GEORG-AUGUST-UNIVERSITÄT
GÖTTINGEN / GERMANY

International Max Planck Research School

Neurosciences

MSc/PhD/MD-PhD Program

YEARBOOK 2020 / 2021

Yearbook 2020/2021

MSc/PhD/MD-PhD Neuroscience Program

at the University of Göttingen

International Max Planck Research School

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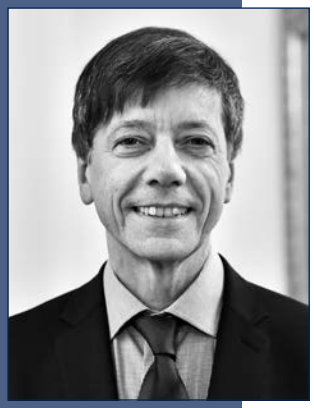


Letter from the President

The University of Göttingen is committed to the education of the next-generation scientists. Firmly rooted in excellent science, our goals are to train competent and critical young academics that are able to meet the challenges of the future. Within the Göttingen Campus, the cooperation between our university, the local Max-Planck Institutes and the German Primate Center fosters a dynamic and vibrant research environment in which the free exchange of ideas leads to top science in a true manifestation of the famous “Göttingen Spirit”.

The two international MSc/PhD programs in Neurosciences and Molecular Biology are highly acclaimed role models in graduate training that 20 years after their foundation continue to be enormously successful. Embedded in the Göttingen Campus they integrate faculty members across institutional borders and provide junior faculty members with full rights as thesis supervisors. The programs offer not only scientific training of outstanding quality but also a comprehensive range of services including training in professional skills, career counseling, and practical support for dealing with daily life, greatly facilitating integration of students from abroad. Due to their success, these programs served as blueprints for the creation of additional PhD training programs that are united under the roof of the Göttingen Graduate Center for Neurosciences, Biophysics and Molecular Biosciences (GGNB). GGNB was supported by the Federal Excellence Initiative until the expiration of its Graduate School program and is now stably financed by the university in cooperation with its partners on the Göttingen Campus.

The Neuroscience and Molecular Biology programs remain unique within the 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 two decades, these international programs have been particularly successful in attracting large numbers of high quality applicants from all around the world, allowing for the selection of the very best candidates. The new concepts that were introduced by these programs have recently 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 keep pace with the dynamic change of research areas in the participating institutions. Accordingly, 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 maintain close links with the relevant industries to enhance the opportunities of the graduates for a successful professional career in the private sector.

As founding member and former speaker of the international MSc/PhD program in Molecular Biology I am very proud of what we all have achieved, and I remain on board as an active faculty member despite the many obligations in my new office. Most importantly, I would like to thank all colleagues and institutions for their unwavering commitment to 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 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. Reinhard Jahn

(President of the University of Göttingen)

Letter from the Max Planck Society

The mission of the Max Planck Society is to conduct top-level basic research in science and the humanities. Because this is only possible with bright young minds, the Max Planck Society funds graduate education nationwide - including the Neuroscience program in Göttingen.

Currently, over 80 Max Planck Institutes are located on scientific campuses across Germany, most of them close to universities. To strengthen the scientific ties with universities, the Max Planck Society, together with the German University Rectors' Conference, launched the International Max Planck Research Schools (IMPRSs) as a new joint program - during celebrations in Göttingen on the occasion of the 50th anniversary of the Max Planck Society.

The goals of the IMPRSs are

- to attract excellent students from all around the world to intensive PhD training programs in Germany, preparing them for careers in science,
- to integrate internationally renowned Max Planck researchers into top-level scientific training programs for junior scientists, 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, 64 International Max Planck Research Schools have been established involving 81 Max Planck Institutes, 35 German universities, and 26 universities abroad. Over 3,100 PhD students from over 123 countries are presently enrolled.

Since their foundation in 2000, the Göttingen IMPRSs in Neurosciences and Molecular Biology have met with particular - and extraordinary - success. This is due to multiple factors. Most notably, the Göttingen IMPRSs in Neurosciences and Molecular Biology are the result of a true synergism between the local Max Planck Institutes and the University of Göttingen, the University Medical Center Göttingen, the German Primate Center, and additional extra-university institutions, which allowed to completely reform local graduate education in the course of their establishment. Moreover, all of the respective IMPRS funds are invested into the Neurosciences and Molecular Biology graduate programs. This allows us to offer excellent training conditions and financial support, which is a major attraction for the best students worldwide. Accordingly, most former students of our programs moved on to postdoctoral positions, typically at prestigious international institutions, and many have become successful independent scientists themselves.

Over the past two decades, the IMPRS-funded graduate programs in Neurosciences and Molecular Biology have 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 centre of scientific excellence. Furthermore, the schools served as role models and founding members of the Göttingen Graduate Center 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 our IMPRS students will continue to be successful in their professional careers - and that they will remember their training period in Göttingen as an exciting, stimulating, and formative phase of their lives.

Nils Brose
Dean of the IMPRS
Neurosciences

Overview

This yearbook is intended to provide information on the International MSc/PhD/MD-PhD Program for Neurosciences 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 Center for Neurosciences, Biophysics, and Molecular Biosciences (GGNB), which was supported by the Federal Excellence Initiative until the expiration of its Graduate School program and is now stably financed by the university in cooperation with its partners on the Göttingen Campus. 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 current and former Clusters of Excellence (CNMPB 2002-2019 and MBExC since 2019), 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, GRK).

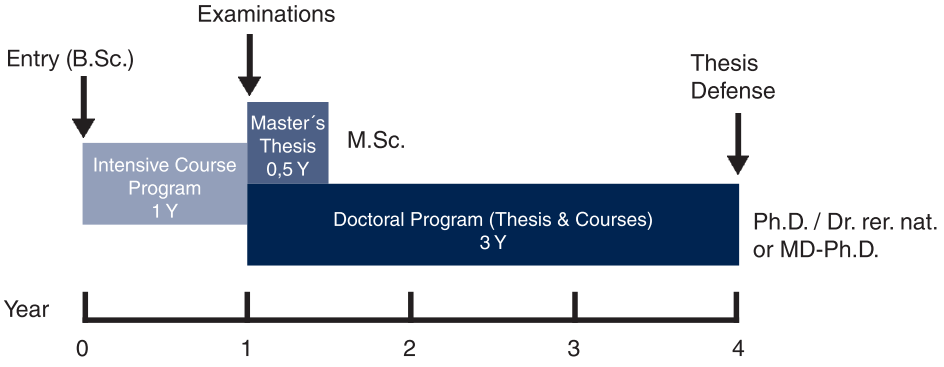
The International MSc/PhD/MD-PhD Neuroscience Program qualifies students for professional work in the neurosciences. The program is open to students from Germany and from abroad, who hold a Bachelor's degree (or equivalent) in the biosciences, medicine, psychology, physics, or related fields. All courses 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. The continuation in the PhD program is possible and desired.



Intensive Course Program (First Year)

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

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

Lectures and Tutorials (Theoretical Modules)

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. (M.Neuro.11, M.Neuro.16,): Neuroanatomy and Development

B. (M.Neuro.14, M.Neuro.12): Molecular Biology, Development, Neurogenetics & Basic Statistics

C. (M.Neuro.12): Physiology

D. (M.Neuro.13): Modelling, Autonomous Nervous System, Pharmacology

E. (M.Neuro.15): Sensory and Motor Systems

F. (M.Neuro.16): 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 (Practical Modules)

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:

M.Neuro.21 Histology & Cytology

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

M.Neuro.22 Electrophysiology

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

M.Neuro. 23 Microscopy & Imaging

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

M. Neuro.24 Zoo-Physiology

- cell culture methods
- methods in molecular biology
- genetics of transgenic mouse models

Laboratory Rotations (Practical Module M.Neuro.25)

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 by the students in the group of a faculty member. The PhD students select three independent faculty members as their thesis advisory committee who closely monitor progress and advise the 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, career planning, time and project management, bioethics and research ethics, elective courses, and participation in international conferences or workshops. Regular industry excursions are offered to biotechnological or pharmaceutical companies, including visits of the R&D facilities and discussions of career options with representatives of the HR departments.

Doctoral students of the program organize the international PhD student symposium "Neurizons" every two years with great success, attracting outstanding speakers and up to 300 participants from all over the world. The meeting was designed by the students to promote scientific exchange between young researchers from different disciplines. Since a few years, a "Career Fair for Scientists" precedes the Neurizons meetings. The career fair offers a unique and exciting program of career presentations, workshops and networking opportunities and is also organized by the Neuroscience students. Both events include an increasing number of alumni, sharing their experience.

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 fulfilled all PhD degree requirements, medical students may apply for the degree of an M.D.-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 2020

Applicants must hold a Bachelor's degree or equivalent in biology, medicine, psychology, physics, chemistry, 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 2020, the coordination office received 420 applications from 62 countries.

Continent	Applications	Admissions
Europe (total)	**71**	**10**
Germany	20	4
other West Europe / Middle Europe	19	2
East Europe	32	4
America (total)	**42**	**5**
North America	18	3
Central/South America	24	2
Africa (total)	**80**	**0**
North Africa	25	0
Central/South Africa	55	0
Asia (total)	**224**	**5**
Near East	48	1
Central Asia/ Far East	176	4
Australia	**3**	**0**

Incl. 2 NEURASMUS students (from India and USA).

Neurasmus is an Erasmus Mundus Joint Master Degree program (EMJMDs) which is based on the cooperation of 5 partner universities, comprising Université de Bordeaux/ France, Vrije Universiteit Amsterdam/Netherlands, Universitätsmedizin Göttingen/ Germany, Charité - Universitätsmedizin Berlin/Germany and Université Laval/Canada.

For details please refer to the Neurasmus website:
http://www.neurasmus.u-bordeaux2.fr/

Students 2020/2021

Name		Home Country
Yuliya	Badayeva	Canada
Maximilian	Ferle	Germany
Svilen	Georgiev	Bulgaria
Ali	Ghadami	Iran
Sophie	Gobeil	Canada
Vladyslav	Ivanov	Ukraine
Henrike	Jungeblut	Germany
Sinem	Koçak	Turkey
Dafna	Ljubotina	Serbia
Taisiia	Nazarenko	Ukraine
Petr	Nejedly	Czech Republic
Jackeline	Neves Pereira	Brazil
Neha	Prasanna	India
Carolina	Quintanilla Sánchez	Mexico
Mahalakshmi	Ramadas*	India
Anna	Siegert	Germany
Dawn J	Tan	Singapore
Ilona	Vieten	Germany
Margaret	Young*	USA

* NEURASMUS student

Yuliya Badayeva

Canada

Yuliya Badayeva

EDUCATION

College / University:

University of British Columbia

Highest Degree:

B.Sc.

Major Subjects:

Neuroscience, Developmental Biology, Genetics

Lab Experience:

Molecular biology (cloning, *in-situ* hybridization, PCR, RNA and protein extraction, Western Blot, immunofluorescence and immunohistochemistry), light and fluorescence microscopy, bioinformatics (genomic data analysis, R), animal husbandry.

Projects / Research:

2018 – 2020: Analysis of enhancer sequence activity during cerebellar development and identification of a novel regulator of granule cell differentiation and migration, Goldowitz Lab, UBC Department of Medical Genetics

2015: Characterizing of molecular markers of pulmonary arterial hypertension, Pulmonary Hypertension Research Group, University Institute of Cardiology and Respirology of Quebec

2014: Cell shape, motility, and the role of Toll-like receptor signaling during *Campylobacter jejuni* infection, Vallance Lab, BC Children's Hospital Research Institute

Scholarships:

2020 – 2021: Stipend by the International Max Planck Research School

2019: UBC Genome Science and Technology Program Scholarship

2016: Natural Sciences and Engineering Research Council of Canada (NSERC) Student Research Award

Maximilian Ferle

Germany

Maximilian Ferle

EDUCATION

College / University:

University of Göttingen

Highest Degree:

B.Sc. (Honors) in Biochemistry

Major Subjects:

Biochemistry, Biophysics, Bioinformatics

Lab Experience:

(Fluorescence-) microscopy; transformation ($CaCl_2$, Electroporation) of microorganisms; mammalian cell culture, transfection (Lipofectamine); purification of synaptic vesicles from rat brain, protein extraction and purification, western blotting, automated peptide- and oligonucleotide-synthesis; DNA extraction, purification and PCR; formation of liposomes, reconstitution of membrane proteins, encapsulation of soluble proteins, HPLC, ITC, AFM, stopped-flow, photometric enzyme-kinetics, fluorimetric FRET mesurements, reading of MS- and NMR-spectra; advanced programming in Python and R

Projects / Research:

Since 2020: Bachelor's thesis and subsequent research assistance "The role of tight junction proteins for collective cell migration" Dept. of Biophysical Chemistry (Prof. Janshoff), Institute for Physical Chemistry, Göttingen

2019: Internship "Characterization of a vesicular nucleotide transporter (VNUT)". Dept. of Neurobiology (Prof. Jahn), MPI for Biophysical Chemistry, Göttingen

Scholarships:

2020 – 2021: Stipend by the International Max Planck Research School

Bulgaria

Svilen Georgiev

EDUCATION

College / University:

University of Economics Varna; Freie Universität Berlin

Highest Degree:

B.Sc. Finance; B.Sc. Biology

Major Subjects:

Neurobiology, Biochemistry, Genetics

Lab Experience:

Basic work with *D. melanogaster* – handling of stocks, adult flies brain dissections, filopodia tracking with the help of Amira. Work with mice: IHC, in situ Ca^{2+} imaging, confocal microscopy, qPCR, MACS, Genotyping. Work with *Escherichia coli - E.coli* expression, Protein Purification, SDS-PAGE, LIC Cloning, Plasmid Purification Basic experience with imageJ, MATLAB, CorelDraw, R, Igor Pro.

Projects / Research:

2020: Student assistant position, Rosenmund Lab, Charité, support of the TAs

2019 – 2020: Internship, Daumke Lab, MDC for Molecular Medicine, investigation of the Aryl Hydrocarbon Receptor from a biochemical perspective

2019: Internship and Bachelor's Thesis, Kettenmann Lab, MDC for Molecular Medicine. Topic of the thesis: "Communication between neurons and microglia via metabotropic glutamate receptors"

2018: Student assistant position, Hiesinger Lab, Freie Universität Berlin. Kiral et al. Autophagy-dependent filopodial kinetics restrict synaptic partner choice during *Drosophila* brain wiring. Nat. Commun. 11, 1325. (2020), Co-authorship

Scholarships:

2020 – 2021: Stipend by the International Max Planck Research School

Iran

Ali Ghadami

EDUCATION

College / University:

Islamic Azad University, Tehran Medical Sciences

Highest Degree:

B.Sc.

Major Subjects:

Cellular and Molecular Biology – Genetics

Lab Experience:

Immunohistochemistry, DAB staining, Nissl staining, Stereotactic surgery, Rat perfusion, Rat and mice brain dissection, Rat IP and ICV injection, behavioral tests (rats), Real Time PCR, Primer Designing, SDS-PAGE.

Projects / Research:

2019 – 2020: "Synaptophysin alteration in Hippocampus in rats with Morphine Addiction", Dr. Solmaz Khalifeh, Cognitive and Neuroscience Research Center (CNRC), Islamic Azad University Tehran Medical Sciences, Tehran, Iran

2018 – 2020 : Khalifeh S, Khodagholi F, Zarrindast MR, et al. Altered D2 receptor and transcription factor EB expression in offspring of aggressive male rats, along with having depressive and anxiety-like behaviors [published online ahead of print, 2020 Apr 28]. Int J Neurosci. 2020;1-11. doi:10.1080/00207454.2020.1758086

2016 – 2018: "Molecular Mechanisms of Cocaine Addiction and its related Behavioral Changes", Prof. Dr. Mohammad-Reza Zarrindast, Pharmacology Department of Tehran Medical University, Tehran, Iran

Scholarships:

2020 – 2021: Stipend by the International Max Planck Research School

Canada

Sophie Gobeil

EDUCATION

College / University:

University of Calgary

Highest Degree:

B.Sc.

Major Subjects:

Neuroscience

Lab Experience:

Wet laboratory skills: Zebrafish and mouse husbandry and basic dissections, *in situ* hybridization, immunohistochemistry, qPCR, gel electrophoresis, microtome and cryosectioning, light and fluorescence microscopy.

Dry laboratory skills: ImageJ, MATLAB, Python.

Projects / Research:

2019 – 2020: Bachelor's thesis, "Semaphorin 3F action in zebrafish retinal pigment epithelium genetic ablation", Dr. Sarah McFarlane

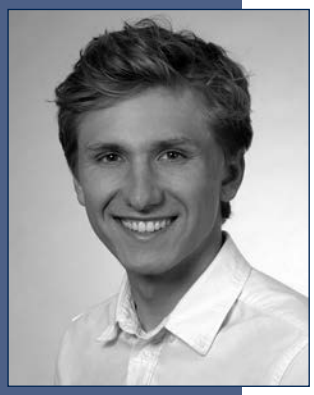
2019: International Internship, "Outer retinal phenotype in a sema3fa mutant zebrafish model of choroidal neovascularization", Dr. Sarah McFarlane, University of Calgary

2018: Summer Internship, "Anisotropic exclusion effect between photocatalytic Ag/AgCl Janus particles and passive beads in a dense colloidal matrix", Dr. Larysa Baraban, Technische Universität Dresden

2017: Summer Internship, "Investigating the role of Cystatin C in astrocytes in experimental autoimmune encephalomyelitis", Dr. Shalina Ousman, University of Calgary

Scholarships:

2020 – 2022: DAAD Study Scholarship



Ukraine

Vladyslav Ivanov

EDUCATION

College / University:

University of Göttingen

Highest Degree:

B.Sc.

Major Subjects:

Biology

Lab Experience:

Psychophysical experiments, MATLAB, Drift Diffusion Model, Signal Detection Theory, handling fly stocks, behavioural analysis, preparation and staining of the nervous system of *D. melanogaster* larvae, light and fluorescence microscopy, PCR, gel electrophoresis, FPLC.

Projects / Research:

2020: Bachelor thesis "Effector specificity in visual perceptual learning", at the Department "Neural Circuits and Cognition", European Neuroscience Institute, Göttingen, Germany

2019 – 2020: Internship and student research assistant "learning in non-pupate *D. melanogaster* larvae", at the Department for Molecular Neurobiology of Behaviour, Schwann-Schleiden-Research Center, Göttingen, Germany

2018: Internship at the Department for Physical Biochemistry, Max-Planck-Institute for Biophysical Chemistry, Göttingen, Germany

Scholarships:

2020 – 2021: Stipend by the International Max Planck Research School

2019: Lower Saxony Scholarship

Germany

Henrike Jungeblut

EDUCATION

College / University:

Heidelberg University
Trinity College Dublin

Highest Degree:

B.Sc.

Major Subjects:

Psychology

Lab Experience:

EEG and fMRI; basic coding in MATLAB (psychtoolbox), fMRI data analysis via SPM, statistics in IBM SPSS and R.

Projects / Research:

2020: Bachelor Thesis: "An Investigation of the Slope Parameters of Reaction Times and P3 Latencies in the Sternberg Memory Scanning Task – A Fixed Links Model Approach"

2019 – 2020: "Long- and short-term interactions between personality, genetic and epigenetic factors, environmental conditions and mental health and well-being in children, adolescents and adults." Student assistant position at Central Institute for Mental Health Mannheim

2019: "Neuroendocrine mechanisms of grief." Research internship at the Institute for Medical Psychology at University Hospital Heidelberg

Scholarships:

2020 – 2021: Stipend by the International Max Planck Research School

2017 – 2020: Deutschlandstipendium

2018: Baden-Württemberg-Stipendium

Turkey

Sinem Koçak

EDUCATION

College / University:

Boğaziçi University

Highest Degree:

B.Sc. (Hons.) Molecular Biology and Genetics

Major Subjects:

Molecular Biology of the Cell, Molecular Genetics, Biochemistry, Psychology and Pharmacology

Lab Experience:

Zebrafish Embryo Injection, Fruit Fly Adult Brain Dissection,Cryosection, Fluorescent Microscopy, Confocal Microscopy, Immunohistochemistry, *In-situ* Hybridisation, Molecular Cloning Techniques, Mammalian Cell Culture Techniques, Western Blot and Protein Assays.

Projects / Research:

2018: University of Vienna,Thomas Hummel. Antibody Screen for Asymmetric Body in *Drosophila melanogaster* brain

2016 – 2018: Boğaziçi University, Stefan Fuss. The neural regeneration pattern in Zebrafish upon damage and Cre-lox transgenic Zebrafish generation

2016: Boğaziçi University, Reşit Canbeyli. Behavioural experiments on the relation between learning and depression in rat

2015: Boğaziçi University, Kuyaş Buğra Bilge. The role of SIK2 in transformation of Müller Glia cells to progenitor cells and Site Directed Mutagenesis of GAB1

Scholarships:

2020 – 2021: Stipend by the International Max Planck Research School

Serbia

Dafna Ljubotina

EDUCATION

College / University:

Keele University, United Kingdom

Highest Degree:

B.Sc.

Major Subjects:

Neuroscience

Lab Experience:

Immunohistochemistry - Microscopy - Pharmacological techniques - Electrophysiology.

Projects / Research:

2019 – 2020: "What are the key brain mechanisms and structures involved in supporting memory, particularly memories of fear and context and what happened when these mechanisms are dysregulated?" Dr Simon Trent, Keele University, United Kingdom

2019 – 2020: "Determining the distribution of dopamine across layers of the rat entorhinal cortex throughout post-natal development" Dr Douglas Caruana, Keele University, United Kingdom

Scholarships:

2020 – 2021: Stipend by the International Max Planck Research School

Ukraine

Taisiia Nazarenko

EDUCATION

College / University:

Taras Shevchenko National University of Kyiv

Highest Degree:

B.Sc.

Major Subjects:

Genetics

Lab Experience:

Agrobacterium-mediated plant transformation; molecular genetic analysis; plant breeding; cultivation, hybridization and phenotypic analysis of *Drosophila melanogaster.*

Projects / Research:

2019 – 2020: Bachelor's Thesis "*Agrobacterium*-mediated *in vitro* transformation of callus induced from shoot apical meristems of common wheat cv. Podolyanka and cv. Yatran 60" Dept. of Molecular Genetics, Institute of Cell Biology and Genetic Engineering, Kyiv, Ukraine

2018 – 2020: "Molecular genetic analysis of *Triticum aestivum* L. at different stages of development", Dept. of Molecular Genetics, Institute of Cell Biology and Genetic Engineering, Kyiv, Ukraine

2018 – 2020: "Investigation of inheritance of nptII transgene in bread wheat", Dept. of Molecular Genetics, Institute of Cell Biology and Genetic Engineering, Kyiv, Ukraine

Scholarships:

2020 – 2021: Stipend by the International Max Planck Research School

2016 – 2020: Ukrainian State Scholarship for students with high academic achievements

Czech Republic

Petr Nejedly

EDUCATION

College / University:

Brno University of Technology

Highest Degree:

Bachelor in Biomedical Technology and Bioinformatics

Major Subjects:

Signal & Image Processing, Biological signal analysis, Artificial intelligence in medicine

Lab Experience:

2017 - 2020: The Bioelectronics Neurophysiology and Engineering (BNE) Laboratory at Mayo Clinic, USA

2015 - 2020: Institute of Scientific Instruments of the CAS, Czech Republic

Projects / Research:

Localization of epileptic seizure onset zones from intracranial EEG recordings and epileptic seizure prediction. Utilization of artificial intelligence for automated processing of EEG.

Scholarships:

2020 – 2021: Stipend by the International Max Planck Research School

Brazil

Jackeline Neves Pereira

EDUCATION

College / University:

Federal University of São Paulo (UNIFESP), Brazil

Highest Degree:

MBBS

Major Subjects:

Medicine

Lab Experience:

Human behavioral; fMRI; Polysomnography and EEG analysis; Matlab.

Projects / Research:

July 2019: SSSSLEEPING Project: Long-term memory performance and EEG signals night and day (Donders Institute, Sleep and Memory Group, Radboud University, The Netherlands)

2015 – 2016: Distorted entorhinal cortex grids disrupt memory (Donders Institute, Space and Memory Group, Radboud University, The Netherlands)

2013 – 2015: Memory systems behind primacy effect (Division of Psychobiology, Memory Group, UNIFESP)

Scholarships:

2020 – 2021: Stipend by the International Max Planck Research School

2017 – 2018: Undergraduate researcher scholarship by FAPESP

2015 – 2016: Science without Borders scholarship by CNPq

2013 – 2015: Undergraduate researcher scholarship by CNPq

India

Neha Prasanna

EDUCATION

College / University:

PES University

Highest Degree:

B.Tech. (Biotechnology)

Major Subjects:

Biostatistics, Biochemistry, Molecular Biology & Genetics, Bioinformatics, Engineering Mathematics

Lab Experience:

Molecular cloning, PCR, Gel electrophoresis, SDS PAGE, ELISA,Western Blot, *C. elegans* (Handling, Survival assay), Rodents (Fear Conditioning, Viral infusion, Stereotaxic surgery, Perfusion), Fluorescence microscopy, Secondary cell culture, AAV & retro-virus production, Python, Bioinformatics.

Projects / Research:

2019 – 2020: Study of structural & molecular correlates of remote memory formation & retrieval - Dr. Balaji Jayaprakash, IISc Bangalore

2019: B. Tech Thesis "Development of molecular probes for following *in-vivo* structural & functional dynamics associated with memory formation" - Dr. Balaji Jayaprakash, IISc Bangalore

2018: Study of the role of neuropeptides & interleukin related molecules in *C. elegans* immunity – Dr. Varsha Singh, IISc Bangalore (JNCASR summer fellowship)

Scholarships:

2020 – 2021: Stipend by the International Max Planck Research School

2018: JNCASR Summer Research Fellowship Awardee

2015 – 2019: Professor C. N Rao scholarship (PES University)

Mexico

Carolina Quintanilla Sánchez

EDUCATION

College / University:

Faculty of Medicine, Autonomous University of Nuevo Leon UANL

Highest Degree:

Medical Doctor

Major Subjects:

Human Medicine

Lab Experience:

Collaboration in the neurophysiological and behavioral aspect of the project entitled: "Cellular Mechanisms of segregation and consolidation of memory traces in an Alzheimer Disease rodent model" in the Laboratory of Experimental Neurophysiology at the Biomedical Center of the Faculty of Medicine in Pilsen, Charles University.

Projects / Research:

Most of my experience in research has been clinical, especially in endocrinological chronic degenerative diseases. However, in the last months I have been working more on systematic reviews of different topics, but with special focus on methodology and statistical analysis

Scholarships:

2020 – 2021: Stipend by the International Max Planck Research School

India

Mahalakshmi Ramadas

EDUCATION

College / University:

SASTRA Deemed University, Tamil Nadu, India

Highest Degree:

B.Tech. in Bioengineering

Major Subjects:

Biology, Electronics, Applied Science

Lab Experience:

Western and, Northern blots, RT-PCR, Immunofluorescence, Confocal Microscopy, Cell Culture, Gait analysis, MATLAB and Simulink, PYTHON, Basics of Image J, Basics of SPSS, ORIGIN.

Projects / Research:

2020: Internship at Healthcare Technology Innovation Centre, Indian Institute of Technology-Madras, India, (Preejith S.P): "Explore the commercial feasibility of neurostimulation techniques in enhancing the cognitive performance of individuals" and " An algorithm for generating sleep stage annotations using bio-signals, specifically ECG"

2019: Bachelor's Thesis: Krichevsky Lab, Brigham and Women's Hospital, Harvard Medical School, USA, (Dr. Anna Krichevsky, Dr. Rachid El Fatimy): "The role of miR-10b in the nucleus of glioblastoma cell lines"

2018: Mini Project, SASTRA Deemed University, India, (Dr. Anupama, Dr. Adalarasu): "To study the effect of music on gait and cognition"

Scholarships:

2020 - 2022: Gold Neurasmus Excellence Scholarship (NExS)

2020 - 2021: Stipend by International Max Planck Research School

Germany

Anna Siegert

EDUCATION

College / University:

University of Göttingen

Highest Degree:

B.Sc.

Major Subjects:

Molecular Medicine

Lab Experience:

FACS, Western Blot, DIC and fluorescence microscopy, confocal microscopy and FRAP, CD spectroscopy, DLS, cell culture, cryosectioning and immunohistochemistry

Analysis: FlowJo, ImageJ, Excel, GraphPad Prism.

Projects / Research:

"The impact of aging on the Vγ6^{+} γδ T cell population in murine lymph nodes, thymus and ear skin". Institute of Immunology, Medical school of Hanover, Prof. Dr. Immo Prinz

"αSynuclein liquid-liquid phase separation and its interplay with Alzheimer's Disease related Tau protein". German Center for Neurodegenerative Diseases, Göttingen, Prof. Dr. Markus Zweckstetter

Bachelor Thesis: "Influence of disease-associated post-translational modifications on Tau-organelle interactions". German Center for Neurodegenerative Diseases, Göttingen, Prof. Dr. Markus Zweckstetter

Scholarships:

2020 – 2021: Stipend by the International Max Planck Research School

Singapore

Dawn J Tan

EDUCATION

College / University:

National University of Singapore

Highest Degree:

B.Sc.

Major Subjects:

Life Sciences (with specialization in Biomedical Sciences), Psychology

Lab Experience:

Stem cell culture and differentiation, Western Blot, protein extraction, immunohistochemistry, immunofluorescence assay and imaging, light and fluorescence microscopy, ImageJ processing, statistics in IBM SPSS.

Projects / Research:

2018 – 2019: Bachelor's Thesis "Loss of FEZ1 results in impairment of motor neuron development and morphology"

2017: Research project "Understanding the role of FEZ2 in neurons"

Scholarships:

2020 – 2021: Stipend by the International Max Planck Research School

Germany

Ilona Vieten

EDUCATION

College / University:

Universität zu Köln, Germany

Highest Degree:

B.Sc.

Major Subjects:

Neuroscience

Lab Experience:

ELISA, immunohistochemistry, DNA isolation, PCR, SDS-page, Western Blot, basic cell culture techniques, basic mouse handling and perfusion fixation, cryostat and vibratome sectioning, light and confocal microscopy.

Projects / Research:

2020: Internship at Centrosome and Cytoskeleton Biology Laboratory, Heinrich Heine University Düsseldorf, Germany

2019: "Interaction Between Short-chain Polysialic acid and Sialic acid-binding Ig-like Lectins (SIGLECs)", Bachelor's thesis at the Institute of Reconstructive Neurobiology, University of Bonn, Germany

2018: Internship at Translational Neurocircuitry Group of Max Planck Institute for Metabolism Research, Cologne, Germany

Scholarships:

2020 – 2021: Stipend by the International Max Planck Research School

USA

Margaret Young

EDUCATION

College / University:

Northwestern University

Highest Degree:

Bachelor of Arts

Major Subjects:

Neuroscience

Lab Experience:

My undergraduate research exposed me to optogenetic inactivation and electromyography recordings in mice and behavioral assays and quantification (data analysis, including dimensionality reduction and statistical tests, in MATLAB and Python and video labelling in DeepLabCut). However, I also completed undergraduate coursework that focused on machine learning and mathematical modelling techniques in Python, on electrophysiological recordings in Aplysia ganglia, and on other molecular techniques, including Western blotting, immunohistochemistry, and PCR.

Projects / Research:

2019 – 2020: Undergraduate researcher with Dr. Andrew Miri in the Neurobiology Department at Northwestern University. My work culminated in my Bachelor's thesis titled "A Quantitative Analysis of Cortical Influence on Complex Movement in Real Time."

Scholarships:

2020 – 2022: Gold Neurasmus Excellence Scholarship (NExS)

2020 – 2021: Stipend by International Max Planck Research School

2019 – 2020: NEURON Program Participant, Department of Neurobiology at Northwestern UniversitySummer 2019: Neuroscience Summer Research Grant, Department of Neurobiology at Northwestern University

Faculty

Name		Department	Institute
Andrea	Antal	Clinical Neurophysiology	U Göttingen
Mathias	Bähr	Neurology	U Göttingen
Thomas	Bayer	Molecular Psychiatry	U Göttingen
Susann	Boretius	Functional Imaging Laboratory	DPZ
Nils	Brose	Molecular Neurobiology	MPI em
Wolfgang	Brück	Neuropathology	U Göttingen
Gregor	Bucher	Developmental Biology	U Göttingen
Brett	Carter	Synaptic Physiology and Plasticity	ENI
Jan	Clemens	Neural Computation and Behavior	ENI
Peter	Dechent	Cognitive Neurology	U Göttingen
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	German Center for Neurodegenerative Diseases	U Göttingen
Alexander	Flügel	Neuroimmunology	U Göttingen
Tim	Friede	Medical Statistics	U Göttingen
Alexander	Gail	Sensorimotor Transformations	DPZ
Tim	Gollisch	Ophthalmology	U Göttingen
Martin	Göpfert	Cellular Neurobiology	U Göttingen
Ralf	Heinrich	Cellular Neurobiology	U Göttingen
Stefan	Hell	NanoBiophotonics	MPI bpc
Swen	Hülsmann	Experimental Neuroanesthesiology	U Göttingen
Reinhard	Jahn	Neurobiology	MPI bpc
Igor	Kagan	Decision and Awareness	DPZ
Siegrid	Löwel	Systems Neuroscience	U Göttingen
Ira	Milosevic	Synaptic Vesicle Dynamics	ENI
Tobias	Moser	Auditory Neuroscience & InnerEarLab	U Göttingen
Klaus-Armin	Nave	Neurogenetics	MPI em
Tiago	Outeiro	Experimental Neurodegeneration	U Göttingen
Luis	Pardo	Molecular Biology of Neuronal Signals	MPI em
Walter	Paulus	Clinical Neurophysiology	U Göttingen
Arezoo	Pooresmaeili	Perception and Cognition	ENI
Jeong Seop	Rhee	Neurophysiology	MPI-em
Silvio O.	Rizzoli	Neuro- and Sensory Physiology	ENI
Annekathrin	Schacht	CRC Text Structures	U Göttingen
Hansjörg	Scherberger	Neurobiology	DPZ
Oliver	Schlüter	Molecular Neurobiology	ENI
Manuela	Schmidt	Somatosensory Signaling	MPI em
Caspar	Schwiedrzik	Neural Circuits and Cognition	ENI
Michael	Sereda	Molecular and Translational Neurology	MPI em
Jochen	Staiger	Neuroanatomy	U Göttingen
Stefan	Treue	Cognitive Neurosciences	DPZ
Melanie	Wilke	Cognitive Neurology	U Göttingen
Sonja	Wojcik	Neurotransmitter Systems	MPI em
Fred	Wolf	Theoretical Neurophysics	MPI ds
Fred	Wouters	Molecular and Cellular Systems	U Göttingen

U Göttingen = University of Göttingen, 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

Andrea Antal

Professor at the Clinical Neurophysiology

- 1990 Diploma in Biology, Attila József University of Sciences, Szeged, Hungary
- 1993 University Doctor, Attila József University of Sciences, Szeged, Hungary
- 1998 Ph.D., Albert Szent-Györgyi Medical University, Szeged, Hungary
- 2005 Habilitation University of Göttingen, Germany
- 2010 Extraordinary professor, University of Göttingen, Germany

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Major Research Interests

Neuroplasticity became one central topic of neuroscience research in the last decades. Dynamic modifications of neuronal networks are an important substrate for learning and memory formation. Furthermore, pathological neuroplasticity might be one foundation of numerous central nervous system diseases.

The primary aim of our recent work is to develop and establish new non-invasive brain stimulation methods to induce physiological changes in the central nervous system in order to investigate cognition and complex information processing. Transcranial direct current stimulation (tDCS) was developed by our group as a non-invasive tool to induce neuroplasticity in the human cerebral cortex. tDCS as a tool aims to induce prolonged neuronal excitability and activity alterations in the human brain via alterations of the neuronal membrane potential. Accordingly, this method is a promising tool in the treatment of diseases that are accompanied by changes of cortical excitability. Transcranial alternating current stimulation (tACS) and random noise stimulation (tRNS) are new external stimulation techniques influencing cortical activity. tACS and tRNS permit, due to the oscillating stimulation, external interference with the cortical oscillations. They can particularly modulate the temporary connections of cortical areas during a given task. Neuronal oscillations in the brain are associated with the processing of sensory information, learning, cognition, arousal, attention and also pathological conditions (e.g. Parkinson's tremor, epilepsy). Therefore, the external modulation of cortical oscillations could be an important component of induced cerebral plasticity. In terms of effectiveness tRNS seems to have at least the same therapeutic potential for the treatment of diseases such as depression and chronic pain as rTMS and tDCS.

Selected Recent Publications

Lehr A, Henneberg N, Nigam T, Paulus W, Antal A. Modulation of conflict processing by theta range tACS over the dorsolateral prefrontal cortex. Neural Plasticity in press.

Sabel BA, Abd Hamid AI, Borrmann C, Speck O, Antal A. Transorbital alternating current stimulation modifies BOLD activity in healthy subjects and in a stroke patient with hemianopia: a 7 Tesla fMRI feasibility study. International Journal of Psychophysiology in press.

de Lara GA, Alekseichuk I, Turi Zs, Lehr A, Antal A, Paulus W (2018) Perturbation of theta-gamma coupling at the temporal lobe hinders verbal declarative memory. Brain Stimulation 11: 509-517

Huang YZ, Lu MK, Antal A, Classen J, Nitsche MA, Ziemann U, Ridding M, Hamada M, Ugawa Y, Jaberzadeh S, Suppa A, Paulus W, Rothwell J (2017) Plasticity induced by non-invasive transcranial brain stimulation: a position paper. Clinical Neurophysiology, 128: 2318-2329

De Lara GA, Knechtges PN, Paulus W, Antal A (2017) Anodal tDCS over the left DLPFC did not affect the encoding and retrieval of verbal declarative information. Frontiers in Neuroscience 11: 452

Antal A, Alekseichuk I, Bikson M, Brockmöller J, Brunoni AR, Chen R, Cohen LG, Dowthwaite G, Ellrich J, Flöel A, Fregni F, George MS, Hamilton R, Haueisen J, Herrmann CS, Hummel FC, Lefaucheur JP, Liebetanz D, Loo CK, McCaig CD, Miniussi C, Miranda PC, Moliadze V, Nitsche MA, Nowak R, Padberg F, Pascual-Leone A, Poppendieck W, Priori A, Rossi S, Rossini PM, Rothwell J, Rueger MA, Ruffini G, Schellhorn K, Siebner HR, Ugawa Y, Wexler A, Ziemann U, Hallett M, Paulus W (2017) Low intensity transcranial electric stimulation: Safety, ethical, legal regulatory and application guidelines. Clinical Neurophysiology 128: 1774-1809

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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 at the Department of Neurology, University of Göttingen

Major Research Interests

Our research examines cellular and molecular mechanisms of neuronal dysfunction and neuronal cell death in neurodegenerative disorders focusing on Parkinson's disease (PD). In a translational approach we use several models to study pathophysiological cascades, potential biomarkers and develop new therapeutic strategies.

In the Excellence Cluster MBExC we cooperate with several other groups of the Göttingen Campus to determine the role of a-synuclein aggregation for dopaminergic dysfunction and cell death. To that end, we have recently also established new differentiation protocols for iPS cells from idiopathic and genetic PD patients. In all our model systems we use AAV-mediated viral gene transfer to express different disease-or de-/regeneration associated genes as research tools and also as potential therapeutic factors to manipulate the respective molecular events *in vitro* and *in vivo*. In parallel, we examine the pathophysiology in PD patients and develop new diagnostic and prognostic biomarkers.

Final aim of our research approaches 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

Raina A, Leite K, Guerin S, Mahajani SU, Chakrabarti KS, Voll D, Becker S, Griesinger C, Bähr M, Kügler S (2020) Dopamine promotes the neurodegenerative potential of β-synuclein. J Neurochem. 2020 Jul 30. doi: 10.1111/jnc.15134. Online ahead of print

Maass F, Rikker S, Dambeck V, Warth C, Tatenhorst L, Csoti I, Schmitz M, Zerr I, Leha A, Bähr M, Lingor P (2020) Increased alpha-synuclein tear fluid levels in patients with Parkinson's disease. Sci Rep. 2020 May 22;10(1):8507. doi: 10.1038/s41598-020-65503-1

Miloserdov K, Schmidt-Samoa C, Williams K, Weinrich CA, Kagan I, Bürk K, Trenkwalder C, Bähr M, Wilke M (2019) Aberrant functional connectivity of resting state networks related to misperceptions and intra-individual variability in Parkinson's disease. Neuroimage Clin. 2020; 25:102076. doi: 10.1016/j.nicl.2019.102076. Epub 2019 Nov 5

Maass F, Michalke B, Willkommen D, Leha A, Schulte C, Tönges L, Mollenhauer B, Trenkwalder C, Rückamp D, Börger M, Zerr I, Bähr M, Lingor P (2019) Elemental fingerprint: Reassessment of a cerebrospinal fluid biomarker for Parkinson's disease. Neurobiol Dis. 2020 Feb;134:104677. doi: 10.1016/j.nbd.2019.104677. Epub 2019 Nov 13

Balke D, Tatenhorst L, Dambeck V, Ribas VT, Vahsen BF, Michel U, Bähr M, Lingor P (2019) AAV-Mediated Expression of Dominant-Negative ULK1 Increases Neuronal Survival and Enhances Motor Performance in the MPTP Mouse Model of Parkinson's Disease. Mol Neurobiol. 2020 Feb;57(2):685-697. doi: 10.1007/s12035-019-01744-0. Epub 2019 Aug 24

Mahajani S, Raina A, Fokken C, Kügler S, Bähr M (2019) Homogenous generation of dopaminergic neurons from multiple hiPSC lines by transient expression of transcription factors. Cell Death Dis. 2019 Nov 27;10(12):898. doi: 10.1038/s41419-019-2133-9

Maass F, Michalke B, Leha A, Boerger M, Zerr I, Koch JC, Tönges L, Bähr M, Lingor PJ (2018) Elemental fingerprint as a cerebrospinal fluid biomarker for the diagnosis of Parkinson's disease. Neurochem

Tolö J, Taschenberger G, Leite K, Stahlberg MA, Spehlbrink G, Kues J, Munari F, Capaldi S, Becker S, Zweckstetter M, Dean C, Bähr M, Kügler S (2018) Patho- physiological consequences of neuronal α-synuclein overexpression: Impacts on ion homeostasis, stress signaling, mitochondrial integrity, and electrical activity. Front Mol Neurosci. 2018 Mar 7;11:49. doi: 10.3389/fnmol.2018.00049. eCollection 2018

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http://www.alzheimer-bayer.de/

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 University of Göttingen, University Medical Center 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 University of 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), pre-clinical 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

Dietrich K, Bouter Y, Müller M, Bayer TA (2018) Synaptic alterations in mouse models for Alzheimer Disease - a Special Focus on N-truncated Abeta 4-42. Molecules 23(4). pii: E718

Noguerola JSL, Giessen NME, Ueberück M, Meißner JN, Pelgrim C, Adams J, Wirths O, Bouter Y, Bayer TA (2018) Synergistic effect on neurodegeneration by N-truncated Aβ4-42 and pyroglutamate Aβ3-42 in a mouse model of Alzheimer's Disease. Front. Aging Neurosci 10: 64

Storck SE, Meister S, Nahrath J, Meißner JN, Schubert N, Di Spiezio A, Baches S, Vandenbroucke RE, Bouter Y, Prikulis I, Korth C, Weggen S, Heimann A, Schwaninger M, Bayer TA and Pietrzik CU (2016) Endothelial LRP1 transports amyloid-? 1-42 across the blood-brain barrier. J Clin Invest 126: 123-36

Antonios G, Borgers H, Richard BC, Brauß A, Meißner J, Weggen S, Pena V, Pillot T, Davies SL, Bakrania P, Matthews D, Brownlees J, Bouter Y, Bayer TA (2015) Alzheimer therapy with an antibody against N-terminal Abeta 4-X and pyroglutamate Abeta 3-X. Scientific Reports 5: 17338 | DOI: 10.1038/srep17338

Bouter Y, Noguerola JSL, Tucholla P, Crespi GAN, Parker MW, Wiltfang J, Miles LA and Bayer TA (2015) Abeta targets of the biosimilar antibodies of Bapineuzumab, Crenezumab, Solanezumab in comparison to an antibody against N-truncated Abeta in sporadic Alzheimer disease cases and mouse models. Acta Neuropathol 130(5)713-729

Bayer TA (2015) Proteinopathies, a core concept for understanding and ultimately treating degenerative disorders? European Neuropsychopharmacology 25: 713-724

Bayer TA, Wirths O (2014) Focusing the amyloid cascade hypothesis on N-truncated Abeta peptides as drug targets against Alzheimer's disease. Acta Neuropathol 127(6): 787-801

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Susann Boretius

Professor of Functional Imaging at the German Primate Center

- 1994 License to practice veterinary medicine
- 2000 Doctor of veterinary medicine, University of Leipzig
- 2003 Diploma in Physics, University of Göttingen
- 2003 – 2011 Scientific assistant, Max-Planck-Institute for Biophysical Chemistry, Göttingen, Biomedizinische NMR Forschungs GmbH (Prof. J. Frahm)
- 2011 – 2015 Professor of Biomedical Imaging with focus on magnetic resonance technologies, Christian-Albrechts University of Kiel, Germany
- 2013 – 2015 Head of the Molecular Imaging North Competence Center, Christian-Albrechts University of Kiel
- since 2015 Professor of Functional Imaging, Faculty of Biology and Psychology, University of Göttingen and head of the Functional Imaging Laboratory, German Primate Center, Göttingen

Major Research Interests

Magnetic resonance imaging (MRI) and spectroscopy (MRS) Neurosciences: basic and translational research

Our research is focused on the development and improvement of magnetic resonance (MR) methods for application in basic biomedical and applied clinical research especially in the fields of neurosciences. We are particularly interested in applying this method on experimental animals, but we do complementary studies in humans as well. As truly non-invasive techniques, MRI and MRS are important methods for translational research, because almost the same methods can be applied in animals and humans. In this context, our research and development activities aim to continuously improve the spatial and temporal resolution of MRI and MRS in rodents, in non-human primates and in humans. With the help of these techniques we are “watching” the brain while it thinks and aiming to better understand what happens with the brain during maturation and aging, and under healthy and pathological conditions as well. Moreover, by using appropriate animal models and more advanced contrast mechanism like diffusion based techniques, magnetization transfer and susceptibility mapping our goal is to increase the sensitivity and specificity of these MR methods for more precise diagnostics and for a more specific and early detection of the response to therapeutic intervention.

Selected Recent Publications

Poggi G, Boretius S, Möbius W, Moschny N, Baudewig J, Ruhwedel T, Hassouna I, Wieser GL, Werner HB, Goebbels S, Nave KA, Ehrenreich H (2016) Cortical network dysfunction caused by a subtle defect of myelination. GLIA 2016 64(11): 2025-40

Dommaschk M, Peters M, Gutzeit F, Schütt C, Näther C, Sönnichsen FD, Tiwari S, Riedel C, Boretius S, Herges R (2015) Photoswitchable Magnetic Resonance Imaging Contrast by Improved Light-Driven Coordination-Induced Spin State Switch. J AM CHEM SOC 137: 7552-7555

Boretius S, Tammer R, Michaelis T, Brockmöller J, Frahm J (2013) Halogenated volatile anesthetics alter brain metabolism as revealed by proton magnetic resonance spectroscopy of mice *in vivo*. NEUROIMAGE 69: 244-55

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 (2012) Glycolytic oligodendrocytes maintain myelin and long-term axonal integrity. NATURE 485: 517-21

Boretius S, Kasper L, Tammer R, Michaelis T, Frahm J (2009) MRI of cellular layers in mouse brain *in vivo*. NEUROIMAGE 47: 1252-60

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Nils Brose

Professor, Director at the Max Planck Institute for Experimental Medicine

- 1981 – 1985 Undergraduate studies in Biochemistry, Eberhard Karls University, Tübingen, Germany
- 1987 MSc in Physiology with Marianne Fillenz, University of Oxford, Oxford, UK
- 1990 PhD in Biology with Reinhard Jahn, Ludwig Maximilians University, Munich, Germany
- 1991 – 1995 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)
- 1995 – 2001 Research Group Leader, Max Planck Institute of Experimental Medicine, Göttingen, Germany
- since 2001 Director, Department of Molecular Neurobiology, Max Planck Institute of Experimental Medicine, Göttingen, Germany

Major Research Interests

Our research focuses on the molecular mechanisms of nerve cell development and synapse formation and function in the vertebrate central nervous system. To this end, we combine biochemical, morphological, mouse genetic, physiological, and behavioral methods to elucidate the molecular basis of nerve cell differentiation, synapse formation, transmitter release, and postsynaptic transmitter sensing. In selected cases, we explore the dysfunction of corresponding biological processes in neuropsychiatric diseases. Our work in the field of nerve cell development focuses on the role of SUMOylation in cell polarity formation, cell migration, and neuritogenesis, our synaptogenesis research concentrates on synaptic cell adhesion proteins and their role in synapse formation and function, and our 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

Sigler A, Oh WC, Imig C, Altas B, Kawabe H, Cooper BH, Kwon H-B, Rhee J-S*, Brose N* (2017) Formation and maintenance of functional spines in the absence of presynaptic glutamate release. Neuron 94: 304-311 (*joint corresponding authors)

Kawabe H, Mitkovski M, Kaeser PS, Hirrlinger J, Opazo F, Nestvogel D, Kalla S, Fejtova A, Verrier SE, Bungers SR, Cooper BH, Varoqueaux F, Wang Y, Nehring RB, Gundelfinger ED, Rosenmund C, Rizzoli SO, Südhof TC, Rhee J-S, Brose, N. (2017) ELKS1 localizes the synaptic vesicle priming protein bMunc13-2 to a specific subset of active zones. J Cell Biol 216: 1143-1161

Lipstein N, Verhoeven-Duif NM, Michelassi FE, Calloway N, van Hasselt PM, Pienkowska K, van Haaften G, van Haelst MM, van Empelen R, Cuppen I, van Teeseling HC, Evelein AMV, Vorstman JA, Thoms S, Jahn O, Duran KJ, Monroe GR, Ryan TA, Taschenberger H, Dittman JS, Rhee J-S, Visser G, Jans JJ*, Brose N* (2017) Synaptic UNC13A protein variant causes increased synaptic transmission and dyskinetic movement disorder. J Clin Invest 127: 1005-1018 (*joint corresponding authors)

Hammer M, Krueger-Burg D, Tuffy LP, Cooper BH, Taschenberger H, Goswami SP, Ehrenreich H, Jonas P, Varoqueaux F, Rhee J-S, Brose N (2015) Perturbed hippocampal synaptic inhibition and gamma-oscillations in a Neuroligin-4 knock-out mouse model of autism. Cell Rep 13: 516-523

Soykan T, Schneeberger D, Tria G, Buechner C, Bader N, Svergun D, Tessmer I, Poulopoulos A, Papadopoulos T, Varoqueaux F, Schindelin H, Brose N (2014) A conformational switch in Collybistin determines the differentiation of inhibitory postsynapses. EMBO J 18: 2113-2133

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Wolfgang Brück

Professor of Neuropathology

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

Major Research Interests

- Immunopathology 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

Lagumersindez-Denis N, Wrzos C, Mack M, Winkler A, van der Meer F, Reinert MC, Hollasch H, Flach A, Brühl H, Cullen E, Schlumbohm C, Fuchs E, Linington C, Barrantes-Freer A, Metz I, Wegner C, Liebetanz D, Prinz M, Brück W, Stadelmann C, Nessler S (2017) Differential contribution of immune effector mechanisms to cortical demyelination in multiple sclerosis. Acta Neuropathol 134: 15-34

Fard MK, van der Meer F, Sánchez P, Cantuti-Castelvetri L, Mandad S, Jäkel S, Fornasiero EF, Schmitt S, Ehrlich M, Starost L, Kuhlmann T, Sergiou C, Schultz V, Wrzos C, Brück W, Urlaub H, Dimou L, Stadelmann C, Simons M (2017) BCAS1 expression defines a population of early myelinating oligodendrocytes in multiple sclerosis lesions. Sci Transl Med 2017 Dec 6;9(419)

Romanelli E, Merkler D, Mezydlo A, Weil MT, Weber MS, Nikić I, Potz S, Meinl E, Matznick FE, Kreutzfeldt M, Ghanem A, Conzelmann KK, Metz I, Brück W, Routh M, Simons M, Bishop D, Misgeld T, Kerschensteiner M (2016) Myelinosome formation represents an early stage of oligodendrocyte damage in multiple sclerosis and its animal model. Nat Commun 2016 Nov 16;7: 13275

Kinzel S, Lehmann-Horn K, Torke S, Häusler D, Winkler A, Stadelmann C, Payne N, Feldmann L, Saiz A, Reindl M, Lalive PH, Bernard CC, Brück W, Weber MS (2016) Myelin-reactive antibodies initiate T cell-mediated CNS autoimmune disease by opsonization of endogenous antigen. Acta Neuropathol 132: 43-58

Jürgens T, Jafari M, Kreutzfeldt M, Bahn E, Brück W, Kerschensteiner M, Merkler D (2016) Reconstruction of single cortical projection neurons reveals primary spine loss in multiple sclerosis. Brain 139: 39-46

Pfeifenbring S, Bunyan RF, Metz I, Röver C, Huppke P, Gärtner J, Lucchinetti CF, Brück W (2015) Extensive acute axonal damage in pediatric multiple sclerosis lesions. Ann. Neurol., 77: 655-667

Metz I, Weigand SD, Popescu BF, Frischer JM, Parisi JE, Guo Y, Lassmann H, Brück W*, Lucchinetti CF* (2014) Pathologic heterogeneity persists in early active multiple sclerosis lesions. Ann Neurol 75: 728-738

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Gregor Bucher

Professor of Evolutionary Developmental Genetics

- since 2017 Head of Department Evolutionary Developmental Genetics GZMB, Johann Friedrich Blumenbach Institut, University of Göttingen, Germany
- 2013 – 2017 DFG Heisenberg Professor Evolutionary Developmental Genetics, GZMB, Johann Friedrich Blumenbach Institut, University of Göttingen, Germany
- 2006 – 2013 Junior Professor of Developmental Genetics in the Department of Developmental Biology, GZMB, Johann Friedrich Blumenbach Institut, University of Göttingen, Germany (2002)
- 2006-2013 Junior Group Leader of the Göttingen Center for Molecular Biology (GZMB)
- 2004 – 2006 Postdoc University of Göttingen, Germany

Major Research Interests

Head Development and Evolution

We seek to understand the formation of the insect head from pattern formation to morphogenesis. These data provide insights into some long standing zoological question concerning the arthropod head and its evolution.

Brain Development and Evolution

We want to identify the cellular and genetic mechanisms that underly the evolution of the astonishing diversity of insect brains. Further, we identify the genetic signals specifying neural stem cells of the brain. We focus on the central complex as model.

Insect Functional Genomics

We expand the power of our model system by developing novel tools. Transgenic tools and CRISPR/Cas9 genome editing allow a deeper analysis of gene function. The genome wide iBeetle RNAi screen reveals novel gene functions.

Selected Recent Publications

Farnworth MS, Eckermann KN, Bucher G (2020) Sequence heterochrony led to a gain of functionality in an immature stage of the central complex: A fly–beetle insight. PLOS Biol 18, e3000881

He B, Buescher M, Farnworth MS, Strobl F, Stelzer EH, Koniszewski ND, Muehlen D, Bucher G (2019) An ancestral apical brain region contributes to the central complex under the control of foxQ2 in the beetle *Tribolium*. eLife 8.

Ansari S, Troelenberg N, Dao VA, Richter T, Bucher G, Klingler M (2018) Double abdomen in a short-germ insect: Zygotic control of axis formation revealed in the beetle *Tribolium castaneum*. Proc Natl Acad Sci 201716512

Schmitt-Engel C, Schultheis D, Schwirz J, Ströhlein N, Troelenberg N, Schoppmeier M, Klingler M, Bucher G (2015) The iBeetle large-scale RNAi screen reveals gene functions for insect development and physiology. Nat Commun 6: 7822

Fu J, Posnien N, Bolognesi R, Fischer TD, Rayl P, Oberhofer G, Kitzmann P, Brown SJ, Bucher G (2012) Asymmetrically expressed axin required for anterior development in *Tribolium*. Proc Natl Acad Sci USA 109: 7782–7786

Posnien N, Koniszewski NDB, Hein HJ, Bucher G (2011) Candidate Gene Screen in the Red Flour Beetle *Tribolium* Reveals Six3 as Ancient Regulator of Anterior Median Head and Central Complex Development. PLoS Genet 7, e1002418

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Brett Carter

Group Leader at ENI

- 2002 Undergraduate studies in chemical engineering, Georgia Institue of Technology, Atlanta, USA
- 2004 – 2006 Research Assistant with David Clapham, Children's Hospital Boston, USA
- 2006 – 2011 PhD in Neurobiology with Bruce Bean, Harvard, Boston, USA
- 2011 – 2017 Postdoctoral training with Craig Jahr, Vollum Institute, Portland, USA
- since 2017 Research group leader, European Neuroscience Institute, Göttingen, Germany

Major Research Interests

Our research focuses on synaptic function and the changes that can occur after synaptic plasticity. We study intact glutamatergic synapses in brain slices using a combination of electrophysiology, 2-photon imaging, and pharmacology. In particular, we are interested in understanding the role of NMDA receptors in signaling synaptic depression.

Selected Recent Publications

Sun W, Wong JM, Gray JA, Carter BC (2018) Incomplete block of NMDA receptors by intracellular MK-801. Neuropharmacology 143: 122-129

Carter BC and Jahr CE (2016) Postsynaptic, not presynaptic NMDA receptors are required for spike timing dependent LTD induction. Nat Neurosci 19: 1218-1224

Carter BC, Giessel AJ, Sabatini BL, Bean BP (2012) Transient sodium current at subthreshold voltages: activation by EPSP waveforms. Neuron 75(6): 1081-1093

Desai BN, Krapivinsky G, Navarro B, Krapivinsky L, Carter BC, Febvay, S, Delling M, Penumaka A, Ramsey IS, Manasian Y, Clapham DE (2012). Cleavage of TRPM7 releases the kinase domain from the ion channel and regulates its participation in Fas-induced apoptosis. Dev Cell 22(6): 1149-1162

Carter BC and Bean BP (2011) Incomplete inactivation and rapid recovery of voltage-dependent sodium channels during high-frequency firing in cerebellar Purkinje neurons. J Neurophysiol. 105(2): 860-871

Carter BC and Bean BP (2009) Sodium entry during action potentials of mammalian neurons: incomplete inactivation and reduced metabolic efficiency in fast-spiking neurons. Neuron 64(6): 898-909

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Jan Clemens

Group leader, European Neuroscience Institute

- 2012 PhD in Computational Neuroscience, Humboldt-Universität zu Berlin, BCCN Berlin
- 2012 – 2017 Postdoctoral Fellow, Princeton University
- since 2017 Group leader, European Neuroscience Institute

Major Research Interests

The "Neural Computation and Behavior" works on how acoustic communication signals are processed to inform behavior. Acoustic communication is widespread in the animal kingdom - yet it's neural basis is only poorly understood. Like songbirds or crickets - fruit flies also produce mating songs during courtship. We use high-throughput behavioral assays and computer vision to precisely quantify how song influences behavior on multiple time scales – from changes in locomotion in response to the song over tens of milliseconds to a mating decision based on song accumulated over several minutes of courtship. We then exploit the genetic toolbox available in *Drosophila* to identify the neural substrates of these behaviors: Using optogenetics, we activate or inactivate individual neurons in the fly brain during courtship interactions – quantitative models of the behavior then allow us to identify the time scales and components of the behavior controlled by these neurons. Having found individual neurons involved in processing song, we then use electrophysiology and two-photon Calcium imaging to interrogate the dynamical neural representations of song to determine how song is encoded in the brain and how these neural codes give rise to behavior.

Selected Recent Publications

Clemens J, Deutsch D, Thiberge S, Murthy M (2018) Shared song object detector neurons in *Drosophila* male and female brains drive divergent, sex-specific behaviors. biorxiv

Clemens J, Coen P, Roemschied FA, Pereira T, Mazumder D, Pacheco D, Murthy M (2018) Discovery of a new song mode in *Drosophila* reveals hidden structure in the sensory and neural drivers of behavior. Current Biology 28: 2400–2412

Clemens J, Ozeri N, Murthy N (2018) Fast intensity adaptation enhances the encoding of sound in *Drosophila*. Nature Communications 9: 134

Stern D, Clemens J, Coen P, Calhoun A, Shirangi T, Hogenesch J, Arthur B, Murthy M (2017) Experimental and statistical reevaluation provides no evidence for *Drosophila* courtship song rhythms. PNAS 114(37): 9978-9983

Coen P, Xie M, Clemens J, Murthy M (2016) Sensorimotor transformations underlying variability in song intensity during *Drosophila* courtship. Neuron 89(3): 629–644

Clemens J, Girardin C, Coen P, Guan G, Dickson B, Murthy M (2015) Connecting neural codes with behavior in the auditory system of *Drosophila*. Neuron 87(6): 1332-1343

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Peter Dechent

Research Group Leader, Cognitive Neurology

- 1991 – 2001 Studies of Biology, University of Mainz
- 1994 Scientific Assistant at the Biophysical Institute, University of Mainz
- 1995 – 1996 Scholarship of the Erasmus-Program, University of Manchester, England
- 1996 Research Fellow at the Neuroscience Department, Karolinska Institute, Stockholm, Sweden
- 1997 – 1998 Diploma Thesis at the 'Biomedical NMR Research' at the Max-Planck-Institute for Biophysical Chemistry, Göttingen; Diploma in Biology
- 1998 – 2001 Doctoral thesis at the 'Biomedical NMR Research'; Dr.rer.nat. (Biology)
- 2001 – 2003 Postdoc at the 'Biomedical NMR Research' (Laboratory of Prof. Dr. J. Frahm)
- since 2004 Head of the Research Group 'MR-Research in Neurology and Psychiatry' Medical Faculty, University Göttingen

Major Research Interests

- Combination of functional magnetic resonance imaging (fMRI) with non-invasive brain stimulation techniques like transcranial Direct / Alternating Current Stimulation (tDCS/tACS) and Transcranial Magnetic Stimulation (TMS) to modulate functional brain networks in healthy and pathologic conditions.
- Characterization of hemodynamic processes, the basis of blood oxygenation level dependent (BOLD) changes in standard fMRI investigations.
- Application of modern MR techniques to investigate the human brain in healthy and pathologic conditions. Applied methods comprise:
  - Structural MRI
  - Diffusion-weighted- and diffusion-tensor-imaging (DWI/DTI)
  - Localized MR-spectroscopy (MRS)

Selected Recent Publications

Wilke M, Schneider L, Dominguez-Vargas AU, Schmidt-Samoa C, Miloserdov K, Nazzal A, Dechent P, Cabral-Calderin Y, Scherberger H, Kagan I, Bähr M (2018) Reach and grasp deficits following damage to the dorsal pulvinar. Cortex 99: 135-149

Wilke M, Dechent P, Bähr M (2017) Sarcoidosis Manifestion Centered on the Thalamic Pulvinar Leading to Persistent Astasia. Mov Disord Clin Pract. 4(6): 898-900

Barke A, Preis MA, Schmidt-Samoa C, Baudewig J, Kröner-Herwig B, Dechent P (2016) Neural correlates differ in high and low fear-avoidant chronic low back pain patients when imagining back-straining movements. J Pain 17(8): 930-43

Cabral-Calderin Y, Weinrich C, Schmidt-Samoa C, Poland E, Dechent P, Bähr M, Wilke M (2016) Transcranial alternating current stimulation affects the BOLD signal in a frequency and task-dependent manner. Hum Brain Mapp 37(1): 94-121

Cabral-Calderin Y, Williams K, Dechent P, Opitz A, Wilke M (2016) Transcranial alternating current stimulation modulates spontaneous low frequency fluctuations as measured with fMRI. Neuroimage 2016 Jul 5. [Epub ahead of print]

August JM, Rothenberger A, Baudewig J, Roessner V, Dechent P (2015) May Functional Imaging be Helpful for Behavioral Assessment in Children? Regions of Motor and Associative Cortico-Subcortical Circuits Can be Differentiated by Laterality and Rostrality. Front Hum Neurosci 9: 314

Goya-Maldonado R, Weber K, Trost S, Diekhof E, Keil M, Dechent P, Gruber O (2015) Dissociating pathomechanisms of depression with fMRI: bottom-up or top-down dysfunctions of the reward system. Eur Arch Psychiatry Clin Neurosci 265(1): 57-66

Thomas Dresbach

Professor of Anatomy

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

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 gene-rate 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

Körber C, Horstmann H, Venkataramani V, Herrmannsdörfer F, Kremer T, Kaiser M, Schwenger DB, Ahmed S, Dean C, Dresbach T, Kuner T (2015) Modulation of Presynaptic Release Probability by the Vertebrate-Specific Protein Mover. Neuron 87: 521-33

Mendoza Schulz A, Jing Z, Sánchez Caro JM, Wetzel F, Dresbach T, Strenzke N, Wichmann C, Moser T (2014) Bassoon-disruption slows vesicle replenishment and induces homeostatic plasticity at a CNS synapse. EMBO J 33: 512-27

Ahmed S, Wittenmayer N, kremer T, Hoeber J, Kiran Akula A, urlaub H, Islinger M, Kirsch J, Dean C, Dresbach T (2013) Mover is a homomeric phospho-protein present on synaptic vesicles. PLoS One 8: e63474

Stan A, Pielarski KN, 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 USA 107: 11116-111121

Wittenmayer N, Kremer T, Varoqueaux N, Brose N, Dresbach T (2009) Neuro-ligin 1 promotes the maturation of presynaptic boutons. Proc Natl Acad Sci USA 106: 13564-13569

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Hannelore Ehrenreich

Professor of Neurology and Psychiatry, Head, Clinical Neuroscience, MPI-EM

- 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 Clinical Fellow, Department of Internal Medicine, University of Munich
- 1987 Graduation (Medicine), University of Munich
- 1987 – 1988 Residency, Department of Neurology, University of Munich
- 1989 Doctor of Medicine, University of Munich
- 1989 – 1991 Postdoctoral Fellow NIAID, NIH, Bethesda, MD, USA (Dr. A.S. Fauci)
- 1992 – 1994 Residency, Dpts. of Neurology and Psychiatry, University of Göttingen
- 1994 Habilitation (Neurology and Psychiatry)
- 1994 – present: Head, Clinical Neuroscience, MPIEM
- 1995 – present: Consultant & Professor of Neurology & Psychiatry, University of Göttingen
- 2000 – 2002 Vice President, University of Göttingen
- 2008 Professor of Biology and Psychology (Honorary), University of Göttingen
- 2016 Member of the Leopoldina, German National Academy of Science

Major Research Interests

Translational Neuroscience with particular focus on:

(1) Genetic and environmental underpinnings of neuropsychiatric diseases;

(2) Endogenous neuroprotection and neuroregeneration as therapeutic strategies for patients: Research centering on the brain erythropoietin system and hypoxia;

(3) Autoimmune/inflammatory processes contributing to neuropsychiatric phenotypes.

Selected Recent Publications

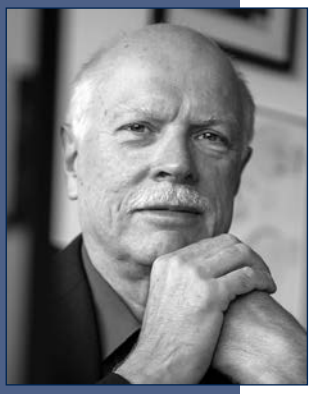
Wakhloo D, Scharkowski F, Curto Y, Butt UJ, Bansal V, Steixner-Kumar AA, Wüstefeld L, Rajput A, Arinrad S, Zillmann MR, Seelbach A, Hassouna I, Schneider K, Ibrahim AQ, Werner HB, Martens H, Miskowiak K, Wojcik SM, Bonn S, Nacher J, Nave KA, Ehrenreich H (2020) Functional hypoxia drives neuroplasticity and neurogenesis via brain erythropoietin. Nature Communications 11 (1): 1313

Pan H, Steixner-Kumar AA, Seelbach A, Deutsch N, Ronnenberg A, Tapken D, Ahsen N, Mitjans M, Worthmann H, Trippe R, Klein-Schmidt C, Schopf N, Rentzsch K, Begemann M, Wienands J, Stöcker W, Weissenborn K, Hollmann M, Nave KA, Lühder F, Ehrenreich H (2020) Multiple inducers and novel roles of autoantibodies against the obligatory NMDAR subunit NR1: A translational study from chronic life stress to brain injury; Mol Psychiatry, doi: 10.1038/s41380-020-0672-1. [Epub ahead of print]

Janova H, Arinrad S, Balmuth E, Mitjans M, Hertel J, Habes M, Bittner RA, Pan H, Goebbels S, Begemann M, Gerwig UC, Langner S, Werner HB, Kittel-Schneider S, Homuth G, Davatzikos C, Völzke H, West BL, Reif A, Grabe HJ, Boretius S, Ehrenreich H*, Nave KA (2018) Microglia ablation alleviates myelin-associated catatonic signs in mice; J Clin Invest, 128(2): 734-745. doi: 10.1172/JCI 97032. *shared last authorship

Ehrenreich H, Mitjans M, Van der Auwera S, Centeno TP, Begemann M, Grabe HJ, Bonn S, Nave KA (2018) OTTO: A new strategy to extract mental disease-relevant combinations of GWAS hits from individuals; Mol Psychiatry, 23(2): 476-486 doi: 10.1038/mp.2016.208

Bansal V, Mitjans M, Burik CAP, Linnér RK, Okbay A, Rietveld CA, Begemann M, Bonn S, Ripke S, de Vlaming R, Nivard MG, Ehrenreich H*, Koellinger PD (2018) Genome-wide association study results for educational attainment aid in identifying genetic heterogeneity of schizophrenia. Nature Communications 9(1): 3078. doi: 10.1038/s41467-018-05510-z. *shared last authorship



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Gregor Eichele

Professor, Director at the Max Planck Institute for Biophysical Chemistry

- 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 behavior.

Selected Recent Publications

Faubel R, Westendorf C, Bodenschatz E, Eichele G (2016) Cilia-based flow network in the brain ventricles. Science 353(6295): 176-8

Hammerschmidt K, Whelan G, Eichele G, Fischer J (2015) Mice lacking the cerebral cortex develop normal song: insights into the foundations of vocal learning. Sci Rep (5): 8808

Husse J, Leliavski A, Tsang AH, Oster H, Eichele G (2014) The light-dark cycle controls peripheral rhythmicity in mice with a genetically ablated suprachiasmatic nucleus clock. FASEB J (11): 4950-4960

Diez-Roux G et al (2011) A high-resolution anatomical atlas of the transcriptome in the mouse embryo. PLoS Biology 9: e1000582

Kiessling S, Eichele G, Oster H (2010) Adrenal glucocorticoids have a key role in circadian resynchronization in a mouse model of jet lag. Journal of Clinical Investigation 120: 2600-2609

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

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André Fiala

Professor of Molecular Neurobiology of Behavior

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

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

Martelli C, Pech U, Kobbenbring S, Pauls D, Bahl B, Sommer MV, Pooryasin A, Barth J, Arias CWP, Vassiliou C, Luna AJF, Poppinga H, Richter FG, Wegener C, Fiala A, Riemensperger T (2017) SIFamide Translates Hunger Signals into Appetitive and Feeding Behavior in *Drosophila*. Cell Rep 20: 464-478

Gupta VK, Pech U, Bhukel A, Fulterer A, Ender A, Mauermann SF, Andlauer TF, Antwi-Adjei E, Beuschel C, Thriene K, Maglione M, Quentin C, Bushow R, Schwärzel M, Mielke T, Madeo F, Dengjel J, Fiala A, Sigrist SJ (2016) Spermidine Suppresses Age-Associated Memory Impairment by Preventing Adverse Increase of Presynaptic Active Zone Size and Release. PLoS Biol 14: e1002563

Riemensperger T, Kittel RJ, Fiala A (2016) Optogenetics in Drosophila neuroscience. Methods Mol Biol 1408: 167-75

Pooryasin A, Fiala A (2015). Identified serotonin-releasing neurons induce behavioral quiescence and suppress mating in *Drosophila*. J Neurosci 35: 12792-812

Pech U, Revelo NH, Seitz KJ, Rizzoli SO, Fiala A (2015) Optical dissection of experience-dependent pre- and postsynaptic plasticity in the *Drosophila* brain. Cell Rep 10: 2083-95

AzimiHashemi N, Erbguth K, Vogt A, Riemensperger T, Rauch E, Woodmansee D, Nagpal J, Brauner M, Sheves M, Fiala A, Kattner L, Trauner D, Hegemann P, Gottschalk A, Liewald JF (2014) Synthetic retinal analogues modify the spectral and kinetic characteristics of microbial rhodopsin optogenetic tools. Nat Commun 5: 5810

Andlauer TF, Scholz-Kornehl S, Tian R, Kirchner M, Babikir HA, Depner H, Loll B, Quentin C, Gupta VK, Holt MG, Dipt S, Cressy M, Wahl MC, Fiala A, Selbach M, Schwarzel M, Sigrist SJ (2014) Drep-2 is a novel synaptic protein important for learning and memory. Elife 2014 Nov 13;3. doi: 10.7554/eLife.03895

Dawydow A, Gueta R, Ljaschenko D, Ullrich S, Hermann M, Ehmann N, Gao S, Fiala A, Langenhan T, Nagel G, Kittel RJ (2014) Channelrhodopsin-2-XXL, a powerful optogenetic tool for low-light applications. Proc Natl Acad Sci U S A 111: 13972-7

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André Fischer

Professor for Psychiatry and Psychotherapy

- 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
- 2007 – 2011 Independent Group Leader at ENI
- since 2011 W3 Professor at the Department for Psychiatry and Psychotherapy, University Medical Center Göttingen
- since 2011 Speaker of the German Center for Neurodegenerative Diseases (DZNE) site Göttingen

Major Research Interests

The long-term goal of our research is to understand the cellular and mole-cular mechanisms underlying brain diseases and to develop neuroprotective and neurodegenerative therapeutic approaches. There is now accumulating evidence that on an individual level health or disease critically depends on the interaction between genes and environment. Epigenetic mechanisms such as histone-modification, DNA-methylation and non-coding RNA-mediated processes are key-regulators of gene-environment interactions. Importantly, such epigenetic mechanisms have recently been implicated with the pathogenesis of neurodegenerative and psychiatric diseases. Thus our current hypothesis is that deregualtion of genome-environment interactions, especially via epigenetic gene-expression, is a key feature of neurodegenerative diseases such as Alzheimer's disease. We combine studies in patient material, mouse and cellular models, behavioral, molecular, genetic, and bioinformatic techniques to address these questions.

Selected Recent Publications

Bahari-Javan S, Varbanov H, Halder R, Benito E, Kaurani L, Burkhardt S, Anderson-Schmidt H, Anghelescu I, Budde M, Stilling RM, Costa J, Dietrich D, Figge C, Folkerts H, Gade K, Heilbronner U, Koller M, Konrad C, Nussbeck SY, Scherk H, Spitze C, Stierl S, Stöckel J, Thiel J, Hagen M, Zimmermann J, Zitzelsberger A, Schulz A, Schmitt A, Delalls I, Falkai P, Schulze TG, Dityatev A, Sananbenesi F, Fischer A (2017) Hdac1 as a target for individualized therapy of schizophrenia patients. PNAS. Epub ahead of print

Benito E, Urbanke U, Ramachandran B, Barth J, Halder R, Awasthi A, Jain G, Capece V, Burkhardt S, Navarro-Sala M, Nagarajan N, Schütz AL, Johnsen SA, Bonn SA, Lührmann R, Dean C, Fischer A (2015) Reinstating transcriptome plasticity and memory function in models for cognitive decline. Journal of Clinical Investigation 125(9): 3572-84

Zovoilis A, Agbemenyah HY, Agis-Balboa RC, Stilling RM, Edbauer D, Rao P, Farinelli L, Delalle I, Schmitt A, Falkai P, Bahari-Javan S, Burkhardt S, Sananbenesi F, Fischer A (2011) microRNA-34c is a novel target to treat dementias. EMBO J 30(20): 4299-308. doi: 10.1038/emboj.2011.327

Peleg S, Sananbenesi F, Zovoilis A, Burkhardt S, Bahari-Javan S, Agis-Balboa RC, Cota P, Wittnam JL, Gogol-Doering A, Opitz L, Salinas-Riester G, Dettenhoffer M, Farinelli L, Chen W, Fischer A (2010) Altered histone H4 lysine 12 acetylation is associated with age-dependent memory impairment in mice. Science 328: 753

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Alexander Flügel

Professor of 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 Institute for Neuroimmunology and 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

Lodygin D, Hermann M, Schweingruber N, Flügel-Koch C, Watanabe T, Schlosser C, Merlini A, Körner H, Chang H-F, Fischer HJ, Reichardt HM, Zagrebelsky M, Mollenhauer B, Frahm J, Stadelmann C, Kügler S, Fitzner D, Haberl M, Odoardi F, Flügel A (2019) ß-Synuclein reactive T cells induce autoimmune CNS grey matter degeneration: Nature 566: 503-508

Schläger C*, Körner H*, Krueger M, Vidoli S, Haberl M, Mielke D, Brylla E, Issekutz T, Cabañas C, Nelson PJ, Ziemssen T, Rohde V, Bechmann I, Lodygin D, Odoardi F*, Flügel A* (2016) Effector T-cell trafficking between the leptomeninges and the cerebrospinal fluid. Nature 530: 349-353. *equal contribution

Flach A*, Litke T*, Strauss J*, Haberl M, Cordero Gómez C, Reindl M, Saiz A, Fehling HJ, Wienands J, Odoardi F, Lühder F§, Flügel A§ (2016) Autoantibody-boosted T-cell reactivation in the target organ triggers manifestation of autoimmune CNS disease. PNAS 113: 3323-3328. *§equal contribution

Lodygin D, Odoardi F, Schläger C, Körner H, Kitz A, Nosov M, van den Brandt J, Reichardt HM, Haberl M, Flügel A (2013) A combination of fluorescent NFAT and H2B sensors uncovers dynamics of T cell activation in real time during CNS autoimmunity. Nature Medicine 19: 784-790

Odoardi F, Sie C, Streyl K, Ulaganathan VK, Schläger C, Lodygin D, Heckelsmiller K, Nietfeld W, Ellwart J, Klinkert WE, Lottaz C, Nosov M, Brinkmann V, Spang R, Lehrach H, Vingron M, Wekerle H, Flügel-Koch C, Flügel A (2012) T cells become licensed in the lung to enter the central nervous system. Nature 488: 675-679

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

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Tim Friede

Professor of Biostatistics

- 1998 Dipl.-Math. (Master's 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

Clinical biostatistics including designs for clinical trials (in particular flexible adaptive designs) and systematic reviews / meta-analyses

Selected Recent Publications

Cole J, Raffel J, Friede T, Eshaghi A, Brownlee W, Chard C, De Stefano N, Enzinger C, Pipramer L, Filippi M, Gasperini C, Rocca MA, Rovira A, Ruggieri S, Sastre-Garriga J, Stromillo ML, Uitdehaag B, Vrenken H, Barkhof F, Nicholas R, Ciccarelli O on behalf of the MAGNIMS study group (2020) Longitudinal assessment of multiple sclerosis with the brain-age paradigm. Annals of Neurology 88: 93-105

Stork L, Ellenberger D, Ruprecht K, Reindl M, Beißbarth T, Friede T, Kümpfel T, Gloth M, Paul F, Brück W, Metz I (2020) Antibody signatures in patients with histopathologically defined multiple sclerosis patterns. Acta Neuropathologica 139: 547-564

Friede T, Pohlmann H, Schmidli H (2019) Blinded sample size reestimation in event-driven clinical trials: Methods and an application in multiple sclerosis. Pharmaceutical Statistics 18: 351–365

Nicholas RS, Han E, Raffel J, Chataway J, Friede T (2018) Over three decades study populations in progressive multiple sclerosis have become older and more disabled, but have lower on-trial progression rates: a systematic review and meta-analysis of 43 randomized placebo-controlled trials. Multiple Sclerosis Journal (in press)

Stork L, Ellenberger D, Beißbarth T, Friede T, Lucchinetti CF, Brück W, Metz I (2018) Differences in the reponses to apheresis therapy of patients with 3 histopathologically classified immunopathological patterns of multiple sclerosis. JAMA Neurology 75: 428-435

Varges D, Manthey H, Heinemann U, Ponto C, Schmitz M, Krasnianski A, Breithaupt M, Fincke F, Kramer K, Friede T, Zerr I (2017) Doxycycline in early CJD ? double-blinded randomized phase II and observational study. Journal of Neurology, Neurosurgery & Psychiatry 88: 119-125

Raffel J, Wallace A, Gveric D, Reynolds R, Friede T, Nicholas R (2017) Patient-reported outcomes and survival in multiple sclerosis: a 10-year retrospective cohort study using the MSIS-29. PLOS Medicine 14(7): e1002346

Gold SM, Enck P, Hasselmann H, Friede T, Hegerl U, Mohr DC, Otto C (2017) Control conditions for randomized trials of behavioral interventions in psychiatry: A decision framework. Lancet Psychiatry 4: 725–732

Stellmann JP, Krumbholz M, Friede T, Gahlen A, Borisow N, Fischer K, Hellwig, Pache F, Ruprecht K, Havla J, Kümpfel T, Aktas O, Hartung HP, Ringelstein M, Geis C, Kleinschnitz C, Berthele A, Hemmer B, Angstwurm K, Young KL, Schuster S, Stangel M, Lauda F, Tumani H, Mayer C, Zeltner L, Ziemann U, Linker RA, Schwab M, Marziniak M, Then Bergh F, Hofstadt-van Oy U, Neuhaus O, Zettl U, Faiss J, Wildemann B, Paul F, Jarius S, Trebst C, Kleiter I on behalf of NEMOS (Neuromyelitis Optica Study Group) (2017) Immunotherapies in neuromyelitis optica spectrum disorder: Efficacy and predictors of response. Journal of Neurology, Neurosurgery and Psychiatry 88(8): 639-647

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Alexander Gail

Professor for Sensorimotor Neuroscience and Neuroprosthetics at the German Primate Center

- 1997 Physics Diploma, Philipps University, Marburg
- 2002 Dr. rer. nat. (Physics) Philipps University, Marburg
- 2002 – 2003 Postdoc (Neurophysics Laboratory of R. Eckhorn, Marburg)
- 2003 – 2006 Postdoc (Laboratory of R. Andersen, Pasadena, CA, USA)
- since 2006 Head of Sensorimotor Research Group, German Primate Center and Bernstein Center for Computational Neuroscience
- since 2012 Professor for Sensorimotor Neuroscience and Neuroprosthetics, University of Göttingen

Major Research Interests

Sensorimotor integration, cognitive movement planning, neuroprosthetics, neuronal synchronization, visual object coding; methods: awake monkey electrophysiology, extracellular multi-channel microelectrode recordings, psychophysics in human and non-human primates, correlation and spectral coherence analysis, pattern recognition

Selected Recent Publications

Martinez-Vazquez P, Gail A (2018) Directed interaction between monkey premotor and posterior parietal cortex during motor-goal retrieval from working memory. Cerebral Cortex

Morel P, Ulbrich P, Gail A (2017) What makes a reach movement effortful? – Physical effort discounting supports common minimization principles in decision making and motor control. PLOS Biology, PLoS Biol 15(6): e2001323

Kuang S, Morel P, Gail A (2016) Planning movements in visual and physical space in monkey posterior parietal cortex. Cerebral Cortex 26(2): 731-747

Suriya-Arunroj L, Gail A (2015) I Plan Therefore I Choose: Free-Choice Bias Due to Prior Action-Probability but Not Action-Value. Front Behav Neurosci 9: 315

Taghizadeh B, Gail A (2014) Spatial task context makes short-latency reaches prone to induced Roelofs illusion. Front Hum Neurosci 8(673)

Klaes C, Schneegans S, Schöner G, Gail A (2012) Sensorimotor learning biases choice behavior: A learning neural field model for decision making. PLOS Computational Biology 8(11): e1002774

Klaes C, Westendorff S, Chakrabarti S, Gail A (2011) Choosing goals, not rules: Deciding among rule-based action plans. Neuron 70: 536-548

Westendorff S, Klaes C, Gail A (2010) The cortical timeline for deciding on reach motor-goals. J Neurosci 30: 5426-5436

Gail A, Klaes C, Westendorff S (2009) Implementation of Spatial Transformation Rules for Goal-Directed Reaching via Gain Modulation in Monkey Parietal and Premotor Cortex. J Neurosci 29: 9490-9499

Gail A, Andersen RA (2006) Neural dynamics in monkey parietal reach region reflect context-specific sensorimotor transformations. J Neurosci 26: 9376-9384

Tim Gollisch

Professor for Sensory Processing in the Retina

- 2000 Diploma in Physics, University of Heidelberg
- 2004 PhD in Biophysics, Humboldt University Berlin
- 2004 – 2007 Postdoctoral Researcher, Harvard University, Dept. of Molecular and Cellular Biology
- 2007 – 2010 Max Planck Research Group Leader, Max Planck Institute of Neurobiology, Munich-Martinsried
- since 2010 Professor for Sensory Processing in the Retina, School of Medicine, University of Göttingen

Major Research Interests

We are interested in how the neuronal network of the retina processes visual information. The focus of our work is on studying the function of the various neuron types in the retina and their synaptic connections. One goal is to better understand the "neural code" of the retina: how do the patterns of electrical activity in retinal neurons transmit information about the visual environment to downstream brain areas? Another goal is to better understand "neural computation" in the retina: how do the cells in the retinal network work, adapt, and interact to produce specific, useful responses? On the basis of these questions, we also study how dysfunction of the retinal circuitry, for example in retinal diseases, compromises sensory processing and how optogenetics can be used to artificially stimulate retinal neurons for vision restoration when photoreceptors are degenerating.

Our investigations are based on various techniques of recording the activity of neurons in the retina while stimulating the network with visual images or movies. To do so, we use isolated retinas of mice and salamanders and apply extracellular multi-electrode array recordings and intracellular recordings with glass pipettes. A central theme of our work is to combine the experiments with novel tools of data analysis and with mathematical modeling of the signal processing in the retina.

Selected Recent Publications

Kühn NK, Gollisch T (2019) Activity correlations between direction-selective retinal ganglion cells synergistically enhance motion decoding from complex visual scenes. Neuron 101: 963-976

Liu JK, Schreyer HM, Onken A, Rozenblit F, Khani MH, Krishnamoorthy V, Panzeri S, Gollisch T (2017) Inference of neuronal functional circuitry with spike-triggered non-negative matrix factorization. Nature Communications 8: 149

Krishnamoorthy V, Weick M, Gollisch T (2017) Sensitivity to image recurrence across eye-movement-like image transitions through local serial inhibition in the retina. eLife 6: 322431

Kühn NK, Gollisch T (2016) Joint encoding of object motion and motion direction in the salamander retina. J Neurosci 36:12203-12216

Liu JK, Gollisch T (2015) Spike-triggered covariance analysis reveals phenomenological diversity of contrast adaptation in the retina. PLoS Comput Biol 11: e1004425

Takeshita D, Gollisch T (2014) Nonlinear spatial integration in the receptive field surround of retinal ganglion cells. J Neurosci 34: 7548-7561

Garvert MM, Gollisch T (2013) Local and global contrast adaptation in retinal ganglion cells. Neuron 77: 915-928

Bölinger D, Gollisch T (2012) Closed-loop measurements of iso-response stimuli reveal dynamic nonlinear stimulus integration in the retina. Neuron 73: 333-346

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Martin Göpfert

Professor for Cellular Neurobiology

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

Major Research Interests

Our group studies fundamental processes in hearing. By combining mechanical me surements 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 characteri-zation 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

Versteven M, Vanden Broeck L, Geurten B, Zwarts L, Decraecker L, Beelen M, Göpfert MC, Heinrich R, Callaerts P (2017) Hearing regulates *Drosophila* aggression. Proc Natl Acad Sci USA 114: 1958-1963

Andrés M, Seifert M, Spalthoff C, Warren B, Weiss L, Giraldo D, Winkler M, Pauls S, Göpfert MC (2016) Auditory efferent system modulates mosquito hearing. Curr Biol 26: 2028-2036

Guo Y, Wang Y, Zhang W, Meltzer S, Zanini D, Yu Y, Li J, Cheng T, Guo Z, Wang Q, Jacobs JS, Sharma Y, Eberl DF, Göpfert MC, Jan LY, Jan YN, Wang Z (2016) Transmembrane channel-like (tmc) gene regulates *Drosophila* larval locomotion. Proc Natl Acad Sci USA 113: 7243-7248

Göpfert MC, Hennig RM (2016) Hearing in Insects. Annu Rev Entomol 61: 257-276

Zhang W, Cheng LE, Kittelmann M, Li J, Petkovic M, Cheng T, Jin P, Guo Z, Göpfert MC, Jan LY, Jan YN. (2015) Ankyrin repeats convey force to gate the NOMPC mechanotransduction channel. Cell 162: 1391-1403

Ralf Heinrich

Professor, Department of Cellular Neurobiology

- 1995 Dr. rer. nat., University of Göttingen
- 1997 – 1999 Postdoctoral fellow, Harvard Medical School, Boston, USA
- 2004 Habilitation, Zoology
- 2002 – 2008 Junior professor for Molecular Neuropharmacology of Behavior, Göttingen
- since 2008 apl Professor, Dept. of Cellular Neurobiology

Major Research Interests

Vertebrates and invertebrates evolved from common ancestors that already possessed neurons, neurosecretory systems and structured central nervous systems. Though nervous systems of invertebrates are typically less complex than those of vertebrates (especially mammals) they share many molecular and functional characteristics. We study the neural basis of insect behaviors and mechanisms underlying neuroprotection and neuroregeneration in insect nervous systems with an evolutionary perspective.

1) The cytokine erythropoietin (Epo) mediates neuroprotective and neuroregenerative functions in insects similar to its beneficial effects described in mammals including humans. Similar structural and functional characteristics of the Epo-binding receptors, partly shared transduction pathways that prevent apoptosis and the functional implication in neuroprotective and neuroregenerative processes in both mammalian and insect species suggest that Epo-like signaling was already established in their common ancestors. We study insects, both with invitro and invivo approaches, to identify “ancient” Epo-like signals and their cell-protective receptors and to characterize their functions when animals face environmental and/or physiological challenges.

2) Apoptosis plays a major role in development, tissue renewal and the progression of degenerative diseases. Similar molecular players and mechanisms in vertebrates and invertebrates indicated that the complex “mammalian-like” apoptosis regulatory network was already present in early metazoans. Our recent studies identified the pro-apoptotic function of insect acetylcholinesterase as another shared characteristic between vertebrate and insect apoptosis.

3) Social behavior is the product of complex interactions between various types of neurons that integrate external sensory information with internal physiological states. We study the regulation of insect social behaviors by synaptic molecules (e.g. neuroligins, transmitters) and the neurochemical mechanisms of motivational states with a combination of neuroethological, pharmacological, electrophysiological, histochemical and immunocytochemical methods.

Selected Recent Publications

Knorr DY, Georges NS, Pauls S, Heinrich R (2020) Acetylcholinesterase promotes apoptosis in insect neurons. Apoptosis, (https://doi.org/10.1007/s10495-020-01630-4)

Hahn N, Büschgens L, Schwedhelm-Domeyer N, Bank S, Geurten BRH, Neugebauer P, Massih B, Göpfert MC, Heinrich R (2019) The orphan cytokine receptor CRLF3 emerged with the origin of the nervous system and is a neuroprotective erythropoietin receptor in locusts. Frontiers in Molecular Neuroscience 12: 251

Ostrowski D, Heinrich R (2018) Alternative erythropoietin receptors in the nervous system. Journal of Clinical Medicine 7 (2): 24

Hahn N, Knorr DY, Liebig J, Wüstefeld L, Peters K, Büscher M, Bucher G, Ehrenreich H, Heinrich R (2017) The insect orthologue of the human orphan cytokine receptor CRLF3 is a neuroprotective erythropoietin receptor in insects. Frontiers in Molecular Neuroscience 10: 223

Miljus N, Massih B, Weis MA, Rison JV, Bonnas CB, Sillaber I, Ehrenreich H, Geurten BRH, Heinrich R (2017) Neuroprotection and endocytosis: erythropoietin receptors in insect nervous systems. Journal of Neurochemistry 141: 63-74

Hahn N, Geurten B, Gurvich A, Piepenbrock D, Kästner A, Zanini, D, Xing G, Xie W, Göpfert MC, Ehrenreich H, Heinrich R (2013) Monogenic heritable autism gene neuroligin impacts Drosophila social behaviour. Behavioural Brain Research 252: 450-457

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Stefan Hell

Professor, Director at the Max Planck Institute for Biophysical Chemistry

- 1987 Diploma in Physics, University of Heidelberg
- 1990 Doctorate in Physics, University of Heidelberg
- 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
- 2003 – 2017 Head of High Resolution Optical Microscopy Division, DKFZ Heidelberg
- since 01/2004 Hon. Prof., Faculty of Physics, Univ. of Göttingen
- 2014 Nobel Prize in Chemistry
- 2014 Kavli Prize in Nanoscience
- since 11/2015 Director at the Max Planck Institute for Medical Research, Head of Department of Optical Nanoscopy

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

Eilers Y, Ta H, Gwosch KC, Balzarotti F, Hell SW (2018) MINFLUX monitors rapid molecular jumps with superior spatiotemporal resolution. Proc Natl Aacad Sci USA 115: 6117-6122

Balzarotti F, Eilers Y, Gwosch KC, Gynna AH, Westphal V, Stefani FD, Elf J, Hell SW (2017) Nanometer resolution imaging and tracking of fluorescent molecules with minimal photon fluxes. Science 355: 606-612

Heine J, Reuss M, Harke B, D'Este E, Sahl SJ, Hell SW (2017) Adaptive-illumination STED nanoscopy. Proc Natl Aacad Sci USA 114:9797-9802

Ta H, Keller J, Haltmeier M, Saka SK, Schmied J, Opazo F, Tinnefeld P, Munk A, Hell SW (2015) Mapping molecules in scanning far-field fluorescence nanoscopy. Nat Commun 6: 7977

Schneider J, Zahn J, Maglione M, Sigrist SJ, Marquard J, Chojnacki J, Kräusslich HG, Sahl SJ, Engelhardt J, Hell SW (2015) Ultrafast, temporally stochastic STED nanoscopy of millisecond dynamics. Nat Methods 12(9): 827-30

Hell SW (2015) Nanoscopy with Focused Light (Nobel Lecture). Angew Chem Int Ed Engl 54(28):8054-66

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

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

Willig KI, Rizzoli SO, Westphal V, Jahn R, Hell SW (2006) STED-microscopy reveals that synaptotagmin remains clustered after synaptic vesicle exocytosis. Nature 440: 935-939

Swen Hülsmann

Professor of Neurophysiology

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

Major Research Interests

Most behavioral aspects of life are attributed to neurons, leaving many white spots of knowledge about the function of the different types of glial cells. Our group aims to identify and clarify the mechanisms that allow astrocytes to modulate and stabilize the most vital behavior of breathing.

Selected Recent Publications

Hülsmann S, Mesuret G, Dannenberg J, Arnoldt M, Niebert M (2016) GlyT2-dependent preservation of MECP2-expression in inhibitory neurons improves early respiratory symptoms but does not rescue survival in a mouse model of Rett syndrome Front. Physiol. doi: 10.3389/fphys.2016.00385

Rahman J, Besser S, Schnell C, Eulenburg V, Hirrlinger J, Wojcik SM, Hülsmann S (2015) Genetic ablation of VIAAT in glycinergic neurons causes a severe respiratory phenotype and perinatal death. Brain Struct Funct 220: 2835-2849

Schnell C, Shahmoradi A, Wichert SP, Mayerl S, Hagos Y, Heuer H, Rossner MJ#, Hülsmann S# (2015) The multispecific thyroid hormone transporter OATP1C1 mediates cell-specific Sulforhodamine 101-labeling of hippocampal astrocytes. Brain Struct Funct 220: 193-203

Winter SM, Fresemann J, Schnell C, Oku Y, Hirrlinger J, Hülsmann S (2009) Glycinergic interneurons are functionally integrated into the inspiratory network of mouse medullary slices. Pflügers Arch 458: 459-469

Grass D, Pawlowski PG, Hirrlinger J, Papadopoulos N, Richter DW, Kirchhoff F, Hülsmann S (2004) Diversity of functional astroglial properties in the respiratory network. J Neurosci 24: 1358-1365

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Reinhard Jahn

Professor, Director at the Max Planck Institute for Biophysical Chemistry

- 1981 Dr. rer. nat., University of Göttingen
- 1985 Assistant Professor, The Rockefeller University, New York (USA)
- 1986 Junior Group leader, Max Planck Institute for Psychiatry, Martinsried
- 1991 Associate Professor of Pharmacology and Cell Biology, Yale University, and Investigator, Howard Hughes Medical Institute, New Haven (USA)
- 1995 Professor of Pharmacology and Cell Biology, Yale University, New Haven
- 1997 Director, Max Planck Institute for Biophysical Chemistry, Göttingen
- 1997 – 2001 Adjunct Professor of Pharmacology, Yale University School of Medicine, New Haven, USA
- 2001 Adjunct Professor of Biology, University of Göttingen
- 2019 Emeritus Group Leader, Max Planck Institute for Biophysical Chemistry, Göttingen
- 2019 President of the University of Göttingen

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 are interested in the mechanisms by which synaptic vesicles sequester and store neurotransmitters. Uptake is mediated by specific vesicular neurotransmitter transporters that are energized by an electrochemical proton gradient across the membrane. Presently we aim for a better understanding of the transport mechanisms using a variety of biochemical and biophysical approaches including imaging of single vesicles. Finally, we use quantitative proteomics to better understand how the presynaptic protein network contributes to the regulation of synaptic release, focusing on protein phosphorylation.

Selected Recent Publications

Jakhanwal S, Lee CT, Urlaub H, Jahn R (2017) An activated Q-SNARE/SM protein complex as a possible intermediate in SNARE assembly. EMBO J 36: 1788-1802

Farsi Z, Preobraschenski J, van den Bogaart G, Riedel D, Jahn R*, Woehler A (2016) Single-vesicle imaging reveals different transport mechanisms between glutamatergic and GABAergic vesicles. Science 351: 981-984 *corresponding author

Ryo J-K, Min D, Rah S-H, Kim SJ, Park Y, Kim H, Kim H-M, Jahn R*, Yoon T-Y* (2015) Spring-loaded unraveling of a single SNARE complex by NSF in one round of ATP turnover. Science 347: 1485-1489 *corresponding authors

Binotti B, Pavlos NJ, Riedel D, Wenzel D, Vorbrüggen G, Schalk AM, Kühnel K, Boyken J, Erck C, Martens H, Chua JJE, Jahn R (2015) The GTPase Rab26 links synaptic vesicles to the autophagy pathway. eLife 4: e05597

Par Y, Seo JB, Fraind A, Perez-Lara A, Yavuz H, Han K, Jung SR, Kattan I, Walla PJ, Choi MY, Cafiso DS, Koh D, Jahn R (2015) Synaptotagmin-1 binds to PI(4,5)P2-containing membranes but not to SNAREs in a physiological ionic environment. Nature Struct Mol Biol 10: 815-823

Honigmann A, van den Bogaart G, Iraheta E, Risselada HJ, Milovanovic D, Mueller V, Müllar S, Diederichsen U, Fasshauer D, Grubmüller H, Hell SW, Eggeling C, Kühnel K, Jahn R (2013) Phosphatidylinositol 4,5-bisphosphate clusters act as molecular beacons for vesicle recruitment. Nat Struct Mol Biol 20: 679-686

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Igor Kagan

Group Leader, Decision and Awareness Group, Cognitive Neuroscience Laboratory, German Primate Center

- Since 2011 Group Leader, German Primate Center, Göttingen, Germany
- 2009 – 2010 Senior Research Fellow, Andersen Lab, Caltech, Pasadena, CA, USA
- 2003 – 2008 Postdoctoral Scholar, Andersen Lab, Caltech, Pasadena, CA, USA
- 2003 Ph.D. Biomedical Engineering, Technion – Israel Institute of Technology, Haifa, Israel, and Schepens Eye Research
- Institute, Harvard Medical School, Boston, MA, USA
- 1996 B.Sc. Biology, Faculty of Life Sciences, Tel Aviv University, Israel
- 1989 – 1991 Department of Biophysics, Faculty of Physics and Mechanics, St. Petersburg State Technical University, Russia

Major Research Interests

Neurophysiology and functional imaging of decision-making, cognitive and visuomotor functions in primates, interhemispheric interactions and bihemispheric network processing for action planning in the context of goal-directed behaviors. Human-monkey cross-species comparison using functional imaging, pharmacological inactivation, and behavioral approaches. Neuronal basis of fMRI signals. Neurophysiology of active vision in primary visual cortex.

Selected Recent Publications

Domínguez-Vargas AU, Schneider L, Wilke M*, Kagan I* (2017) Electrical microstimulation of the pulvinar biases saccade choices and reaction times in a time-dependent manner. Journal of Neuroscience 37(8): 2234-57

Christopoulos NV, Bonaiuto J, Kagan I, Andersen RA (2015) Inactivation of parietal reach region affects reaching but not saccade choices in internally guided decisions. Journal of Neuroscience 35(33): 11719-28

Kagan I, Hafed ZM (2013) Active vision: microsaccades direct the eye to where it matters most. Current Biology 23(17): R712-R714

Wilke M, Kagan I, Andersen RA (2013) Effects of pulvinar inactivation on spatial decisionmaking between equal and asymmetric reward options. Journal of Cognitive Neuroscience 25(8): 1270-83

Wilke M*, Kagan I*, Andersen RA (2012) Functional imaging reveals rapid reorganization of cortical activity after parietal inactivation in monkeys. Proceedings of the National Academy of Sciences 109(21): 8274-9

Kagan I (2012) Active vision: fixational eye movements help seeing space in time. Current Biology 22(6): R186-R188

Iyer A, Lindner A, Kagan I, Andersen RA (2010) Motor preparatory activity in poste-rior parietal cortex is modulated by subjective absolute value. PLoS Biology 8(8): e1000444

Lindner A, Iyer A, Kagan I, Andersen RA (2010) Human posterior parietal cortex plans where to reach and what to avoid. Journal of Neuroscience 30(35): 11715-25

Kagan I, Iyer A, Lindner A, Andersen RA (2010) Space representation for eye movements is more contralateral in monkeys than in humans. Proceedings of the National Academy of Sciences 107(17): 7933-8

Kagan I, Gur M, Snodderly DM (2008) Saccades and drifts differentially modulate neuronal activity in V1: Effects of retinal image motion, position, and extraretinal influences. Journal of Vision 8(14):19: 1-25

*shared authorship

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Siegrid Löwel

Professor, Head of Department of Systems Neuroscience, University of Göttingen

- 1988 Dr. phil. nat., University of Frankfurt a. M. / Department of Neurophysiology (Prof. Dr. Wolf Singer), Max-Planck-Institut für Hirnforschung, Frankfurt a. M.
- 1997 – 2005 Head of Independent Research Group "Visual Development and Plasticity", Leibniz-Institute for Neurobiology, Magdeburg
- 2002 – 2003 Associate Research Physiologist/Research Associate Professor, School of Medicine, Department of Physiology, University of California in San Francisco, USA
- 2003 – 2004 Dorothea-Erxleben-Guest Professorship, University of Magdeburg
- 2004 – 2005 Scholarship Hertie-Excellency Program "Neurosciences"
- 2005 – 2010 Professor of Neurobiology, University of Jena
- since 2010 Full Professor of Systems Neuroscience, Institute for Zoology and Anthropology, University of Göttingen

Major Research Interests

The Löwel lab is focussed on understanding the development and plasticity of neuronal circuits in the mammalian cortex. We use a combination of techniques, including optical imaging, 2-photon imaging, electrophysiology and virus-mediated knock-down to explore how experience and learning influence the structure and function of nerve cell networks. We hope that answering these key questions not only helps to understand the rules underlying brain development, functioning and learning but additionally will open up new avenues to develop clinically relevant concepts to promote regeneration and rehabilitation for diseased and injured brains. The Löwel lab has made major contributions to experience-dependent changes in nerve cell networks: We were e.g. the first to demonstrate that the learning rule for the development of long-range cortical circuits is correlated activity: "neurons wire together if they fire together" (Löwel & Singer, 1992, Science 255: 209-212).

Selected Recent Publications

Huang X*, Stodieck SK*, Goetze B, Schmidt K-F, Cui L, Wenzel C, Hosang L, Dong Y, Löwel S*, Schlüter OM* (2015) The progressive maturation of silent synapses governs the duration of a critical period. Proc Natl Acad Sci USA112: E3131-40. *equal contribution

van Wyk M, Pielecka-Fortuna J, Löwel S, Kleinlogel S (2015) Restoring the ON-switch in blind retinas: Opto-mGluR6, a next-generation, cell-tailored optogenetic tool. PLoS Biology 13(5): e1002143

Kalogeraki E, Greifzu F, Haack F, Löwel S (2014) Voluntary physical exercise promotes ocular dominance plasticity in adult mouse primary visual cortex. J Neurosci 34: 15476-15481

Greifzu F, Pielecka-Fortuna J, Kalogeraki E, Krempler K, Favaro PD, Schlüter OM, Löwel S (2014) Environmental enrichment extends ocular dominance plasticity into adulthood and protects from stroke-induced impairments of plasticity. Proc Natl Acad Sci USA 111: 1150-1155

Greifzu F, Schmidt S, Schmidt K-F, Kreikemeier K, Witte OW, Löwel S (2011) Global impairment and therapeutic restoration of visual plasticity mechanisms after a localized cortical stroke. Proc Natl Acad Sci USA 108: 15450-15455

Kaschube M, Schnabel M, Löwel S, Coppola DM, White LE, Wolf F (2010) Universality in the evolution of orientation columns in the visual cortex. Science 330: 1113-1116

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Ira Milosevic

Group Leader Synaptic Vesicle Dynamics

- 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)
- 2003 M.Sc., IMPRS Neurosciences, University of 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)
- 2006 Ph.D., IMPRS Neurosciences, University of 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)
- 2007 – 2012 PostDoc, HHMI and Yale University School of Medicine, Dept. of Cell Biology, New Haven, CT, USA (advisor: Prof. Pietro De Camilli)
- since December 2012 Independent Group Leader at the European Neuroscience Institute Göttingen

Major Research Interests

The laboratory investigates fundamental aspects of exocytosis, endocytosis and synaptic vesicle recycling that have relevance to neuronal and brain functions, using mouse and mammalian cells as model systems. We combine biochemistry, imaging (light and electron microscopy), cell biology and electrophysiology to study the processes that regulate synaptic vesicle formation. In a distinct but related line of work, we are exploring the signaling processes that originate from altered neurotransmission and lead to neurodegeneration.

Selected Recent Publications

Fonseca TB, Sánchez-Guerrero A, Milosevic I, Raimundo N (2019) Mitochondrial fission requires Drp1 but not dynamins. Nature 570(7761):E34-E42, doi: 10.1038/s41586-019-1296-y

Kroll J, Jaime Tobón LM, Vogl C, Neef J, Kondratiuk I, König M, Strenzke N, Wichmann C, Milosevic I, Moser T (2019) Endophilin-A regulates presynaptic Ca^{2+} influx and synaptic vesicle recycling in auditory hair cells. EMBO J 38(5), doi: 10.15252/embj.2018100116

Yambire KF, Fernández-Mosquera L, Steinfeld R, Muhle C, Ikonen E, Milosevic I, Raimundo N (2019) Mitochondrial biogenesis is transcriptionally repressed in lysosomal lipid storage diseases. eLife 8, doi: 10.7554/eLife.39598

Watanabe S, Mamer LE, Raychaudhuri S, Luvsanjav D, Eisen J, Trimbuch T, Söhl-Kielczynski B, Fenske P, Milosevic I, Rosenmund C, Jorgensen EM (2018) Synaptojanin and endophilin mediate neck formation during ultrafast endocytosis. Neuron 98(6): 1184-1197

Farsi Z, Gowrisankaran S, Matija K, Rammner B, Woehler A, Mim C, Jahn R, Milosevic I (2018) Clathrin coat controls vesicle acidification by blocking vacuolar ATPase activity. eLife 7, doi: 10.7554/eLife.32569

Fiuza M, Rostosky C, Parkinson G, Bygrave A, Halemani N, Baptista M, Milosevic I, Hanley J (2017) PICK1 regulates AMPA receptor endocytosis via direct interactions with AP2 α-appendage and dynamin. J Cell Biol 216(10): 3323-3338

Murdoch JD, Rostsoky C, Gowrisankaran S, Arora AS, Soukup SF, Vidal R, Capece V, Freytag S, Fischer A, Verstreken P, Bonn S, Raimundo N, Milosevic I (2016) Endophilin-A deficiency induces the FoxO3a-Fbxo32 network in the brain and causes dysregulation of autophagy and the ubiquitin-proteasome system. Cell Rep 17(4): 1071-1086

Giordano F, Saheki Y, Idevall-Hagren O, Colombo SF, Pirruccello M, Milosevic I, Gracheva EO, Bagriantsev SN, Borgese N, De Camilli P (2013) PI(4,5)P2-dependent and Ca^{2+}-regulated ER-PM interactions mediated by the extended synaptotagmins. Cell 153 (7): 1494-509

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http://www.em.mpg.de/index.php?id=373&tx_jppageteaser_pi1%5BbackId%5D=16

https://mbexc.de/

http://www.sfb889.uni-goettingen.de/

Tobias Moser

Professor of Auditory Neuroscience

- 1995 M.D. University of Jena
- 1994 – 1997 Postdoc with E. Neher at the MPI for Biophysical Chemistry
- 1997 – 2001 Junior Group Leader at the at the MPI for Biophysical Chemistry, Göttingen
- since 2001 Leader of the InnerEarLab and Clinical Work at the Department of Otolaryngology, University Medical Center Göttingen
- Director of the Institute for Auditory Neuroscience, University Medical Center Göttingen and group leader at the MPIs for Experimental Medicine and Biophysical Chemistry and the German Primate Center

Major Research Interests

Auditory Neuroscience - Synaptic Physiology and Pathophysiology – Audiology and Neuroprosthetics

Our work focuses on the molecular anatomy, physiology and pathophysiology of sound encoding and information processing in the auditory system as well as the restoration of hearing by gene replacement therapy and optogenetic stimulation. We combine various techniques to characterize synapses of hair cells and the auditory brainstem from the molecular to the systems level. This way we have contributed to the understanding of structure and function of auditory synapses and initiated the concept of auditory synaptopathy. Towards restoration of hearing we aim to establish virus-mediated gene replacement therapy of auditory synaptopathy and pursue the optogenetic stimulation of auditory nerve for improving the performance of the cochlear implant.

Selected Recent Publications

Keppeler D, Schwaerzle M, Harczos T, Jablonski L, Dieter A, Wolf B, Ayub S, Vogl C, Wrobel C, Hoch G, Abdellatif K, Jeschke M, Rankovic V, Paul O, Ruther P, Moser T (2020) Multichannel optogenetic stimulation of the auditory pathway using microfabricated LED cochlear implants in rodents. Sci Translat Med Vol 12(553): eabb8086

Dieter A, Klein E, Keppeler D, Jablonski L, Harczos T, Hoch G, Rankovic V, Paul O, Jeschke M, Ruther P, Moser T (2020) µLED-based optical cochlear implants for spectrally selective activation of the auditory nerve. EMBO Molecular Medicine, Jun 29;e12387. doi: 10.15252

Jean P, Anttonen T, Michanski S, de Diego A, Steyer AM, Neef A, Oestreicher D, Kroll J, Nardis C, Pangršič T, Möbius W, Ashmore J, Wichmann C, Moser T (2020) Macromolecular and electrical coupling between inner hair cells in the rodent cochlea. Nat Commun 11: 3208

Dieter A, Duque-Afonso CJ, Rankovic V, Jeschke M, Moser T (2019) Near physiological spectral selectivity of cochlear optogenetics. Nature Communications 10: 1962

Jean P, Demet Özçete Ö, Tarchini B, Moser T (2019) Intrinsic planar polarity mechanisms influence the position-dependent regulation of synapse properties in inner hair cells. PNAS pii: 201818358

Neef J, Ohn TL, Urban NT, Frank T, Jean P, Hell SW, Willig KI, Moser T (2018) Quantitative optical nanophysiology of Ca^{2+}-signaling at inner hair cell active zones. Nat commun 18;9(1): 290. doi: 10.1038/s41467-017-02612-y

Mager T, Lopez de la Morena D, Senn V4,5, Schlotte J, D Errico A, Feldbauer K, Wrobel C, Jung S, Bodensiek K, Rankovic V, Browne L, Huet A, Jüttner J1, Wood PG, Letzkus JJ, Moser T, Bamberg E (2018) High frequency neural spiking and auditory signaling by ultrafast red-shifted optogenetics. Nat Commun 2018 May 1;9(1):1750. doi: 10.1038/s41467-018-04146-3

Wrobel C, Dieter A, Huet A, Keppeler D, Duque-Afonso C, Vogl C, Hoch G, Jeschke M, Moser T (2018) Optogenetic stimulation of cochlear neurons activates the auditory pathway and restores auditory-driven behavior in deaf adult gerbils. Sci Translat Med 11 Jul 2018: Vol. 10, Issue 449, eaao0540. DOI: 10.1126/scitranslmed.aao0540

Klaus-Armin Nave

Director at the Max Planck Institute for 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
- since 1999 Director at the Max Planck Institute for Experimental Medicine

Major Research Interests

We are studying the interactions of neurons and glial cells in the mammalian nervous system with a special interest in the role of oligodendrocytes and Schwann cells, best known as myelin forming cells of the central and peripheral nervous system. These highly specialized glial cells enwrap axons with a multilayered sheath that provides electrical insulation for rapid impulse propagation. However the biology of these axon-glia interactions is complex. Using mouse genetics, originally to study the role of proteins in the myelin architecture and in neurogenetic disorders, we made the unexpected discovery of a novel function of oligodendrocytes, which even precedes myelin in nervous system evolution: the glial metabolic support of axonal conduction, axonal transport and long-term integrity. We determined that oligodendrocytes and Schwann cells take up glucose and deliver lactate, here the product of aerobic glycolysis, to the axonal compartment. This supportive function helps maintaining axon functions especially when ATP demands are increased at higher firing rates, also because access of axons to extracellular metabolites is restricted by myelin itself. Here, the fine architecture of the myelin sheath that we visualize with advanced electron microscopic techniques appears critical. Specialized cytoplasmic connections within the myelin sheath ('myelinic nanochannels') must provide a pathway of continuous communication between oligodendrocytes and the encapsulated axon. In neurological diseases, in which myelin is structurally affected or even destroyed, such as in multiple scleroses, leukodystrophies and various peripheral neuropathies, there is invariably secondary axonal degeneration that we propose is caused by the lack of adequate metabolic support. We are investiga-ting the underlying molecular mechanisms of these diseases in detail, using correspon-ding animal models that we have generated with a range of genetic techniques. A further goal is to understand the role of myelinating glial cells in higher brain functions and psychiatric diseases, which we approach in close collaboration with the Department of Hannelore Ehrenreich at our institute.

Selected Recent Publications

Saab AS, Tzvetavona ID, Trevisiol A, Baltan S, Dibaj P, Möbius W, Kusch K, Goetze B, Jahn HM, Huang W, Steffens H, Schomburg ED, Pérez-Samartín A, Pérez-Cerdá F, Bakhtiari D, Matute C, Löwel S, Griesinger C Hirrlinger J, Kirchhoff F, Nave KA (2016) Oligodendroglial NMDA receptors regulate axonal energy metabolism. Neuron 91: 199-132

Goebbels S, Wieser GL, Pieper A, Spitzer S, Weege B, Yan K, Edgar JM, Yagensky O, Wichert S, Agarwal A, Karram K, Renier N, Tessier-Lavigne M, Rossner MJ, Káradóttir RT, Nave KA (2017) A neuronal PI(3,4,5)P3-dependent program of oligodendrocyte precursor recruitment and myelination. Nature Neuroscience 20: 10-15

Quintes S, Brinkmann BG, Ebert M, Fröb F, Kungl T., Arlt FA, Tarabykin V, Huylebroeck D, Meijer D, Suter U, Wegner M, Sereda MW, Nave KA (2016) Sip1 is essential for Schwann cell differentiation, myelination and nerve repair. Nature Neuroscience 19: 1050-1059

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

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

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Tiago Fleming Outeiro

Professor of Aggregopathies, Director of the Department of Neurodegeneration and Restaurative Research

- 1994 – 1998 B.S. in Biochemistry Faculty of Sciences, University of Porto, Portugal
- 1999 – 2004 Ph.D. in Molecular and Cell Biology Whitehead Institute for Biomedical Research, MIT Cambridge, University of Chicago (UC), USA
- 2004 Consultant and Research Scientist, FoldRx Pharmaceuticals, Inc, Cambridge, USA: Ph.D. work was transferred to the start-up company FoldRx Pharmaceuticals, Inc.
- 2004 – 2007 Postdoctoral Research Fellow; advisor Dr. Brad Hyman, MGH Harvard University, USA
- 2007 – 2011 Principal Investigator and Group Leader at Instituto de Medicina Molecular, Lisbon, Portugal
- 2007 – 2008 Visiting Scientist, Massachusetts General Hospital, Harvard Medical School, Boston, USA
- 2007 – present Auxiliar Professor, Instituto de Fisiologia, Faculdade de Medicina da Universidade de Lisboa, Portugal
- 2010 – present: Full Professor of Aggregopathies, Director of the Department of Neurodegeneration and Restaurative Research, University Medical Center Göttingen

Major Research Interests

Our research interests are focused on the understanding of the molecular mechanisms which lead to neurodegeneration in diseases such as Parkinson's, Huntington's, or Alzheimer's disease. These diseases are intimately associated with protein misfolding and aggregation in specific regions of the brain.

Because the molecular pathways involved in protein homeostasis are highly conserved, we employ a wide variety of model organisms, from the simple but powerful budding yeast to mammalian cell culture and mice, to study the origin of the problems.

We are also developing novel *in vivo* imaging approaches based on multi-photon microscopy to observe protein misfolding and aggregation in the living brain.

Our ultimate goals are to develop novel therapeutic approaches for these and other related disorders. We are working closely together with clinicians in order to accelerate drug discovery efforts, translating basic research into clinical applications that will improve the lives of patients.

Selected Recent Publications

Vicente Miranda H, Szego ÉM, Oliveira LM, Breda C, Darendelioglu E, de Oliveira RM, Ferreira DG, Gomes MA, Rott R, Oliveira M, Munari F, Enguita FJ, Simões T, Rodrigues EF, Heinrich M, Martins IC, Zamolo I, Riess O, Cordeiro C, Ponces-Freire A, Lashuel HA, Santos NC, Lopes LV, Xiang W, Jovin TM, Penque D, Engelender S, Zweckstetter M, Klucken J, Giorgini F, Quintas A, Outeiro TF (2017) Glycation potentiates -synuclein-associated neurodegeneration in synucleinopathies. Brain 2017 Apr 10

de Oliveira RM, Vicente Miranda H, Francelle L, Pinho R, Szegö ÉM, Martinho R, Munari F, Lázaro DF, Moniot S, Guerreiro P, Fonseca-Ornelas L, Marijanovic Z, Antas P, Gerhardt E, Enguita FJ, Fauvet B, Penque D, Pais TF, Tong Q, Becker S, Kügler S, Lashuel HA, Steegborn C, Zweckstetter M, Outeiro TF (2017) Correction: The mechanism of sirtuin 2-mediated exacerbation of alpha-synuclein toxicity in models of Parkinson disease. PLoS Biol 2017 Apr 5;15(4): e1002601

Villar-Piqué A, Lopes da Fonseca T, Sant'Anna R, Szegö ÉM, Fonseca-Ornelas L, Pinho R, Carija A, Gerhardt E, Masaracchia C, Abad Gonzalez E, Rossetti G, Carloni P, Fernández CO, Foguel D, Milosevic I, Zweckstetter M, Ventura S, Outeiro TF (2016) Environmental and genetic factors support the dissociation between -synuclein aggregation and toxicity. Proc Natl Acad Sci U S A 2016 Oct 5

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Professor of Molecular Biology of Neuronal Signals, Group Leader at the 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
- since 2008 Max-Planck Research Group Leader
- since 2011 Apl. Professor, University Medical Center Göttingen

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

Sánchez A, Urrego D, Pardo LA. (2016) Cyclic expression of the voltage-gated potassium channel KV10.1 promotes disassembly of the primary cilium. EMBO Rep 2016 May;17(5): 708-23. doi: 10.15252/embr.201541082. Epub 2016 Apr 20

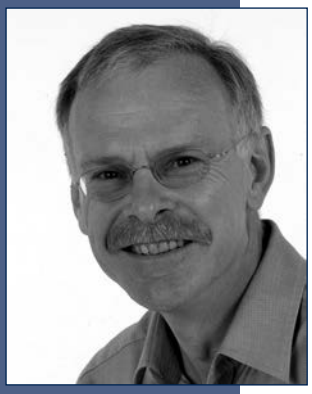
Urrego D, Movsisyan N, Ufartes R, Pardo LA. (2016) Periodic expression of Kv10.1 driven by pRb/E2F1 contributes to G2/M progression of cancer and non-transformed cells. Cell Cycle 2016 Mar 18;15(6): 799-811. doi: 10.1080/15384101.2016.1138187

Mortensen LS, Schmidt H, Farsi Z, Barrantes-Freer A, Rubio ME, Ufartes R, Eilers J, Sakaba T, Stuehmer W, Pardo LA (2015) K(V)10.1 opposes activity-dependent increase in Ca^{2+} influx into the presynaptic terminal of the parallel fibre-Purkinje cell synapse. Journal of Physiology-London 593: 181-196

Lörinczi É, Gómez-Posada JC, de la Peña P, Tomczak AP, Fernández-Trillo J, Leipscher U, Stühmer W, Barros F, Pardo LA (2015) Voltage-dependent gating of KCNH potassium channels lacking a covalent link between voltage-sensing and pore domains. Nat Commun 6

Pardo LA, Stühmer W (2014) The roles of K^+ channels in cancer. Nat Rev Cancer 14: 39-48

Jimenez-Garduno AM, Mitkovski M, Alexopoulos IK, Sanchez A, Stuhmer W, Pardo LA, Ortega A (2014) KV10.1 $K^{(+)}$-channel plasma membrane discrete domain partitioning and its functional correlation in neurons. Biochim Biophys Acta 1838: 921-31



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Walter Paulus

Professor of Clinical Neurophysiology

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

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

Alekseichuk et al. (2016) Spatial Working Memory in Humans Depends on Theta and High Gamma Synchronization in the Prefrontal Cortex. Current Biology 26: 1513-1521

Voss U, Holzmann R, Hobson A, Paulus W, Koppehele-Gossel J, Klimke A, Nitsche M A (2014) Induction of self awareness in dreams through frontal low current stimulation of gamma activity. Nat Neurosci 17(6): 810-2

Paulus W (2014) Transcranial brain stimulation: potential and limitations. e-Neuroforum doi:DOI 10.1007/s13295-014-0056-6

Sommer M, Norden C, Schmack L, Rothkegel H, Lang N, Paulus W (2013) Opposite optimal current flow directions for induction of neuroplasticity and excitation threshold in the human motor cortex. Brain Stimul 6(3): 363-70

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

Antal A, Polania R, Schmidt-Samoa C, Dechent P, Paulus W. (2011) Transcranial direct current stimulation over the primary motor cortex during fMRI. Neuro-image. 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

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Arezoo Pooresmaeili

Group Leader Perception and Cognition

- 1994 – 2001 Tehran University School of Medicine and Health Sciences, obtained degree: MD
- 2003 – 2009 PhD projects exploring mechanisms of visual attention in the primary visual cortex and Frontal Eye Fields (under supervision of Dr. Pieter Roelfsema)
- 2009 – 2011 Postdoctoral fellow, Pisa Vision Lab, with Dr. Concetta Morrone and Dr. David Burr
- 2011 – 2014 Postdoctoral fellow, Berlin School of Mind and Brain, with Dr. Ray Dolan (Einstein Visiting Fellow)
- since 2015 Group Leader, Perception and Cognition Group, European Neuroscience Institute, Göttingen, Germany

Major Research Interests

- Systems Neuroscience
    - Cognitive Neuroscience
        - Behavioral, Neuroimaging, Electrophysiology and Brain Stimulation Studies in humans
            - Sensory Perception
            - Attention
            - Reward Processing
            - Decision Making
            - Social Cognition

Selected Recent Publications

Arezoo Pooresmaeili, Aurel Wannig, Raymond J. Dolan (2015) Receipt of reward leads to altered estimation of effort. Proc Natl Acad Sci U S A 112(43): 13407-10. doi: 10.1073/pnas.1507527112. Epub 2015 Oct 12

Arezoo Pooresmaeili, Thomas H.B. FitzGerald, Dominik R. Bach, Ulf Toelch, Florian Ostendorf, Raymond J. Dolan (2014) Crossmodal effects of value on perceptual acuity and stimulus encoding. Proceedings of the National Academy of Sciences (PNAS) 111(42): 15244-9. doi: 10.1073/pnas.1408873111

Arezoo Pooresmaeili and Pieter Roelfsema (2014) A growth-cone model for the spread of object-based attention. Current Biology 24(24): 2869-77. doi: 10.1016/j

Arezoo Pooresmaeili, Jasper Poort, Pieter R Roelfsema (2014) Simultaneous selection by object-based attention in visual and frontal cortex. Proceedings of the National Academy of Sciences (PNAS) 111(17): 6467-72. doi: 10.1073/pnas.1316181111

Arezoo Pooresmaeili, Roberto Arrighi, Laura Biagi, Maria Concetta Morrone: (2013) Blood Oxygen Level-Dependent Activation of the Primary Visual Cortex Predicts Size Adaptation Illusion. Journal of Neuroscience 33(40): 15999-16008

Arezoo Pooresmaeili, Jasper Poort, Alexander Thiele, Pieter R Roelfsema (2010) Separable codes for attention and luminance contrast in the primary visual cortex. Journal of Neuroscience 30(38): 12701-11

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Professor, Max Planck Institute for Experimental Medicine

- 1992 M.S. in Biology, Sogang University Master thesis, Seoul, Korea
- 1997 Ph. D. Kyushu University, School of Medicine Department of Physiology, Japan
- 1997 – 2000 Assistant Professor, Kyushu University, Faculty School of Medicine Department of Physiology, Japan
- 2000 – 2004 Postdoctoral fellow, Max-Planck Institute Biophysical Chemistry, Department of Membranbiophysik, Germany
- 2004 – 2006 Assistant Professor, Baylor College of Medicine, Department of Human Genetics and Neuroscience, USA
- since 2006 Group Leader, Max Planck Institute of Experimental Medicine, Göttingen, Germany
- since 2017 Professor, University of Göttingen, Germany

Major Research Interests

We study that signaling between nerve cells in the brain is mainly mediated at synapses, which are specialized cellular contact sites. The transfer of information at synapses can be regulated dynamically, a process that is called synaptic plasticity. Our main research goal is to elucidate the molecular mechanisms that underlie synaptic plasticity at synapses in the central nervous system. For this purpose we mainly use electrophysiological methods, in combination with nerve cells from genetically modified mice or virus-mediated molecular perturbation of nerve cell function.

Neurotransmitter release is the first step in synaptic signaling. It is mediated by exocytosis of synaptic vesicles at highly specialized contact sites, the active zones of synapses. Neurotransmitters are stored in synaptic vesicles, which undergo a complex trafficking cycle in the presynaptic compartment in order to sustain the rapid and repetitive transfer of information between nerve cells. Synaptic vesicles are initially tethered at the active zone plasma membrane, a process termed docking. Subsequently vesicles undergo a prefusion reaction termed priming, which renders docked vesicles fusion competent, thus defining the readily releasable pool of vesicles. Triggered by the arrival of an action potential at the nerve terminal and the concomitant increase in the intracellular Ca^{2+} concentration, a fraction of fusion competent vesicles in the readily releasable pool fuse with the plasma membrane and release their content. After fusion, vesicular membrane and protein components are recycled by endocytosis and used for additional rounds of exocytosis.

Essentially, each step of the synaptic vesicle cycle can contribute to the regulation of synaptic plasticity. We combine mouse genetics, molecular biological and morphological methods, and patch clamp electrophysiological analyses of autaptic cultured neurons, organotyptic brain slice cultures, acute brain slices, or acutely isolated neurons with active presynaptic terminals in order to identify the molecular mechanisms underlying the individual synaptic vesicle recycling steps. In the past, we characterized mutant mice lacking identified presynaptic protein components of the neurotransmitter release machinery. Experiments on mutant mouse neurons are complemented by virus mediated expression of proteins in cultured neurons, which allows us to perform detailed structure-function analyses of presynaptic proteins.

Selected Recent Publications

Lai Y, Choi UB, Leitz J, Rhee HJ, Lee C, Altas B, Zhao M, Pfuetzner RA, Wang A, Brose N, Rhee JS and Brunger AT (2017) Molecular mechanisms of synaptic vesicle priming by Munc13 and Munc18. Neuron, in press

Sigler A, Oh WC, Imig C, Altas B, Kawabe H, Cooper BH, Kwon HB, Rhee JS*, Brose N* (2017) Formation and Maintenance of Functional Spines in the Absence of Presynaptic Glutamate Release. Neuron 94: 304-311 (*joint corresponding authors)

Silvio O. Rizzoli

Professor, Director of Department of Neuro- and Sensory Physiology

- 1996 – 2000 BSc in Biochemistry at the University of Bucharest, Romania
- 2000 – 2004 PhD in Physiology at the University of Colorado, Denver, USA (Department of Physiology and Biophysics, Prof. W. J. Betz)
- 2004 – 2007 Postdoctoral Fellow, Dept. of Neurobiology, Max-Planck Institute for Biophysical Chemistry, Göttingen
- 2007 – 2012 Group Leader (STED Microscopy) at the European Neuroscience Institute Göttingen (ENI-G)
- 2012 – 2014 Professor (W3), University Medical Center Göttingen
- 2014 – Director of the Department of Neuro- and Sensory Physiology, University Medical Center Göttingen

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 dia-meter). They are located in small areas in the synapses (about 1 micron in dia-meter). 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

Vreja IC, Nikic I, Goettfert F, Bates M, Kröhnert K, Outeiro TF, Hell SV, Lemke EA, Rizzoli SO (2015) Super-resolution Microscopy of Clickable Amino Acids Reveals the Effects of Fluorescent Protein Tagging on Protein Assemblies. ACS Nano 9: 11034-41

Vreja IC, Kabatas S, Saka SK, Kröhnert K, Höschen C, Opazo F, Diederichsen U, Rizzoli SO (2015) Secondary-ion mass spectrometry of genetically encoded targets. Angew Chem Int Ed Engl 54: 5784-5788

Wilhelm BG, Mandad S, Truckenbrodt S, Kröhnert K, Schäfer C, Rammner B, Koo SJ, Claßen GA, Krauss M, Haucke V, Urlaub H, Rizzoli SO (2014) Composition of isolated synaptic boutons reveals the amounts of vesicle trafficking proteins. Science 344: 1023-1028

Revelo NH, Kamin D, Truckenbrodt S, Wong AB, Reuter-Jessen K, Reisinger E, Moser T, Rizzoli SO (2014) A new probe for super-resolution imaging of membranes elucidates trafficking pathways. J Cell Biol 205: 591-606

Saka SK, Honigmann A, Eggeling C, Hell SW, Lang T, Rizzoli SO (2014) Multi-protein assemblies underlie the mesoscale organization of the plasma membrane. Nat Commun 5: 4509

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Annekathrin Schacht

Professor of Affective Neuroscience and Psychophysiology

- 2004 – 2008 Research Scientist, Biological Psychology / Psychophysiology (Prof. Dr. Werner Sommer), Institute of Psychology, HU Berlin
- 2008 Dissertation (Dr. rer. nat., HU Berlin)
- 2009 Visiting Professor of Psychology of Motivation and Emotion (substitution), Department of Psychology, University of Potsdam
- 2010 Invited Junior Professor of Affective Neuroscience, Swiss Center for Affective Sciences (CISA), University of Geneva
- 2010 Visiting Professor of Cognitive Neuroscience, Institute of Psychology, Humboldt-Universitaet zu Berlin
- 2011 Habilitation (venia legendi) in Psychology (HU Berlin)
- since 10/2010 Junior Professor (tenure track), Courant Research Centre "Text Structures", University of Goettingen
- since 2016 Professor of Affective Neuroscience and Psychophysiology, Institute of Psychology, University of Goettingen

Major Research Interests

Our main research activities focus on the interplay of cognition and emotion in several domains of human information processing, including faces and written and spoken language. Our work aims to identify the specification of the origins, dynamics, and boundary conditions of emotion effects within and between different stimulus domains and modalities, as well as to better define the emotional outcomes of cognitive operations. In order to answer our research questions, we employ a combination of well-established experimental paradigms with several psychophysiological measures, including event-related brain potentials (ERPs), eye movements, electrodermal and respiratory activity, facial muscle activity (via EMG recordings), and changes of pupil diameter.

Research areas:

- Affective and motivational impacts on visual sensory processing
- Emotion-cognition interplay in the processing of written and spoken language
- Face processing, including emotional expressions, attractiveness, and face identity
- Audiovisual integration of social signals in human communication

Selected Recent Publications

Bayer M, Ruthmann K, Schacht A (2017) The impact of personal relevance on emotion processing: evidence from event-related potentials and pupillary responses. Social Cognitive and Affective Neuroscience 2017, nsx075, DOI: 10.1093/scan/nsx075

Hammerschmidt W, Sennhenn-Reulen H, Schacht A (2017) Associated motivational salience impacts early sensory processing of human faces. NeuroImage 156: 466-474. DOI: 10.1016/j.neuroimage.2017.04.032

Rossi V, Vanlessen N, Bayer M, Grass A, Pourtois G, Schacht A (2017) Motivational salience modulates early visual cortex responses across task sets. Journal of Cognitive Neuroscience 29: 968-979. DOI: 10.1162/jocn_a_01093

Rellecke J, Sommer W, Schacht A (2012) Does processing of emotional facial expressions depend on intention? Time-resolved evidence from event-related brain potentials. Biological Psychology 90(1): 23 - 32. DOI: 10.1016/j.biopsycho.2012.02.002

Schacht A, Adler N, Chen P, Guo T, Sommer W (2012) Association with Positive Outcome induces Early Effects in Event-related Brain Potentials. Biological Psychology 89: 130-136. DOI: 10.1016/j.biopsycho.2011.10.001

Rellecke J, Palazova M, Sommer W, Schacht A (2011) On the automaticity of emotion processing in words and faces: Event-related brain potentials evidence from a superficial task. Brain and Cognition 77: 23-32

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Hansjörg Scherberger

Professor of Primate Neurobiology at the German Primate Center

- 1993 Dipl. math. (MS Math), University of Freiburg, Germany
- 1996 Dr. med. (MD), University of Freiburg, Germany
- 1995 – 1998 Postdoctoral Fellow, Dept of Neurology, University of Zürich, Switzerland
- 1998 – 2000 Postdoctoral Fellow, California Institute of Technology
- 2000 – 2004 Senior Postdoctoral Fellow, California Institute of Technology
- 2004 – 2009 Work group leader, Institute of Neuroinformatics, ETH / University of Zürich, Switzerland
- since 2008 Professor for Primate Neurobiology, University of Göttingen and Deutsches Primatenzentrum GmbH

Major Research Interests

We are interested in how hand movements are generated in the primate brain and how intentions to grasp objects can be decoded for controlling a neural prosthesis. For this, we investigate the cortical representation of hand movements in motor-related cortical areas and their relation to sensory systems and decision making. Furthermore, we are developing brain-machine interfaces that can read out such movement intentions to control robotic devices. Such systems could be useful for future applications aiming to restore hand function in paralyzed patients.

Selected Recent Publications

Michaels JA, Dann B, Intveld RW, Scherberger H (2018). Neural dynamics of variable grasp movement preparation in the macaque fronto-parietal network. J Neuroscience 38: 5759-5773

Michaels JA, Scherberger H (2018) Population coding of grasp and laterality-related information in the macaque fronto-parietal network. Scientific Reports 8: 1710

Scherberger H (2017) Stirred, Not Shaken: Motor Control with Partially Mixed Selectivity. Neuron 95(3): 479-481

Michaels JA, Dann B, Scherberger H (2016) Neural Population Dynamics during Reaching Are Better Explained by a Dynamical System than Representational Tuning. PLoS Computational Biology 12(11): e1005175

Dann B, Michaels JA, Schaffelhofer S, Scherberger H (2016) Uniting functional network topology and oscillations in the fronto-parietal single unit network of behaving primates. eLife 5: e15719

Schaffelhofer S, Scherberger H (2016) Object vision to hand action in macaque parietal, premotor, and motor cortices. eLife 5: e15278

Michaels J, Dann B, Intveld RW, Scherberger H (2015) Predicting Reaction Time from the Neural State Space of the Premotor and Parietal Grasping Network. J Neuroscience 35: 11415-11432

Janssen P, Scherberger H (2015) Visual Guidance in Control of Grasping. Annual Review of Neuroscience 38: 69-86

Schaffelhofer S, Agudelo-Toro A, Scherberger H (2015) Decoding a Wide Range of Hand Configurations from Macaque Motor, Premotor, and Parietal Cortices. J Neuroscience 35: 1068-1081

Schaffelhofer S, Scherberger H (2012) A new method of accurate hand- and armtracking for small Primates. Journal of Neural Engineering 9: 026025

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Oliver Schlüter

Group Leader Molecular Neurobiology

- 1995 – 2001 M.D. Ph.D. with Thomas C. Südhof at the Max-Planck-Institute for Experimental Medicine in Göttingen
- 2000 Dr. rer. nat. (PhD), University of Hannover
- 2001 Dr. med. (Medical thesis), University of Göttingen
- 2001 – 2002 Postdoc with Christian Rosenmund and Reinhard Jahn at the Max-Planck-Institute for Biophysical Chemistry in Göttingen
- 2002 – 2006 Postdoc with Robert C. Malenka at Stanford University Medical Center (USA)
- 2006 – 2015 Independent group leader (Emmy-Noether/DFG) at the European Neuroscience Institute Göttingen (ENI-G), since 2006
- Assistant Professor at the Department of Neuroscience, University of Pittsburgh, since 2015
- since 2016 Adjunct Professor at the Department of Psychiatry and Psychotherapy, University Medical Center Göttingen

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 sy-naptic transmission and plasticity will ultimately provide important clues for the function of neuronal circuits and potentially the functioning of the brain.

Selected Recent Publications

Liu Y, Cui L, Schwartz MK, Dong Y, Schlüter OM (2017) Adrenergic gate release in spike timing-dependent synaptic potentiation. Neuron 93(2): 394-408

Shukla A, Beroun A, Panopoulou M, Neumann PA, Grant SGN, Olive MF, Dong Y, Schlüter OM (2017) Calcium permeable AMPA receptors and silent synapses in cocaine-conditioned place preference. EMBO J 36(4):458-474

Huang X, Stodieck SK, Goetze B, Cui L, Wong MH, Wenzel C, Hosang L, Dong Y, Löwel S#, Schlüter OM# (2015) Progressive Maturation of Silent Synapses Governs the Duration of a Critical Period. PNAS. 112(24): E3131-40

Lee BR*, Ma Y*, Huang YH, Wang X, Otaka M, Ishikawa M, Neumann PA, Graziane NM, Brown TE, Suska A, Guo C, Lobo MK, Sesack SR, Wolf ME, Nestler EJ, Shaham Y, Schlüter OM, Dong Y# (2013) Maturation of silent synapses in amygdala-accumbens projection contributes to incubation of cocaine craving. Nat Neurosci 16(11): 1644-51

Krüger JM, Favaro PD, Liu M, Kitlinska A, Huang X, Raabe M, Akad DS, Liu Y, Urlaub H, Dong Y, Xu W, Schlüter OM# (2013) Differential roles of Postsynaptic Density-93 isoforms in regulating synaptic transmission. J Neurosci 33(39): 15504-17

Bonnet SA, Akad DS, Samaddar T, Liu Y, Huang X, Dong Y, Schlüter OM (2013) Synaptic state-dependent functional interplay between Postsynaptic Density-95 and Synapse-associated Protein 102. J Neurosci 33(33): 13398-409

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Manuela Schmidt

Group Leader Somatosensory Signaling at the Max Planck Institute for Experimental Medicine

- since 2019 W2-Professor at the Faculty of Biology and Psychology, University of Goettingen
- 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

Research in our laboratory is driven by our motivation to decipher the dynamics of protein networks underlying vertebrate somatosensation in health, development (aging) and disease (chronic pain). Methodologically, we combine molecular biology, biochemistry and latest proteomics techniques, electrophysiology, pharmacology, mouse models of painful pathologies and in vivo virus-mediated gene transfer.

This multidisciplinary approach has enabled us to reveal ion channel-associated signaling complexes (i.e. the interactome of TRPV1, TRPA1 and Piezo2 channels) with pathological relevance for pain. Moreover, in a quantitative systems biology approach, we investigate spatiotemporal proteome dynamics both in mice and humans. Our research lives from our fruitful collaborations with basic researchers and clinicians alike facilitating forward and reverse translation of our research results.

In this way we strive to gain mechanistic insights into developmental and pain-associated plasticity – an endeavor, which lies at the heart of both understanding the molecular signature of chronic pain and identifying novel drug targets.

Selected Recent Publications

Niklas M, Narayanan P, Shomroni, O, Schmidt M (2020) Maturational Changes in Mouse Cutaneous Touch and Piezo2-Mediated Mechanotransduction. Cell Reports. https://doi.org/10.1016/j.celrep.2020.107912. Editors´ Pick "Paper of the Week", PainResearchForum

Sondermann J, Barry AM, Jahn O, Michel N, Abdelaziz R, Kügler S, Gomez-Varela D, Schmidt M (2019) Vti1b promotes TRPV1 sensitization during inflammatory pain. PAIN. doi: 10.1097/j.pain.0000000000001418. Awarded with "1st prize for pain research 2019" (Förderpreis für Schmerzforschung), German Pain Society

Barry AM, Sondermann J, Sondermann JH, Gomez-Varela D and Schmidt M (2018) Region resolved quantitative proteome profiling reveals molecular dynamics associated with chronic pain in the PNS and spinal cord. Front Mol Neurosci doi: 10.3389/fnmol.2018.00259

Narayanan P, Huette M, Kudryasheva G, Taberner FJ, Lechner S, Rehfeldt F, Gomez-Varela D, Schmidt M (2018) Myotubularin related protein-2 and its phospholipid substrate PIP2 control Piezo2-mediated mechanotransduction in peripheral sensory neurons. eLife. doi: 10.7554/eLife.32346

Rouwette T, Sondermann J, Avenali L, Gomez-Varela D, Schmidt M (2016) Standardized profiling of the membrane-enriched proteome of mouse dorsal root ganglia provides novel insights into chronic pain. Molecular & Cellular Proteomics, doi: 10.1074/mcp.M116.058966

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Caspar M. Schwiedrzik

Group Leader

- 2003 – 2008 University of Konstanz, Germany, studies of Psychology
- 2008 – 2011 Max Planck Institute for Brain Research, Frankfurt a. M., Germany, PhD student, advisor Prof. Wolf Singer
- 2012 – 2016 The Rockefeller University, New York, USA, Postdoc, advisor Prof. Winrich Freiwald
- since 2017 Group Leader, Neural Circuits and Cognition Lab, European Neuroscience Institute, Göttingen, Germany
- since 2019 Group Leader, Perception and Plasticity Group, German Primate Center, Göttingen, Germany

Major Research Interests

Learning is a core building block of intelligent behavior. It endows complex systems with flexibility to adjust to changing environments and with the capacity to generalize to novel situations. We pursue the idea that inroads into understanding learning and generalization can be made in the visual system, where these complex problems can be broken down into tractable hypotheses. Visual processing hierarchies provide an ideal testing ground and offer unique opportunities to unravel the role of feedforward and feedback message passing along the hierarchy as a function of learning and generalization. To this end, we capitalize on combining noninvasive neuroimaging with electrophysiological recordings and causal manipulations of brain activity in non-human primates, and parallel experiments using fMRI in humans. We investigate learning at multiple time scales, from learning effects that build up within seconds to learning effects that take days and weeks to materialize, and across levels of complexity, from learning to discriminate simple visual features to high-level associative and statistical learning. Our overall goal is to determine the neural basis of the visual system's capacity to learn and generalize through an explicitly comparative approach - a necessary step towards understanding the human mind and its complexity.

Selected Recent Publications

Schwiedrzik CM and Sudmann SS (2020) Pupil Diameter Tracks Statistical Structure in the Environment to Increase Visual Sensitivity. Journal of Neuroscience 40(23): 4565-4575

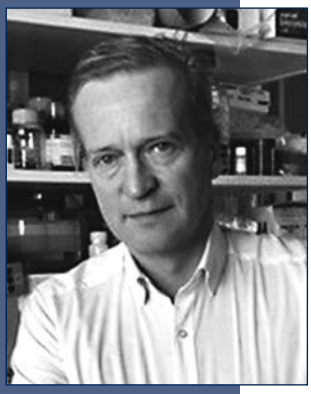
Schwiedrzik CM, Sudmann SS, Thesen T, Wang X, Groppe DM, Mégevand P, Doyle W, Mehta AD, Devinsky O, Melloni L (2018) Medial prefrontal cortex supports perceptual memory. Current Biology 28(18): R1094-R1095

Schwiedrzik CM, Freiwald WA (2017) High-level prediction signals in a low-level area of the macaque face-processing hierarchy. Neuron 96(1): 89-97

Schwiedrzik CM, Bernstein B, Melloni L (2016) Motion along the mental number line reveals shared representations for numerosity and space. eLife 5:e10806

Schwiedrzik CM, Zarco W, Everling S, Freiwald WA (2015) Face patch resting state networks link face processing to social cognition. PLoS Biology 13(9): e1002245

Schwiedrzik CM, Ruff CC, Lazar A, Leitner FC, Singer W, Melloni L (2014) Untangling perceptual memory: hysteresis and adaptation map into separate cortical networks. Cerebral Cortex 24(5): 1152-64



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Michael Sereda

Professor of Molecular and Translational Neurology, Group Leader at the Max Planck Institute for Experimental Medicine

- 2007 Group leader "Molecular and Translational Neurology", Max Planck Institute of Experimental Medicine
- 2008 Board certification in Neurology (Facharzt für Neurologie)
- 2008 Attending Neurologist and Head Neurogenetics Outpatients Clinic, Dept. of Clinical Neurophysiology, University of Göttingen (UMG)
- 2010 Associate Professorship "Neurology and Neurogenetics" (Habilitation)
- 2012 DFG-Heisenberg Professorship "Hereditary Neuropathies", Dept. of Clinical Neurophysiology, UMG
- 2017 Tenured Professorship of Neurology, Dept. of Clinical Neurophysiology, UMG

Major Research Interests

We pursue a basic research interest in glia cell biology, axon-glia interaction and mechanisms of diseases of the peripheral nervous system (PNS). 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 which leads to an overexpression of the tetraspan protein PMP22. Transgenic "CMT 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. The CMT rat allows a better understanding of the cellular disease mechanism operating in human CMT1A, and is helpful in the analysis of modifier genes, epigenetic factors, and in the evaluation of experimental treatment strategies. In an attempt to translate findings from the animal model to humans we were able to identify biomarkers of disease severity in the skin of CMT1A patients, which could already be validated in patients from across Europe. Currently, within CMT-NET, a national BMBF funded network on rare diseases coordinated by Prof. Sereda, we aim at transferring our results from skin to easily accessible blood samples from CMT patients, which would facilitate the performance of clinical trials in the near future.

Selected Recent Publications

Fledrich R, Akkermann D, Schütza V, Abdelaal TA, Hermes D, Schäffner E, Soto-Bernardini MC, Götze T, Klink A, Kusch K, Krueger M, Kungl T, Frydrychowicz C, Möbius W, Brück W, Mueller WC, Bechmann I, Sereda MW, Schwab MH, Nave KA, Stassart RM. (2019) NRG1 type I dependent autoparacrine stimulation of Schwann cells in onion bulbs of peripheral neuropathies. Nat Commun 10(1): 1467. doi: 10.1038/s41467-019-09886-4

Prukop T, Stenzel J, Wernick S, Kungl T, Mroczek M, Adam J, Ewers D, Nabirotchkin S, Nave KA, Hajj R, Cohen D, Sereda MW. (2019) Early short-term PXT3003 combinational therapy delays disease onset in a transgenic rat model of Charcot-Marie-Tooth disease 1A (CMT1A). PLoS One 16;14(1): e0209752. doi: 10.1371/journal.pone.0209752. eCollection 2019

Fledrich R, Abdelaal T, Rasch L, Bansal V, Schütza V, Brügger B, Lüchtenborg C, Prukop T, Stenzel J, Rahman RU, Hermes D, Ewers D, Möbius W, Ruhwedel T, Katona I, Weis J, Klein D, Martini R, Brück W, Müller WC, Bonn S, Bechmann I, Nave KA, Stassart RM, Sereda MW (2018) Targeting myelin lipid metabolism as a potential therapeutic strategy in a model of CMT1A neuropathy. Nat Commun 9(1): 3025

Fledrich R, Mannil M, Leha A, Ehbrecht C, Solari A, Pelayo-Negro AL, Berciano J, Schlotter-Weigel B, Schnizer TJ, Prukop T, Garcia-Angarita N, Czesnik D, Haberlová J, Mazanec R, Paulus W, Beissbarth T, Walter MC, Triaal C, Hogrel JY, Dubourg O, Schenone A, Baets J, De Jonghe P, Shy ME, Horvath R, Pareyson D, Seeman P, Young P, Sereda MW (2017) Biomarkers predict outcome in Charcot- Marie-Tooth disease 1A. J Neurol Neurosurg Psychiatry 88: 941-9522

Fledrich R, Stassart RM, Klink A, Rasch LM, Prukop T, Haag L, Czesnik D, Kungl T, Abdelaal TA, Keric N, Stadelmann C, Brück W, Nave KA, Sereda MW (2014) Soluble neuregulin-1 modulates disease pathogenesis in rodent models of Charcot-Marie-Tooth disease 1A. Nat Med 20: 1055-1061

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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 University of 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

Prönneke A, Witte M, Mock M, Staiger JF (2020) Neuromodulation Leads to a Burst-Tonic Switch in a Subset of VIP Neurons in Mouse Primary Somatosensory (Barrel) Cortex. Cerebral Cortex 30: 488-504.

Hafner G, Witte M, Guy J, Subhashini N, Fenno LE, Ramakrishna C, Kim YS, Deisseroth K, Callaway EC, Oberhuber M, Conzelmann KK, Staiger JF (2019) Mapping Brain-Wide Afferent Inputs of Parvalbumin-Expressing GABAergic Neurons in Barrel Cortex Reveals Local and Long-Range Circuit Motifs. Cell Reports 28: 3450-3461.E8

Feldmeyer D, Qi G, Emmenegger V, Staiger JF (2018) Inhibitory interneurons and their circuit motifs in the many layers of the barrel cortex. Neuroscience 368: 132-151

Zhou XJ, Rickmann M, Hafner G, Staiger JF (2017) Subcellular targeting of VIP boutons in mouse barrel cortex is layer-dependent and not restricted to interneurons. Cerebral Cortex 27: 5353-5368

Guy J, Staiger JF (2017) The functioning of a cortex without layers. Frontiers in Neuroanatomy 11: 54

Walker F, Möck M, Feyerabend M, Guy J, Wagener RJ, Schubert D, Staiger JF*, Witte M* (2016) Parvalbumin- and vasoactive polypeptide-expressing neocortical interneurons impose differential inhibition on Martinotti cells. Nature Communications 7: 13664

Wagener RJ, Witte M, Guy J, Mingo-Moreno N, Kugler S, Staiger JF (2016) Thalamocortical Connections Drive Intracortical Activation of Functional Columns in the Mislaminated Reeler Somatosensory Cortex. Cereb Cortex 26: 820-837

Prönneke A, Scheuer B, Wagener RJ, Mock M, Witte M, Staiger JF (2015) Characterizing VIP Neurons in the Barrel Cortex of VIPcre/tdTomato Mice Reveals Layer-Specific Differences. Cerebral Cortex 25: 4854-4868

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Stefan Treue

Professor, Director of the German Primate Center
Head of the Cognitive Neuroscience Laboratory

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

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

Yao T, Treue S, Krishna BS (2018) Saccade-synchronized rapid attention shifts in macaque visual cortical area MT. Nature Communications 9: 958

Yao T, Treue S, Krishna BS (2016) An attention-sensitive memory trace in macaque MT following saccadic eye movements. PLoS Biol 14:e1002390

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

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Melanie Wilke

Professor of Cognitive Neurology

- 1997 – 2001 M.A. in Psycholinguistics, Neuropsychology and Neurobiology, Ludwig-Maximilians-University, Munich, Germany
- 2001 – 2005 PhD student at the Max Planck Institute for Biological Cybernetics, Tübingen, Advisor: Dr. D.A. Leopold
- 2005 – 2008 Postdoctoral Fellow in the Laboratory of Neuropsychology, NIMH, Bethesda, Advisor: Dr. D.A. Leopold
- 2008 – 2010 Postdoctoral Fellow in the Division of Biology, Caltech, Pasadena; Advisor: Prof. R.A. Andersen
- since 2011 Co-Investigator in the "Decision and Awareness" group (DAG) at the German Primate Center (DPZ)
- since 2011 Schilling Foundation Professor (W3), Director of the department of Cognitive Neurology and Head of the MR-Research Unit, UKG, University of Göttingen

Major Research Interests

The long-term goal of our research is to understand how neural activity gives rise to spatial awareness and how distributed information is integrated to guide the selection of movement goals. Furthermore we are dedicated to perform translational research from monkey models of cognitive disorders to human patients. Current research focuses on the question how thalamic nuclei and cortical areas interact during visual perception and decision making. Another line of research is concerned with the neural mechanisms underlying spatial neglect, which is a frequent and severe consequence of brain damage in humans. Specifically, we are investigating pathological and compensatory changes in large-scale brain networks in human stroke patients by means of imaging (DTI, fMRI) and stimulation (tACS, tDCS, TMS) methods. We develop and employ monkey models of spatial neglect to study the underlying neural mechanisms by means of fMRI, electrophysiological recordings, inactivation and stimulation techniques with the goal to develop new therapeutic interventions.

Selected Recent Publications

Storm F, Boly M, Casali M, Massimini M, Olcese M, Pennartz CMA, Wilke M (2017) Consciousness regained: disentangling mechanisms, brain systems, and behavioral responses. J of Neuroscience, (in press)

Wilke M, Dechent P, Bähr M (2017) Sarcoidosis manifestion centered on the thalamic pulvinar leading to persistent astasia. Movement Disorders: Clinical Practice, (in press)

Dominguez-Vargas A, Schneider L, Wilke M*, Kagan I* (2017) Electrical Microstimulation of the Pulvinar Biases Saccade Choices and Reaction Times in a Time-Dependent Manner. J of Neuroscience 37(8): 2234-2257. *equal contribution

Cabral-Calderin Y, Williams K, Dechent P, Opitz A, Wilke M (2016) Transcranial alternating current stimulation modulates spontaneous low frequency fluctuations as measured with fMRI. 2016. Neuroimage 141: 88-107

Cabral-Calderin Y, Weinrich C, Schmidt-Samoa C, Poland E, Dechent P, Bähr M, Wilke M (2016) Transcranial alternating current stimulation affects the BOLD signal in a frequency and task-dependent manner. Hum Brain Map 37(1): 94-121

Tsuchiya N, Wilke M, Frässle S, Lamme V (2015) No-report paradigms: Extracting the true neural correlates of consciousness. Trends Cogn Sci 19(12): 757-70

Hwang E, Hauschild M, Wilke M, Andersen RA (2014) Spatial and Temporal Eye-Hand Coordination Relies on the Parietal Reach Region. J of Neuroscience 34: 12884-92

Hwang EJ, Hauschild M, Wilke M, Andersen RA (2012) Inactivation of the parietal reach region causes optic ataxia, impairing reaches but not saccades. Neuron 76(5): 1021-9

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Sonja M. Wojcik

Group Leader at the Max Planck Institute for Experimental Medicine

- 1994 Diploma in Biology, RWTH Aachen, Germany
- 2000 Ph.D. in Molecular and Cellular Biology, Baylor College of Medicine, Houston, TX, USA
- 2001 Postdoctoral fellow, Department of Molecular Neurobiology, Max Planck Institute of Experimental Medicine, Göttingen, Germany
- 2008 Group leader, Max Planck Institute of Experimental Medicine, Göttingen, Germany
- 2014 Habilitation, Medical Faculty of the University of Göttingen, Germany

Major Research Interests

We study the molecular processes underlying neurotransmitter release and the functional consequences of alterations in these processes at the cellular and network levels.

In the past, projects were mainly focused on analyzing the role of vesicular neurotransmitter transporters in neurons as determining factors in the establishment and maintenance of glutamatergic, GABAergic and glycinergic synaptic phenotypes.

Current projects include the analysis of regulatory mechanisms that control the release of non-classical neurotransmitters from large dense-core vesicles in neuroendocrine chromaffin cells and peptidergic neurons.

Selected Recent Publications

Wüstefeld L, Winkler D, Janc OA, Hassouna I, Ronnenberg A, Ostmeier K, Muller M, Brose N, Ehrenreich H, Wojcik SM (2015) Selective expression of a constitutively active erythropoietin receptor in GABAergic neurons alters hippocampal network properties without affecting cognition. J Neurochem doi: 10.1111/jnc.13445. [Epub ahead of print]

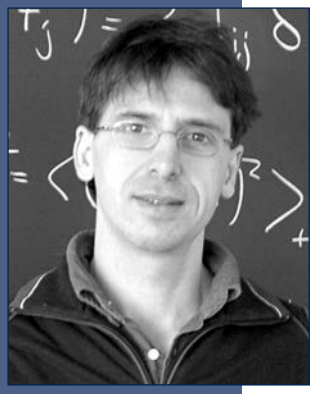
Man KM, Imig C, Walter AM, Pinheiro PS, Stevens DR, Rettig J, Sorensen JB, Cooper BH, Brose N, Wojcik SM (2015) Identification of a Munc13-sensitive step in chromaffin cell large dense-core vesicle exocytosis. eLife 4, doi: 10.7554/eLife.10635

Rahman J, Besser S, Schnell C, Eulenburg V, Hirrlinger J, Wojcik SM Hulsmann S (2015) Genetic ablation of VIAAT in glycinergic neurons causes a severe respiratory phenotype and perinatal death. Brain Struct Funct 220: 2835-2849

Wojcik SM, Tantra M, Stepniak B, Man KN, Muller-Ribbe K, Begemann M, Ju A, Papiol S, Ronnenberg A, Gurvich A, Shin Y, Augustin I, Brose N, Ehrenreich H (2013) Genetic Markers of a Munc13 Protein Family Member, BAIAP3, Are Gender-Specifically Associated with Anxiety and Benzodiazepine Abuse in Mice and Humans? Mol Med 19: 135-148

Wojcik SM, Katsurabayashi S, Guillemin I, Friauf E, Rosenmund C, Brose N, Rhee JS (2006) A Shared Vesicular Carrier Allows Synaptic Corelease of GABA and Glycine. Neuron 50: 575-587

Herzog E, Takamori S, Jahn R, Brose N, Wojcik SM (2006) Synaptic and vesicular co-localization of the glutamate transporters VGLUT1 and VGLUT2 in the mouse hippocampus. J Neurochem 99: 1011-1018



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Fred Wolf

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

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

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

Palmigiano A, Geisel T, Wolf F jsa, Battaglia D (2017) Flexible information routing by transient synchronization. Nature Neurosci doi: 10.1038/nn.4569

Chapochnikov N M, Takago H, Huang C-H, Pangrsic T, Khimich D, Neef J, Auge E, Göttfert F, Hell S W, Wichmann C, Wolf F jsa, Moser T (2014) Uniquantal Release through a Dynamic Fusion Pore Is a Candidate Mechanism of Hair Cell Exocytosis. Neuron 83(6): 1389-1403, doi: 10.1016/j.neuron.2014.08.003

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

Naundorf B, Wolf F jsa, Volgushev M (2006) Unique features of action potential initiation in cortical neurons. Nature 440: 1060

Wolf F, Geisel T (1998) Spontaneous pinwheel annihilation during visual development. Nature 395: 73-78

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Fred Wouters

Professor for Molecular and Cellular Systems

- 1997 Dr. (Ph. D.), Faculty of Chemistry, University of Utrecht, The Netherlands
- 1997 – 2000 Postdoctoral fellow, Imperial Cancer Research Fund (ICRF), London UK
- 2000 – 2001 Postdoctoral fellow, European Molecular Biology laboratory (EMBL), Heidelberg
- 2001 Appointed as group leader at the European Neuroscience Institute, Göttingen
- 2006 PD (habilitation), Physiology, Göttingen University
- since July 2007 Professor

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 proces-ses. 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

de Castro MA, Bunt G, Wouters FS (2016) Cathepsin B launches an apoptotic exit effort upon cell death-associated disruption of lysosomes. Cell Death Discov. 2016 Feb 29;2: 16012

Schmitz M, Wulf K, Signore SC, Schulz-Schaeffer WJ, Kermer P, Bähr M, Wouters FS, Zafar S, Zerr I (2014) Impact of the cellular prion protein on amyloid-β and 3PO-tau processing. J Alzheimers Dis 38(3): 551-65

Schulz O, Pieper C, Clever M, Pfaff J, Ruhlandt A, Kehlenbach RH, Wouters FS, Großhans J, Bunt G, Enderlein J (2013) Resolution doubling in fluorescence microscopy with confocal spinning-disk image scanning microscopy. Proc Natl Acad Sci U S A 2013 Dec 24;110(52): 21000-5

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. *equal contribution.

van den Bogaart G, Holt MG, Bunt G, Riedel D, Wouters FS, Jahn R (2010) One SNARE complex is sufficient for membrane fusion. Nature Struct Mol Biol 17: 358-365

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