, tACS, tRNS). TMS induces a short electric current in the human brain. Both rTMS and electric stimulation techniques 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.
The Department of Clinical Neurophysiology pursues other research areas such as Neurorehabilitation in conjunction with the Bernstein Centre of Computational Neuroscience and with the Company Otto Bock. Another focus concerns Hereditary Neuropathies in collaboration with the MPI for Experimental Medicine, speech disorders with a focus on stuttering and others (overview researcher ID A-3544-2009).

Selected Recent Publications

Antal A, Polania R, Schmidt-Samoa C, Dechent P, Paulus W. (2011) Transcranial direct current stimulation over the primary motor cortex during fMRI. Neuroimage. 2011 Mar 15;55(2): 590-6

Moliadze V, Antal A, Paulus W. Boosting brain excitability by transcranial high frequency stimulation in the ripple range. J Physiol 2010 588: 4891-904

Nitsche MA, Kuo MF, Karrasch R, Wächter B, Liebetanz D, Paulus W (2009) Serotonin affects transcranial direct current-induced neuroplasticity in humans. BIOL PSYCHIAT 66(5): 503-8

Terney D, Chaieb L, Moliadze V, Antal A, Paulus W (2008) Increasing human brain excitability by transcranial high-frequency random noise stimulation. J Neurosci 28(52): 14147-55

Polanía R, Nitsche MA, Korman C, Batsikadze G, Paulus W (2012) The importance of timing in segregated theta phase-coupling for cognitive performance. Curr Biol 22: 1314-8

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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

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Moritz Rossner

Group Leader, Gene Expression

- 1998 PhD, Center of Molecular Biology Heidelberg (ZMBH), University of Heidelberg
- 2000 Project Leader, Axaron Bioscience AG, Heidelberg
- 2003 Group Leader, Max-Planck-Institute of Experimental Medicine, Göttingen

Major Research Interests

Our research interest is directed towards the generation and analysis of transgenic mouse mutants in order to understand individual gene functions in the adult brain. Towards this goal, we employ mouse genetics, molecular/biochemical and behavioral techniques. Our current interest focuses on basic-helix-loop-helix (bHLH) transcription factors. Several loss- and gain-of-function mouse mutants of the bHLH family that we and others have analyzed display behavioral alterations frequently also observed in psychiatric diseases. Among these are alterations of the sleep-wake or circadian behavior, altered cognitive performances and disturbed environmental adaptations to time shifts (jet-lag) or social stress. At the molecular level, we find several signaling pathways to be deregulated that likely provide a mechanistic link between disturbed environmental adaptations and deregulated gene expression seen in bHLH mouse mutants. To study cellular signaling upstream of gene expression, we have developed a series of genetically encoded biosensors that can be analyzed with standard fluorescent or luminescent reporter proteins but also with libraries of molecular barcodes to perform systems-level analyses. Currently, we aim at combining mouse models and genetic sensors to better understand the molecular adaptations of gene-environment interactions relevant for psychiatric and neurological diseases.

Selected Recent Publications

Djannatjan MS, Galinski S, Fischer TM, Rossner M (2011) Studying G protein-coupled receptor activation using split-TEV assays. Analytical Biochmistry Feb 2. doi 10.1016/j.ab.2011.01.042

Brzózka MM, Radyushkin R, Wichert SP, Ehrenreich H, Rossner M (2010) Cognitive and sensorimotor gating impairments in transgenic mice overexpressing the schizophrenia susceptibility gene Tcf4 in the forebrain. Biological Psychiatry July; 68(1): 33-40. Epub April 29

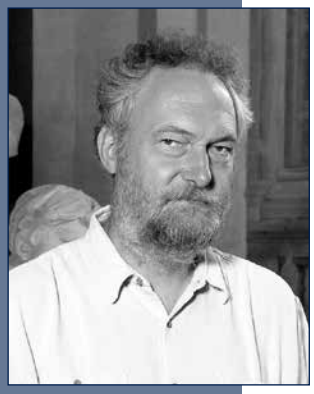
Botvinnik A, Wichert SP, Fischer TM, Rossner M (2010) Integrated analysis of receptor activation and downstream signaling with EXTassays. Nature Methods Jan;7(1): 74-80

He Y, Jones CR, Fujiki N, Xu Y, Guo B, Holder JL Jr, Rossner M, Nishino S, Fu YH (2009) The transcriptional repressor DEC2 regulates sleep length in mammals. Science Aug 14;325(5942): 866-70

Hirrlinger J, Scheller A, Hirrlinger PG, Kellert B, Tang W, Wehr MC, Goebbels S, Reichenbach A, Sprengel R, Rossner M, Kirchhoff F (2009) Split-cre complementation indicates coincident activity of different genes *in vivo*. PLoS ONE 4(1): e4286. Epub Jan 27

Rossner M, Oster H, Wichert SP, Reinecke L, Wehr MC, Reinecke J, Eichele G, Taneja R, Nave KA (2008) Disturbed clockwork resetting in Sharp-1 and Sharp-2 single and double mutant mice. PLoS ONE Jul 23;3(7): e2762

Begemann M, Sargin D, Rossner M, Bartels C, Theis F, Wichert SP, Stender N, Fischer B, Sperling S, Stawicki S, Wiedl A, Falkai P, Nave KA, Ehrenreich H (2008) Episode-specific differential gene expression of peripheral blood mononuclear cells in rapid cycling supports novel treatment approaches. Mol Med Sep-Oct;14(9-10): 546-52



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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Manuela Schmidt

- Since 2012: Emmy Noether Group Leader
- 2007 – 2012: Postdoc with Ardem Patapoutian, The Scripps Research Institute, La Jolla, California, USA
- 2002 – 2006: PhD, Neurosciences, International Max Planck School Neurosciences, Laboratory of Stephan Sigrist, ENI-G, Goettingen, Germany
- 2001 – 2002: Master, Neurosciences, International Max Planck School Neurosciences, Goettingen, Germany
- 1997 – 2002: Diploma, Biology, University of Wuerzburg, Germany

Major Research Interests

The perception of and appropriate reaction to external and internal stimuli is critical for survival. In vertebrates, chemical, mechanical (from pleasant touch to painful contact) and thermal stimuli are detected by specialized somatic sensory neurons which transfer these signals via the spinal cord to the brain. An important subset of these neurons, so-called nociceptors, senses noxious stimuli. Consequently, their activation mediates nociception and leads to the sensation of pain. Pain is the single most common symptom for which patients seek medical assistance. While acute pain has served as a protective mechanism throughout evolution to guard the body against injury, pain can also become chronic and highly debilitating. Unfortunately, chronic pain imposes substantial challenges to medical practice: current therapies can be effective for short-term treatment however many do not provide sufficient relief to chronic conditions or cause strong side-effects. Therefore, a deeper understanding of the molecular mechanisms underlying both, acute and chronic pain is crucially needed.
Our research focuses on the comparative and quantitative analysis of somatosensory signaling networks in established mouse models of acute and chronic pain. To this purpose our lab employs interactomics, genetic profiling, calcium-imaging, electrophysiology, neuronal tracing and mouse behavioral studies in order to address key questions:

- What are the specific dynamic changes that occur at the molecular, cellular and network levels in nociceptors during acute and chronic pain?
- How are these changes mirrored in pain-related regions of the central nervous system?

Selected Recent Publications

Dubin AE, Schmidt M, Mathur J, Petrus MJ, Xiao B, Coste B, Patapoutian A (2012) Inflammatory signals enhance piezo2-mediated mechanosensitive currents. Cell Rep Sep 27;2(3): 511-7

Gómez-Varela D, Schmidt M, Schoellerman J, Peters EC, Berg DK (2012) PMCA2 via PSD-95 Controls Calcium Signaling by α7-Containing Nicotinic Acetylcholine Receptors on Aspiny Interneurons. J Neurosci 16;32(20): 6894-905

Coste B, Xiao B, Santos JS, Syeda R, Grandl J, Spencer KS, Kim SE, Schmidt M, Mathur J, Dubin AE, Montal M, Patapoutian A (2012) Piezo proteins are pore-forming subunits of mechanically activated channels. Nature 19;483(7388):176-81

Coste B, Mathur J, Schmidt M, Earley TJ, Ranade S, Petrus MJ, Dubin AE, Patapoutian A (2010) Piezo1 and Piezo2 Are Essential Components of Distinct Mechanically Activated Cation Channels Science 330: 55-60

Owald D*, Fouquet W*, Schmidt M, Wichmann C, Mertel S, Depner H, Christiansen F, Zube C, Quentin C, Körner J, Urlaub H, Mechtler K, Sigrist SJ. (2010) A Syd-1 homologue regulates pre- and postsynaptic maturation in *Drosophila*. J Cell Biol Feb 22; 188(4): 565-79 *equal contribution

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Michael Sereda

Major Research Interests

Tetraspan myelin proteins play an important role in CNS and PNS myelination. We have generated a transgenic rat model of the most frequent human neuropathy, Charcot-Marie-Tooth disease type 1A (CMT1A). This disease is associated with a partial duplication of chromosome 17 and we have proven experimentally that the underlying cause is overexpression of the PMP22 gene. Transgenic rats expressing additional copies of this gene share characteristic clinical features of the human disease, including muscle weakness, reduced nerve conduction velocities, and marked Schwann cell hypertrophy resulting in onion bulb formation. PMP22 overexpression may result in defects of intracellular protein trafficking. The rat model allows to adress the molecular pathology of CMT1A in more detail than previously possible with human biopsy material. We are specifically interested in the ultrastructural analysis of presymptomatic Schwann cells at early disease stages. Moreover, we are applying the tools of biochemistry and radioactive labeling of protein synthesis (*ex vivo*) to study the kinetics of myelination and intracellular protein sorting.
When bred to homozygosity, PMP22 transgenic rats completely fail to elaborate myelin and Schwann cells appear to be developmentally arrested at the “promyelin”stage. However, all myelin genes which mark the mature Schwann cell phenotype are normally expressed. Thus, a several-fold PMP22 overexpression causes a novel uncoupling of the molecular and morphological parameters of Schwann cell differentiation.
Steroid hormones have recently been identified as coregulators of Schwann cell function and peripheral myelination. Progesterone increases the expression of PMP22 in Schwann cell cultures and in the peripheral nervous system *in vivo*. In an attempt to lower PMP22 overexpression, we applied the progesterone receptor antagonist Onapristone to CMT-rats. Daily administration of progesterone elevated the steady-state levels of Pmp22 and Mpz mRNA in the sciatic nerve, resulting in enhanced Schwann cell pathology and a more progressive clinical neuropathy. In contrast, administration of the selective progesterone receptor antagonist reduced overexpression of Pmp22 and improved the CMT phenotype, without obvious side effects, in wild-type or transgenic rats. Taken together, these data provide proof of principle that the progesterone receptor of myelin-forming Schwann cells is a promising pharmacological target for therapy of CMT-1A. We are currently planning follow-up studies to pave the way to clinical application.
In summary, the CMT rat allows a better understanding of the cellular disease mechanism operating in human CMT1A, and should be helpful in the analysis of modifier genes, epigenetic factors, and in the evaluation of experimental treatment strategies.

Selected Recent Publications

Fledrich R, Schlotter-Weigel B, Schnizer TJ, Wichert SP, Stassart RM, Meyer Zu Hörste G, Klink A, Weiss BG, Haag U, Walter MC, Rautenstrauss B, Paulus W, Rossner MJ, Sereda MW (2012) A rat model of Charcot-Marie-Tooth disease 1A recapitulates disease variability and supplies biomarkers of axonal loss in patients. Brain 135: 72-87

Makoukji J, Belle M, Meffre D, Stassart R, Grenier J, Shackleford G, Fledrich R, Fonte C, Branchu J, Goulard M, de Waele C, Charbonnier F, Sereda MW, Baulieu EE, Schumacher M, Bernard S, Massaad C. (2012) Lithium enhances remyelination of peripheral nerves. Proc Natl Acad Sci USA 109: 3973-3978

Fünfschilling U, Supplie LM, Mahad D, Boretius S, Saab AS, Edgar J, Brinkmann BG, Kassmann CM, Tzvetanova ID, Möbius W, Diaz F, Meijer D, Suter U, Hamprecht B, Sereda MW, Moraes CT, Frahm J, Goebbels S, Nave KA (2012) Glycolytic oligodendrocytes maintain myelin and long-term axonal integrity. Nature 485: 517-521

Goebbels S, Oltrogge JH, Wolfer S, Wieser GL, Nientiedt T, Pieper A, Ruhwedel T, Groszer M, Sereda MW, Nave KA (2012) Genetic disruption of Pten in a novel mouse model of tomaculous neuropathy. EMBO Mol Med 4: 486-499

Fledrich R, Stassart RM, Sereda MW (2012) Murine therapeutic models for Charcot-Marie-Tooth (CMT) disease. Br Med Bull 102: 89-113

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Mikael Simons

Group Leader of Centre for Biochemistry and Molecular Cell Biology

- 2004 Facharzt/Specialty qualification in Neurology
- 2005 Habilitation in Neurology, University of Tübingen
- 2004 – 2008 Junior group leader, Centre for Biochemistry and Molecular Cell Biology, University of Göttingen
- 2007 Attendant at the Department of Neurology; Head of the Multiple Sclerosis out-patient clinic, Department of Neurology, University of Göttingen
- 2008 Group leader with an ERC Starting Grant at the Max-Planck Institute for Experimental Medicine
- Feb 2009 W3- Heisenberg Professorship, Department of Neurology, University of Göttingen

Major Research Interests

Mechanisms of myelin biogenesis and repair

The myelin sheath is one of the most abundant membrane structures in the vertebrate nervous system. It is formed by the spiral wrapping of glial plasma membrane extensions around the axons, followed by the extrusion of cytoplasm and the compaction of the stacked membrane bilayers. These tightly packed membrane stacks provide electrical insulation around the axons and maximize their conduction velocity. Axonal insulation by myelin not only facilitates rapid nerve conduction but also regulates axonal transport and protects against axonal degeneration. Damage to the myelin sheath, as it for example occurs in multiple sclerosis (MS) results therefore in severe neurological disability also as a result of neurodegeneration.

Our main goal is to come up with new approaches of how to promote remyelination in demyelinating diseases such as MS. To realize this goal we need to understand how myelin is formed during normal development.

Selected Recent Publications

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

Aggarwal S, Yurlova L, Snaidero N, Reetz C, Frey S, Zimmermann J, Pähler G, Janshoff A, Friedrichs J, Müller DJ, Goebel C, Simons M (2011) A Size Barrier Limits Protein Diffusion at the Cell Surface to Generate Lipid-Rich Myelin-Membrane Sheets. Dev Cell 21(3): 445-56

Aggarwal S, Yurlova L, Simons M (2011) Central nervous system myelin: structure, synthesis and assembly. Trends Cell Biol 21(10): 585-93

Budde H, Schmitt S, Fitzner D, Opitz L, Salinas-Riester G, Simons M (2010) Control of oligodendroglial cell number by the miR-17-92 cluster. Development 137(13): 2127-32

Hsu C, Morohashi Y, Yoshimura SI, Manrique-Hoyos N, Jung SY, Lauterbach M, Bakhti M, Grønborg G, Möbius W, Rhee JS, Barr FA, Simons M (2010) Regulation of exosome secretion by Rab35 and its GTPase-activating proteins TBC1D10A-C. J Cell Biol 189(2): 223-32

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

Simons M, Trotter J (2007) Wrapping it up: the cell biology of myelination. Curr Opin Neurobiol. 17(5): 533-40

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Jochen Staiger

Professor of Neuroanatomy

- 1993 Graduation as Dr. med. at the Medical Faculty of the Justus-Liebig-University Giessen; grade: summa cum laude
- 1994 – 2000 Post-doc at the C. & O. Vogt-Institute for Brain Research, Düsseldorf, (Head: Prof. Dr. K. Zilles); Leader of the research group „Cortical microcircuits“
- 2000 Habilitation and Venia legendi for Anatomy at the Medical Faculty of the Heinrich-Heine-University Düsseldorf
- 2006 Appointment as W3 Univ.-Professor for Cell Biology at the Albert-Ludwigs-University Freiburg
- Since 2010 Full professor and director of the Department of Neuroanatomy at the Georg-August-University Göttingen

Major Research Interests

- Developmental plasticity induced by early postnatal deprivation of sensory stimulation in mice with intact or genetically altered thalamocortical projections
- Thalamo-cortical interactions as the first stage of cortical information processing
- Microcircuits in columnar modules – examining the Bauplan of synaptic connectivity of neocortex
- Tactile learning: Genomic regulation of experience-dependent plasticity in the trigeminal somatosensory system

Selected Recent Publications

Gentet LJ, Avermann M, Matyas F, Staiger JF, Petersen CCH (2010) Membrane potential dynamics of GABAergic neurons in the barrel cortex of behaving mice. Neuron 65: 422-435

Karagiannis A, Gallopin T, David C, Battaglia D, Geoffroy H, Rossier J, Hillman EMC, Staiger JF, Cauli B (2009) Classification of NPYexpressing neocortical interneurons. J Neurosci 29: 3642-3659

Staiger JF, Zuschratter W, Luhmann HJ, Schubert D (2009) Local circuits targeting parvalbumin-containing interneurons in layer IV of rat barrel cortex. Brain Struct Func 214: 1-13; DOI 10.1007/s00429-009-0225-5

Ascoli GA, Alonso-Nanclares L, Anderson SA, Barrionuevo G, Benavides-Piccione R, Burkhalter A, Buzsaki G, Cauli B, DeFelipe J, Fairén A, Feldmeyer D, Fishell G, Fregnac Y, Freund TF, Karube F, Gardner D, Gardner EP, Goldberg JH, Helmstaedter M, Hestrin S, Kisvarday Z, Lambolez B, Lewis D, Marin O, Markram H, Muñoz A, Packer A, Petersen C, Rockland K, Rossier J, Rudy B, Somogyi P, Staiger JF, Tamas G, Thomson AM, Toledo-Rodriguez M, Wang Y, West DC, and Yuste R (2008) Petilla Terminology: Nomenclature of features of GABAergic interneurons of the cerebral cortex. Nat Rev Neurosci 9: 557-568

Helmstaedter M, Staiger JF, Sakmann B, Feldmeyer D (2008) Efficient recruitment of layer 2/3 interneurons by excitatory layer 4 input in single columns of rat somatosensory cortex. J Neurosci 28: 8273-8284

Schubert D, Kötter R, Staiger JF (2007) Mapping functional connectivity in barrel-related columns reveals layer- and cell type-specific microcircuits. Brain Struct Funct 212: 107-119

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Judith Stegmüller

Group Leader, Cellular and Molecular Neurobiology

- 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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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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Anastassia Stoykova

Privatdozentin, Developmental Biology, Max Planck Institute for Biophysical Chemistry

- 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)
- since 2010 Adj. Professor at the University of Göttingen

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.

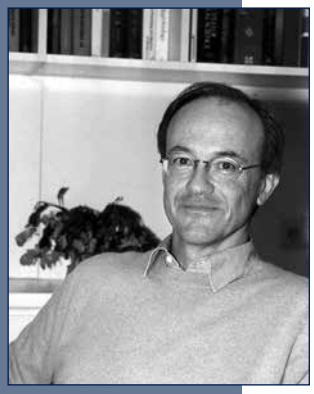
Selected Recent Publications

Boretius S, Michaelis T, Tammer R, Ashery-Padan R, Frahm J, Stoykova A (2009) *In vivo* MRI of altered brain anatomy and fiber connectivity in adult Pax6 deficient mice. Cereb Cortex 19: 2838-2847

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



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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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Stefan Treue

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

Niebergall R, Khayat PS, Treue S, Martinez-Trujillo J (2011) Multifocal attention filters out distracter stimuli within and beyond receptive field boundaries of primate MT neurons. Neuron 72:1067-1079

Anton-Erxleben K, Stephan VM, Treue S (2009) Attention reshapes center-surround receptive-field structure in macaque cortical area MT. Cerebral Cortex 19: 2466-2478

Busse L, Katzner S, 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 105(42): 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 (19): 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, Hol K, Rauber HJ (2000) Seeing multiple directions of motion – Physiology and psychophysics. Nature Neuroscience 3 (3): 270-276

Treue S, Martinez Trujillo JC (1998) Feature-based attention influences motion processing gain in macaque visual cortex. Nature 399: 575-579

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

Morawe T, Honemann-Capito M, von Stein W, Wodarz A (2011) Loss of the extraproteasomal ubiquitin receptor Rings lost impairs ring canal growth in *Drosophila* oogenesis. J Cell Biol 193: 71-80

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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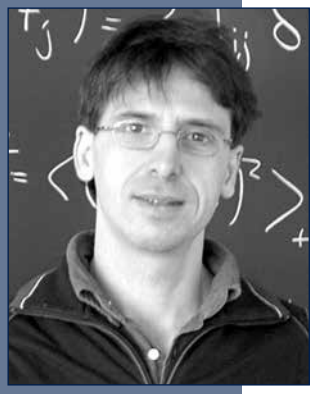

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Fred Wolf

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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Prof. Dr. Gregor Eichele (Spokesperson IMPRS)
Dr. Silvio Rizzoli
Prof. Dr. Dr. Detlev Schild (Chair)
Dr. Judith Stegmüller
Prof. Dr. Fred Wouters
Andrea Adden
Benjamin Wilhelm

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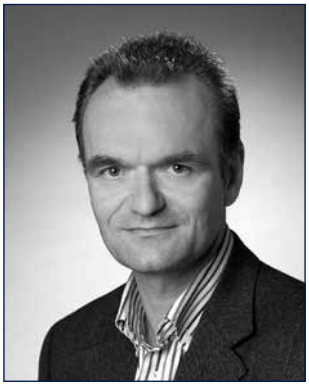

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