Neurosciences
MSc/PhD/MD-PhD Program

www.gpneo.uni-goettingen.de

YEARBOOK 2012 / 2013
MSc/PhD/MD-PhD
Neuroscience Program
at the University of Göttingen
Letter from the President

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

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

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

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

I would very much like to thank all colleagues and institutions for their committed support of these international programs and, last but not least, the German Academic Exchange Service (DAAD), the Lower Saxony Ministry of Science and Culture, and the various generous donors. The Georg-August University of Göttingen will continue to support these programs to promote international exchange at all levels and for further interaction with our partners worldwide.

Prof. Dr. Ulrike Beisiegel

(Professor of the Georg August University Göttingen)
Letter from the Max Planck Society

The mission of the Max Planck Society is to conduct basic research in science and humanities at the highest level. More than 80 Max Planck Institutes are located on scientific campuses across Germany, most of them close to universities. Scientific ties between Max Planck Institutes and universities are traditionally strong. In 1998, during the 50th year celebration of the Max Planck Society in Göttingen, the Max Planck Society, together with the Hochschulrektorenkonferenz, launched the International Max Planck Research Schools as a new joint program to further intensify cooperation.

The goals of the International Max Planck Research Schools are

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

By now, 63 International Max Planck Research Schools have been established involving 82 Max Planck Institutes, 34 German universities and 25 universities abroad. About 2,830 PhD students from 112 countries are presently enrolled. More than 3,100 PhD students have graduated to date from an International Max Planck Research School.

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

Peter Gruss
President
Max Planck Society

Gregor Eichele
Dean of the IMPRS
Neurosciences
Overview

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

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

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

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

Subsequently, two separate segments are offered:

- **PhD Program**: Good to excellent results after the first year qualify for direct admission to a three-year doctoral project in one of the participating research groups. The Master's thesis requirement is waived in this case. After successful defense of a doctoral thesis, the degree Doctor of Philosophy (Ph.D.) or the equivalent title Doctor rerum naturalium (Dr. rer. nat.) is conferred. Students who finished medical school can apply for an MD-Ph.D. title.

- **MSc Program**: Alternatively, students may conclude the program with a Master's thesis, based on six months of experimental scientific research. The degree Master of Science (M.Sc.) is awarded upon successful completion of the Master's thesis.

Examinations

Entry (B.Sc.)

<table>
<thead>
<tr>
<th>Intensive Course Program</th>
<th>1 Y</th>
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<tbody>
<tr>
<td>Master's Thesis</td>
<td>0.5 Y</td>
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<tr>
<td>M.Sc.</td>
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</tr>
<tr>
<td>Doctoral Program (Thesis &amp; Courses)</td>
<td>3 Y</td>
</tr>
<tr>
<td>Thesis Defense</td>
<td></td>
</tr>
<tr>
<td>Ph.D. / Dr. rer. nat. or MD-Ph.D.</td>
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</tbody>
</table>

Year

0 1 2 3 4
Funding of the Program

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

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

*International Degree Programs - Auslandsorientierte Studiengänge (AS)*

**IPP made in Germany**
International Postgraduate Programs – Internationale Promotionsprogramme (IPP)

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

*International Max Planck Research Schools*

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

*Innovationsoffensive*

*Doctoral Programs - Promotionsprogramme*

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

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

Gemeinnützige Hertie-Stiftung, Frankfurt am Main, Germany, http://www.ghst.de
Donors
The Neuroscience Program thanks the following companies for their donations, which were used to financially support students during the first year of studies:

- Bayer AG, Leverkusen, Germany
- Carl Zeiss Lichtmikroskopie, Göttingen, Germany
- Degussa AG, Düsseldorf, Germany
- DeveloGen AG, Göttingen, Germany
- Heka Elektronik GmbH, Lambrecht / Pfalz, Germany
- Hellma GmbH & Co. KG, Müllheim / Baden, Germany
- KWS Saat AG, Einbeck, Germany
- Leica Microsystems GmbH, Bensheim, Germany
- Luigs & Neumann, Ratingen, Germany
- Olympus Europa Holding GmbH, Hamburg, Germany
- Roche Diagnostics GmbH, Penzberg, Germany
- Sartorius stedim AG, Göttingen, Germany
- Solvay Pharmaceuticals, Hannover, Germany
- Springer Verlag, Heidelberg, Germany
- Vossius & Partner, München, Germany
Intensive Course Program (First Year)

Throughout the first year, current topics in the neurosciences are covered by
- lectures
- tutorials
- methods courses
- laboratory rotations
- seminars

Lectures and Tutorials

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

A. Neuroanatomy
B. Physiology and Basic Statistics
C. Modelling, Autonomous Nervous System, Pharmacology
D. Molecular Biology, Development, and Neurogenetics
E. Sensory and Motor Systems
F. Clinical Neurosciences and Higher Brain Functions
G. Specialization Seminars and Tutorials

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

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

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

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

III Modelling, Autonomous Nervous System, Pharmacology
- neuronal modelling
- behavioral analysis
- neuroendocrinology / neuropharmacology
- protein separation techniques

IV Molecular Biology, Development, and Neurogenetics
- cell culture methods
- methods in molecular biology

Laboratory Rotations

Starting in January, every student carries out three independent research projects (laboratory rotations) in participating laboratories. Each project is individually supervised and involves seven weeks of experimental work, followed by one week for data analysis and presentation. For each project, a report must be completed in the format of a scientific publication. The laboratory rotations must cover at least two different subjects.
Seminars
Seminars start in March. The class meets weekly for two hours to discuss two or three student presentations. The presentations are research reports based on work from the laboratory rotations.

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

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

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

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

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

Orientation, Language Courses, Social Activities

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

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

Application, Selection, and Admission 2012

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

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

<table>
<thead>
<tr>
<th>Continent</th>
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<tr>
<td>Germany</td>
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<td>5</td>
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<tr>
<td>other West Europe</td>
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<td>1</td>
</tr>
<tr>
<td>East Europe</td>
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<tr>
<td>America (total)</td>
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</tr>
<tr>
<td>North America</td>
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<tr>
<td>Central/South America</td>
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<tr>
<td>Africa (total)</td>
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<tr>
<td>North Africa</td>
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<tr>
<td>Central/South Africa</td>
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<td>Asia (total)</td>
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<tr>
<td>Tamer Abdelaal</td>
<td>Egypt</td>
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<tr>
<td>Andrea Adden</td>
<td>Germany</td>
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<tr>
<td>Erika Avendaño Guzmán</td>
<td>Mexico</td>
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<tr>
<td>Mariana Cerdeira</td>
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<tr>
<td>Chi Chen</td>
<td>P.R. China</td>
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<tr>
<td>Guergana Ivanova Donccheva</td>
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<td>Alina Gellerer</td>
<td>Germany</td>
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<td>Laura Geurts</td>
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<td>Diego Alejandro Giraldo Sánchez</td>
<td>Colombia</td>
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<td>Sindhuja Gowrisankaran</td>
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<td>Sabitha Joseph</td>
<td>Germany</td>
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<td>Sarah Lam</td>
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<td>Amr Maamoun</td>
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<td>Florentin Masurat</td>
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<td>Sharlen Yared Moore Corona</td>
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<tr>
<td>Pratibha Narayanan</td>
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<td>Ahmad Nazzal</td>
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<td>Sneha Shashidhara</td>
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<tr>
<td>Julia Sondermann</td>
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<tr>
<td>Aarti Swaminathan</td>
<td>India</td>
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<tr>
<td>King Faisal Yambire</td>
<td>Ghana</td>
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</tbody>
</table>
Tamer Abdelaal

EDUCATION

College / University:
Faculty of Science, Al Azhar University of Cairo

Highest Degree:
M.Sc. (Science).

Major Subjects:
Microbiology (Antibiotics), Protein Biochemistry

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

Scholarships:
2012 – 2014: Erasmus Mundus Scholarship
2011: Internship at LUBEM institute, Quimper, France funded by Scientific Sector, French Centre for Culture and Cooperation (CFCC), Embassy of France in Egypt
2010 – 2011: Internship at VIB Department of Molecular and Cellular Interactions, Brussel, Belgium, funded by Ministry of Higher Education

Andrea Adden

EDUCATION

College / University:
Georg August University Göttingen

Highest Degree:
B.Sc.

Major Subjects:
Biology

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

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

Scholarships:
2012 – 2013: International Max Planck Research School support
**Erika Avendaño Guzmán**

**EDUCATION**

**College / University:**
Universidad Nacional Autónoma de México (UNAM)

**Highest Degree:**
B.Sc. (Biology)

**Major Subjects:**
Neurosciences, Cell Physiology

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

**Projects / Research:**
- Aug 2010 – Feb 2012: “The role of the reactive oxygen species in the trophic actions of BDNF and NMDA in cerebellar granule cells”, UNAM, DF, Mexico
- Mar – Sep 2011: “Mechanisms or neuronal death”. Social Service. Cell Physiology Institute, UNAM, DF, Mexico

**Scholarships:**
- 2012 – 2013: Stipend of the Excellence Foundation for the Promotion of the Max Planck Society
- Feb – July 2011: Professor assistant scholarship. National Researchers System
- 2010: Scholarship for higher education programs, Secretariat of Public Education (SEP) of Mexican Federal Government

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**Mariana Cerdeira**

**EDUCATION**

**College / University:**
Universidade Federal Fluminense (UFF)

**Highest Degree:**
B.Sc. (honours)

**Major Subjects:**
Biomedical Sciences

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

**Projects / Research:**
- Bachelor’s thesis: “Immunohistochemical detection of the cellular marker Ki-67 in human glioblastoma”
- 2010 – 2012: Analysis of the immune response to AAV vectors after injection in mouse retina
- 2009 – 2010: Study of the physiological roles of the Cellular Prion Protein

**Scholarships:**
- 2012 – 2014: Erasmus Mundus Scholarship
- 2009 – 2012: Scholarship from the National Council for Scientific and Technological Development (CNPQ, an agency linked to the Brazilian Ministry of Science and Technology)
Chi Chen

EDUCATION

College / University:
Tsinghua University

Highest Degree:
B.Sc.

Major Subjects:
Biological Sciences

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

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

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


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

Guergana Ivanova Dontcheva

EDUCATION

College / University:
University of British Columbia

Highest Degree:
B.Sc.

Major Subjects:
Cell Biology and Genetics

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

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

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

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

EDUCATION

College / University:
Philips University Marburg

Highest Degree:
B.Sc.

Major Subjects:
Biology

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

Projects / Research:

Scholarships:
2012 – 2013: International Max Planck Research School support

Laura Geurts

EDUCATION

College / University:
University College Utrecht, Utrecht University

Highest Degree:
B.Sc. (honours)

Major Subjects:
Cognitive Neuroscience

Lab Experience:
Basic methods in experimental psychology, basic techniques in microbiology

Projects / Research:

Scholarships:
2012 – 2013: Stipend of the Excellence Foundation for the Promotion of the Max Planck Society
Diego Alejandro Giraldo Sánchez

EDUCATION
College / University: Universidad de los Andes, Bogota
Highest Degree: B.Sc.
Major Subjects: Biology
Lab Experience: Behavioral biology, arthropod neurophysiology, insect neuroethology, VSM magnetometry in insect tissues
Projects / Research:
- 2012: Behavioral effects of low power radio frequencies on Chagas disease vector *Rhodnius prolixus*
- 2011: Magnetoreception in *Rhodnius prolixus*: Behavioral experiments and VSM magnetometry
Scholarships:
- 2012 – 2013: Stipend of the Excellence Foundation for the Promotion of the Max Planck Society

Sindhuja Gowrisankaran

EDUCATION
College / University: SASTRA University
Highest Degree: B.Tech.
Major Subjects: Biotechnology
Lab Experience: Cell culture, basic molecular biology techniques, immunohistochemistry and imaging, *Drosophila* behavior studies
Projects / Research:
- Jan – July 2012: B.Tech Thesis: The role of miRNA-31 and -148a in Glioblastoma multiforme (GBM) under the guidance of Dr. Anna Krichevsky, RNA Biology Lab, BWH, Boston
- May – July 2010 & 2011 Study of neurodegenerative disease (Huntington chorea) using *Drosophila* animal model under the guidance of Dr. Sheeba Vasu, JNCASR, Bangalore, India
Scholarships:
- 2012 – 14 Erasmus Mundus Scholarship
- 2012 Internship at BWH, Harvard Medical School
- 2010, 11 J Nehru Center for Advanced Scientific Research (JNCASR) summer fellowship
- 2011 Rajiv Gandhi Science Talent Research Fellow award
Sabitha Joseph

EDUCATION

College / University:
Georg August University Göttingen

Highest Degree:
B.Sc.

Major Subjects:
Molecular Medicine

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

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

Scholarships:
2012 – 2013: International Max Planck Research School support

Sarah Lam

EDUCATION

College / University:
University of Toronto

Highest Degree:
B.Sc. (honours)

Major Subjects:
Neuroscience, Psychology

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

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

Scholarships:
2012 – 2013: Stipend of the Excellence Foundation for the Promotion of the Max Planck Society
2011 – 2012: The Mary Mounfield Scholarship
2011: Woodsworth College Summer Abroad Bursary
Amr Maamoun

EDUCATION
College / University: 
2005 – 2011: Damascus University
Highest Degree: 
M.D.
Major Subjects: 
Medicine
Lab Experience: 
Basic lab techniques
Scholarships: 
2012 – 2013: Stipend of the Excellence Foundation for the Promotion of the Max Planck Society

Amr Maamoun
Syria

Florentin Masurat

EDUCATION
College / University: 
Georg August University Göttingen
Highest Degree: 
B.Sc.
Major Subjects: 
Molecular Medicine
Lab Experience: 
Biomolecular and chemical methods and experience in clinical studies
Projects / Research: 
Bachelor Thesis: “Modulating human cortex plasticity using Transcranial Near-Infrared Laser Stimulation (tILS)”, Prof. Dr. Andrea Antal, Clinical Neurophysiology, University Hospital Göttingen
Scholarships: 
2012 – 2013: International Max Planck Research School support

Florentin Masurat
Germany
Sharlen Yared Moore Corona

EDUCATION

College / University:
Universidad Nacional Autónoma de México (UNAM)

Highest Degree:
B.Sc.

Major Subjects:
Basic Biomedical Research

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

Projects / Research:
2008 – 2009: “Comparative analysis of the immune response to three PE_PGRS proteins from Mycobacterium tuberculosis”
2007 – 2008: “Phenotypic characterization of Streptomyces coelicolor impaired at the protein glycosylation system”

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

Pratibha Narayanan

EDUCATION

College / University:
Sri Venkateswara College, Delhi University

Highest Degree:
B.Sc. (honours) Biochemistry

Major Subjects:
Biochemistry, Molecular biology, Immunology, Cell Biology, Bioenergetics, Genetics, Membrane Biology

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

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

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

EDUCATION

College / University:
University of Jordan

Highest Degree:
B.Sc.

Major Subjects:
Medicine

Lab Experience:
Basic lab techniques

Scholarships:
2012 – 2013: Stipend of the Excellence Foundation for the Promotion of the Max Planck Society
2005 – 2011: Scholarship from Her Royal Majesty Queen Rania Al-Abdullah office for studying Medicine at the University of Jordan

Sneha Shashidhara

EDUCATION

College / University:
Fergusson College (affiliated to University of Pune), Pune

Highest Degree:
B.Sc.

Major Subjects:
Physics

Lab Experience:
2011: Summer project at National Centre for Biological Sciences (Prof. Sumantra Chatterji), Bangalore, India
2008: Summer project at the Centre for Cellular and Molecular Biology (Dr. Rakesh Mishra), Hyderabad, India

Projects / Research:
2011: Study of “the galaxy spectra in general and calculate the star formation rate and metallicity of a particular galaxy” at IUCCA, Pune, India
2011: Study of “the cellular memory though LTP in rat hippocampus using ex-vivo electrophysiological techniques” at NCBS, Bangalore, India
2008: Study of “the aggression behavior in male Drosophila and the effect of genetic constitution of self and of the opponent” at CCMB, Hyderabad, India

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

EDUCATION

College / University:
Georg August University Göttingen

Highest Degree:
B.Sc.

Major Subjects:
Molecular Medicine

Lab Experience:
Basic cellular and molecular biology techniques, electron microscopy

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

Scholarships:
2012 – 2013: International Max Planck Research School support

Aarti Swaminathan

EDUCATION

College / University:
Mepco Schlenk Engineering College / Anna University Chennai

Highest Degree:
B.Tech. (Biotechnology)

Major Subjects:
Biochemistry, Cell Biology, Molecular Biology, Genetic Engineering, Protein Engineering, Immunology, Bioinformatics

Lab Experience:
Real time PCR, in situ hybridization, cloning, cell culture, molecular & cell biology techniques

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

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

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

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

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

EDUCATION

College / University:
University of Ghana

Highest Degree:
B.Sc.

Major Subjects:
Clinical Chemistry and Molecular Biology

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

Projects / Research:
Metallothionein, Trace Element and Oxidative Stress Status in Diabetics

Scholarships:
2012 – 2013: Stipend of the Excellence Foundation for the Promotion of the Max Planck Society
2008: Alumni Prize for Best Second year student in Science
2008: Shell Prize for Best Second year student in Science
2008: Academic Excellence Award for Best B.Sc. student of Commonwealth Hall
<table>
<thead>
<tr>
<th>Name</th>
<th>Institute</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathias Bähr</td>
<td>Neurology</td>
</tr>
<tr>
<td>Thomas Bayer</td>
<td>Molecular Psychiatry</td>
</tr>
<tr>
<td>Nils Brose</td>
<td>Molecular Neurobiology</td>
</tr>
<tr>
<td>Wolfgang Brück</td>
<td>Neuropathology</td>
</tr>
<tr>
<td>Camin Dean</td>
<td>Trans-synaptic Signaling</td>
</tr>
<tr>
<td>Thomas Dresbach</td>
<td>Anatomy and Embryology</td>
</tr>
<tr>
<td>Hannelore Ehrenreich</td>
<td>Clinical Neurosciences</td>
</tr>
<tr>
<td>Gregor Eichele</td>
<td>Genes and Behavior</td>
</tr>
<tr>
<td>André Fiala</td>
<td>Molecular Neurobiology of Behavior</td>
</tr>
<tr>
<td>André Fischer</td>
<td>Laboratory for Aging and Cognitive Diseases</td>
</tr>
<tr>
<td>Alexander Flügel</td>
<td>Neuroimmunology</td>
</tr>
<tr>
<td>Jens Frahm</td>
<td>Biomedical NMR Research / Physical Chemistry</td>
</tr>
<tr>
<td>Tim Friede</td>
<td>Medical Statistics</td>
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<tr>
<td>Eberhard Fuchs</td>
<td>Animal Physiology / Neurobiology</td>
</tr>
<tr>
<td>Theo Geisel</td>
<td>Nonlinear Dynamics</td>
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<tr>
<td>Martin Göpfert</td>
<td>Cellular Neurobiology</td>
</tr>
<tr>
<td>Robert Güttig</td>
<td>Theoretical Neuroscience</td>
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<tr>
<td>Uwe-Karsten Hanisch</td>
<td>Neuropathology</td>
</tr>
<tr>
<td>Ralf Heinrich</td>
<td>Neurobiology</td>
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<tr>
<td>Stefan Hell</td>
<td>NanoBiophotonics</td>
</tr>
<tr>
<td>Michael Hömer</td>
<td>Neurobiology</td>
</tr>
<tr>
<td>Swen Hülsmann</td>
<td>Neuro- and Sensory Physiology</td>
</tr>
<tr>
<td>Reinhard Jahn</td>
<td>Neurobiology</td>
</tr>
<tr>
<td>Hubertus Jarry</td>
<td>Clinical and Experimental Endocrinology</td>
</tr>
<tr>
<td>Siegrid Löwel</td>
<td>Systems Neuroscience</td>
</tr>
<tr>
<td>Till Marquardt</td>
<td>Developmental Neurobiology</td>
</tr>
<tr>
<td>Ira Milosevic</td>
<td>Synaptic Vesicle Dynamics</td>
</tr>
<tr>
<td>Tobias Moser</td>
<td>Otolaryngology</td>
</tr>
<tr>
<td>Klaus-Armin Nave</td>
<td>Neurogenetics</td>
</tr>
<tr>
<td>Luis Pardo</td>
<td>Molecular Biology of Neuronal Signals</td>
</tr>
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<td>Walter Paulus</td>
<td>Clinical Neurophysiology</td>
</tr>
<tr>
<td>Diethelm W. Richter</td>
<td>Neuro- and Sensory Physiology</td>
</tr>
<tr>
<td>Michael Rickmann</td>
<td>Neuroanatomy</td>
</tr>
<tr>
<td>Silvio O. Rizzoli</td>
<td>STED Microscopy of Synaptic Function</td>
</tr>
<tr>
<td>Moritz Rossner</td>
<td>Gene Expression</td>
</tr>
<tr>
<td>Detlev SchILD</td>
<td>Molecular Neurophysiology</td>
</tr>
<tr>
<td>Oliver Schlüter</td>
<td>Molecular Neurobiology</td>
</tr>
<tr>
<td>Manuela Schmidt</td>
<td>Somatosensory Signaling</td>
</tr>
<tr>
<td>Michael Sereda</td>
<td>Molecular and Translational Neurology</td>
</tr>
<tr>
<td>Mikael Simons</td>
<td>Biochemistry and Molecular Cell Biology</td>
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<tr>
<td>Jochen Staiger</td>
<td>Neuroanatomy</td>
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<tr>
<td>Judith Stegmüller</td>
<td>Cellular and Molecular Neurobiology</td>
</tr>
<tr>
<td>Nicole von Steinbüchel-Rheinwall</td>
<td>Medical Psychology and Medical Sociology</td>
</tr>
<tr>
<td>Anastassia Stoykova</td>
<td>Molecular Cell Biology</td>
</tr>
<tr>
<td>Walter Stühmer</td>
<td>Molecular Biology of Neuronal Signals</td>
</tr>
<tr>
<td>Stefan Treue</td>
<td>Cognitive Neuroscience and Biological Psychology</td>
</tr>
<tr>
<td>Andreas Wodarz</td>
<td>Stem Cell Biology</td>
</tr>
<tr>
<td>Fred Wolf</td>
<td>Nonlinear Dynamics</td>
</tr>
<tr>
<td>Fred Wouters</td>
<td>Cellular Biophysics</td>
</tr>
</tbody>
</table>

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

Professor of Neurology

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

Major Research Interests

Neuronal cell loss is not only a major feature of human neurodegenerative diseases like Parkinson's disease (PD), Alzheimer's disease (AD) or stroke, but can also be observed in neuroinflammatory conditions like Multiple Sclerosis (MS) or after traumatic lesions, e.g. of the optic nerve. We examine the cellular and molecular mechanisms of neuronal dysfunction and neuronal cell death in animal models of the respective disorders with the ultimate goal to detect new targets for a therapeutic neuroprotective intervention.

In PD for example, a multidisciplinary research team with our participation in the area C2 of the CMPB examines the role of -synuclein aggregation for dopaminergic dysfunction and cell death and characterizes other disease related proteins in order to develop new neuroprotective strategies. To that end we use AAV viral gene transfer to express different disease-associated and design mutants of -synuclein in the nigrostriatal system of rodents. Using this technology we also developed a novel model of PD based on RNA-interference mediated depletion of anti-oxidant defense mechanisms, demonstrating several features of idiopathic PD such as selective degeneration of DA neurons, progressive aggregate formation and inflammation. A similar approach is also used to develop new gene therapy strategies using viral vectors for delivery of neuroprotective factors to specific neurons or glial cells in various species.

In the recent years it became also clear that axonal and neuronal loss do not only occur in classical neurodegenerative disorders but also in immune-mediated diseases like MS. To study this issue in more detail we have developed a model system of MS in rodents that reproducibly leads to optic neuritis, one of the most common early manifestations of MS. To monitor disease course we have established electrophysiological measurements like visually evoked potentials (VEP), electroretinogramm (ERG) and optical coherence tomography (OCT) that allow us to correlate onset, course and outcome of disease with and without therapy with histomorphological and molecular analyses. The aim is to describe in detail the molecular pathophysiology that leads to axonal and neuronal loss and to develop new therapeutic strategies, some of which have already been translated into proof of concept studies in human patients.

Selected Recent Publications


Thomas Bayer

Professor of Molecular Psychiatry

- 1984 – 1989 Diploma in biology, University of Stuttgart and Whitney Lab Florida
- 1989 – 1993 PhD at the University of Cologne (PhD Thyssen Graduate School)
- 1993 Postdoctoral Research Fellow, University of Cologne, Cologne
- 1993 – 1997 Postdoctoral Research Fellow, Institute of Neuropathology, University of Bonn Medical Center, Bonn
- 1997 – 2002 Lab leader, Department of Psychiatry, University of Bonn Medical Center, Bonn
- 2002 – 2007 Head of Neurobiology Lab, University of Saarland Medical Center, Homburg
- 2004 Appointment to apl Professor at the University Medical Center Saarland
- 2007 – present University Professor in “Molecular Psychiatry” at the Georg-August-University Göttingen, University Medicine Göttingen
- Personal tutor of the Studienstiftung at the Georg-August-University Göttingen

Major Research Interests

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

Selected Recent Publications


Nils Brose

Professor, Director at the Max Planck Institute for Experimental Medicine

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

Major Research Interests

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

Selected Recent Publications


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


Camin Dean

Group Leader Trans-synaptic Signaling

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

Major Research Interests

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

Selected Recent Publications


**Thomas Dresbach**

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

**Major Research Interests**

Our group studies synapse formation with particular focus on the biogenesis of presynaptic nerve terminals. Our goal is to understand the mechanisms of synaptogenesis in enough detail to pinpoint molecular causes of synaptopathies. We study neuronal cultures to unravel fundamental mechanisms operating at the heart of synaptogenesis, and we have begun to study specialized synapses such as the giant synapses of the mammalian auditory system to determine how these mechanisms act together to generate the remarkable specification and heterogeneity of synapses in the brain.

Using live imaging, molecular biological and ultrastructural approaches, we currently analyze
- the role of novel, vertebrate-specific presynaptic proteins in synaptic function
- the trafficking and assembly of synaptic organelles and protein complexes
- the transsynaptic signalling events controlling presynaptic differentiation.

These efforts should help us understand both the common principles by which the various types of synapses are generated, and how they are fine-tuned for specific tasks, such as a particular strength, reliability or adaptivity.

**Selected Recent Publications**


Hannelore Ehrenreich

Professor of Neurology and Psychiatry

- 1981 Doctor of veterinary medicine, University of Munich
- 1983 Elective Period, University of Newcastle-upon-Tyne, England
- 1985 Guest Lecturer, University of the Philippines, Manila
- 1985 – 1986 Assistant, Department of Internal Medicine, University of Munich
- 1987 Graduation (Medicine), University of Munich
- 1987 – 1988 Assistant, Department of Neurology, University of Munich
- 1989 Doctor of Medicine, University of Munich
- 1989 – 1991 Guest Scientist (BMBF grant) NIAID, NIH, Bethesda, MD, USA
- 1992 – 1994 Assistant, Departments of Neurology and Psychiatry, University of Göttingen
- 1994 Habilitation (Neurology and Psychiatry)
- 1994 – present Head, Division of Clinical Neuroscience, MPIEM
- 2000 – 2002 Vice President, University of Göttingen
- 2008 Adjunct Professor of Biology and Psychology, University of Göttingen

Major Research Interests

Translational Neuroscience

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

Selected Recent Publications


Gregor Eichele

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

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

Selected Recent Publications
André Fiala

Professor of Molecular Neurobiology of Behavior

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

Major Research Interests

We study neuronal mechanisms underlying olfaction, learning and memory, and goal-directed behavior using the model organism Drosophila melanogaster. The fruit fly Drosophila offers the advantage of expressing transgenes in almost any population of it’s about 100,000 neurons. Transgenes used by us are, for example, fluorescent sensor proteins that allow us to monitor the spatio-temporal activity of neurons, or light-sensitive proteins by which neuronal activity can be stimulated through illumination. Using these optogenetic techniques in combination with behavioral analyses we aim at unraveling the functioning of dedicated neuronal circuits, and how these circuits contribute to organizing behavior. In addition, molecular mechanisms underlying learning and memory processes are investigated.

Selected Recent Publications


André Fischer

Group Leader Laboratory for Aging and Cognitive diseases

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

Major Research Interests

Our group aims to understand the molecular mechanisms underlying learning and memory processes under physiological and pathological conditions. To this end we combine molecular, biochemical, pharmacological and behavioral approaches using mice as model organisms.

We are particularly interested to understand cognitive impairment associated with normal aging as well as the pathogenesis of mental and neurodegenerative diseases, such as anxiety disorders and Alzheimer's disease.

Using animal models we deeply aim to identify therapeutic strategies that would help to reinstate neuroplasticity, learning behavior and the retrieval of lost long-term memories in patients suffering form such devastating diseases.

Selected Recent Publications


Alexander Flügel

Professor, Neuroimmunology

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

Major Research Interests

- Neuroimmunology
- T cell biology
- Intravital imaging

The focus of my interest lies on the mechanisms and factors that allow T cells to enter the central nervous system, to communicate in this milieu and to influence the brain tissue.

My colleagues and I pursue the following aims, i) development of new models and tools to study CNS autoimmunity; ii) revealing the basics of pathogenesis in (auto-)immune diseases of the nervous system; iii) deducing and developing new therapeutical approaches; and iv) analyzing the mechanisms of action for (adverse) effects of new therapeutical procedures.

Selected Recent Publications


Jens Frahm

Director, Biomedizinische NMR Forschungs GmbH (not-for-profit) at the Max Planck Institute for Biophysical Chemistry

- 1974 Diploma in Physics, Univ. of Göttingen
- 1977 Doctorate in Physical Chemistry, Univ. of Göttingen
- 1977 – 1982 Postdoctoral Researcher, MPI for Biophysical Chemistry
- since 1993 Director, Biomedizinische NMR Forschungs GmbH (not-for-profit, based on group's patents)
- 1994 Habilitation, Faculty of Chemistry, Univ. of Göttingen
- since 1997 Adjunct Professor, Faculty of Chemistry, Univ. of Göttingen
- since 2011 External Scientific Member, MPI for Dynamic and Self-Organization

Major Research Interests

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

Selected Recent Publications


Tim Friede

Professor of Biostatistics

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

Major Research Interests

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

Selected Recent Publications


Eberhard Fuchs

Professor of Neurobiology

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

Major Research Interests

The Clinical Neurobiology Laboratory (CNL) at the German Primate Center is an interdisciplinary research laboratory using neuroanatomical, neuropharmacological, behavioral and molecular techniques to investigate functioning of the brain in animal models of psychiatric and neurodegenerative diseases. The aim of our work is to elucidate brain structures, circuits, pathways and mechanisms that underlie normal and pathological behavior. This work integrates inputs from other research fields with the ultimate aim of developing new therapeutic strategies for psychiatric and neurodegenerative diseases.

The laboratory specializes in the development, validation and investigation of animal models to detect abnormal cognitive, motor and emotional expressions of brain pathology. Currently, we are engaged in the investigation of central nervous and behavioral phenomena associated with stress and depression. In addition, we provide service platforms to study Parkinson's disease and multiple sclerosis.

Selected Recent Publications


Theo Geisel

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

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

Major Research Interests

How do the myriads of neurons in our cortex cooperate when we perceive an object or perform another task? How do they self-organize in the preceding learning process? Questions like these address the complex dynamics of spatially extended and multicomponent nonlinear systems, which still reserve many surprises. In networks of sufficiently many spiking neurons e.g. we find unstable attractors, a phenomenon which would neither have been guessed nor understood without mathematical modelling and which many physicists consider an oxymoron. They can provide a neuronal network with a high degree of flexibility to adapt to permanently changing tasks. The tools and mathematical methods developed in studies of chaotic behaviour in the past can now help us clarify the dynamics and function of complex networks and spatially extended systems and reveal the biological role of dynamical phenomena like unstable attractors.

These methods lend themselves to applications in neuroscience from the level of single cells to the level of cell assemblies and large cortical networks, from the time scales of action potentials (milliseconds) to the time scales of learning and long-term memory (up to years). My work in the past has dealt among others with studies of stochastic resonance of single neurons under periodic and endogenous stimulation, detailed investigations of the properties, functions, and conditions of neuronal synchronization, and the development of neuronal maps in the visual cortex. We have elucidated the influence of the network topology on synchronization and other dynamical properties and demonstrated the existence of speed limits to network synchronization due to disordered connectivity. Besides, I am also focusing on other applications of nonlinear dynamics, e.g. for quantum chaos in semiconductor nanostructures and in mathematical models for the description and forecast of the spread of epidemics.

Selected Recent Publications


Martin Göpfert

Professor for Cellular Neurobiology

- 2008 Full Professor for Cellular Neurobiology, University of Göttingen
- 2008 Associate Professor for Molecular Biology and Biophysics of Sensory Systems, University of Cologne
- 2002 – 2003 Royal Society University Research Fellow, School of Biological Sciences, University of Bristol
- 1998 – 2002 DAAD and Leopoldina Research Fellow, Dept. Neurobiology, University of Zürich and School of Biological Sciences, University of Bristol
- 1998 Degree in Biology, University of Erlangen-Nürnberg

Major Research Interests

Our group studies fundamental processes in hearing. By combining mechanical measurements with genetics, molecular biology, immunohistochemistry, electrophysiology, calcium imaging, and biophysical modelling, we are trying to decipher how molecular processes shape the performance of an ear. Our preferred model system is the hearing organ of the fruit fly Drosophila melanogaster, the auditory sensory cells of which share conserved molecular modules with the hair cells in our ears.

Our work has uncovered striking parallels between fly and vertebrate hearing, including the functional equivalence of the auditory transduction and adaptation machineries, the motility of auditory sensory cells, transducer-based force generation, and the expression of homologous genes. Our work also provided first insights into the diverse roles of – and interactions between – transient receptor potential (TRP) ion channels in hearing, and a model of TRP-function in the fly’s auditory system has been devised. Using a novel electrostatic actuation method, we were able to identify hair cell-like signatures of transducer gating and adaptation in the fly’s auditory mechanics and could show that a simple transduction model as proposed to describe hair cell mechanics comprehensively explains the macroscopic behaviour of an ear. Based on these findings, we are currently devising a computational model that allows for the high-throughput characterization of genetic hearing defects. Candidate genes for hearing, in turn, are narrowed down by expression profiling using whole-genome microarrays. By testing how these genes contribute to auditory function and performance, we aim for a comprehensive molecules-to-system description of the functional workings of an ear.

Selected Recent Publications


Robert Gütig

Max Planck Research Group Leader

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

Major Research Interests

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

Selected Recent Publications


Uwe-Karsten Hanisch

Professor for Experimental Neurobiology

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

Major Research Interests

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

Selected Recent Publications


Ralf Heinrich

Juniorprofessor of Molecular Neuropharmacology of Behavior

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

Major Research Interests

Behavior is the product of complex interactions between various types of neurons that integrate external sensory information with internal physiological states. Motivational systems in general bias an organism to perform most useful actions to secure survival and reproduction by influencing the initiation, intensity, direction and persistence of behaviors. Our lab is especially interested in central nervous and humoral mechanisms underlying the selection and adaptation of actions that are most appropriate for the particular situation an animal encounters. We study the neurochemical mechanisms underlying motivational states in behavior with a combination of neuroethological, pharmacological, electrophysiological, histochemical and immunocytochemical methods and apply these to intact animals, reduced preparations and cultured cells of various invertebrate species.

Our research interests include questions on the evolution of pharmacological signals, central nervous and humoral systems and sensory organs by comparison of various invertebrate and vertebrate species. Since invertebrates offer unique advantages over more complex nervous systems of vertebrates and especially mammals (e.g. a smaller number of neurons in the central nervous system, individually identifiable neurons and rather limited repertoires of behaviors), we select the most suitable and experimentally accessible preparation from various phylogenetic groups including insects (locusts, grasshoppers, fruit flies), crustaceans (marbled crayfish) and annelids (medicinal leech).

Selected Recent Publications


Stefan Hell

Professor, Director at the Max Planck Institute for Biophysical Chemistry

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

Major Research Interests

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

Selected Recent Publications


Michael Hörner

Professor of Cellular Neurobiology

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

Research Interests

Molecular Mechanisms Of Synaptic And Non-Synaptic Modulation

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

Selected Recent Publications


Swen Hützmann

Privatdozent, Department of Neurophysiology

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

Major Research Interests

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

Selected Recent Publications


Reinhard Jahn

Professor, Director at the Max Planck Institute for Biophysical Chemistry

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

Major Research Interests

Our group is interested in the mechanisms of membrane fusion, with the main emphasis on regulated exocytosis in neurons. Intracellular membrane fusion events are mediated by a set of conserved membrane proteins, termed SNAREs. For fusion to occur, complementary sets of SNAREs need to be present on both of the fusing membranes, which then assemble in a zipper-like fashion to initiate membrane merger. The neuronal SNAREs are among the best characterized. They are the targets of the toxins responsible for botulism and tetanus, and they are regulated by several additional proteins including synaptotagmin, the calcium sensor for neurotransmitter release. To understand how these proteins mediate fusion, we study their properties in vitro with biochemical and biophysical approaches using native and artificial membranes.

In a second set of projects, we use modern techniques such as quantitative proteomics to better understand supramolecular protein complexes involved in synaptic function. Using our quantitative description of synaptic vesicles as point of departure we aim at unraveling presynaptic protein networks involved in synaptic vesicle docking and fusion. Furthermore, we are studying regulation of presynaptic function by small GTPases and by protein phosphorylation.

Selected Recent Publications


Hubertus Jarry

Professor of Clinical and Experimental Endocrinology

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

Major Research Interests

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

Selected Recent Publications


Siegrid Löwel

Professor of Systems Neuroscience

- Prof. of Systems Neuroscience, BFNT and Johann-Friedrich-Blumenbach Institute for Zoology and Anthropology, Georg-August-Universität Göttingen, since 2010
- Professor of Neurobiology, Friedrich-Schiller-Universität Jena, 2005 – 2010
- Scholarship in the Hertie-Excellency Program “Neurosciences” (www.ghst.de), 2004 - 2005
- Associate Research Physiologist/Research Associate Professor, School of Medicine, Dept. Physiology, University of California in San Francisco, USA, 2002 – 2003
- Research Assistant, Dept. Neurophysiology (Prof. Dr. Wolf Singer), Max-Planck-Institut für Hirnforschung, Frankfurt am Main, 1990 – 1997
- Dr. phil. nat. (Ph.D.), 1988, Johann-Wolfgang-Goethe-Universität Frankfurt am Main

Major Research Interests

The Löwel lab is focussed on understanding the development and plasticity of neuronal circuits in the mammalian cortex. We use a combination of techniques, including optical imaging, electrophysiology and neuroanatomy to explore how experience and learning influence the structure and function of nerve cell networks and how activity patterns and genetic factors influence these processes. 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 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). We also provided evidence that these connections play a major role for context-dependent effects in visual perception (Crook et al., 2002, Exp. Brain Res. 143: 295-302; Schmidt et al., 1997, Europ. J. Neurosci. 5: 1083-1089). We were also the first to demonstrate a major effect of genetic factors on the layout of cortical maps (Kaschube et al., 2002, J. Neurosci. 22: 7206-7217) and provided evidence that long-range connections between neurons coordinate the development of different brain regions and even of the two brain hemispheres (Kaschube et al., 2009, PNAS 106: 17205-17210). Recently, we helped to establish optical imaging of intrinsic signals as a screening tool for cortical plasticity in mice (Cang et al., 2005, Vis. Neurosci. 685-691) and started characterizing various mutant mice (e.g. Goetze et al., 2010, Thygarajan et al., 2010).

Selected Recent Publications


Till Marquardt

Group Leader Developmental Neurobiology Laboratory

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

Major Research Interests

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

Selected Recent Publications


Ira Milosevic

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

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

Selected Recent Publications
Tobias Moser

Professor of Experimental and Clinical Audiology

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

Major Research Interests

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

Selected Recent Publications


Klaus-Armin Nave

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

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

Major Research Interests

We are interested in the mechanisms of neuron-glia interactions in the higher nervous system, and in the genes that are required for normal glial cell function. Here, transgenic and mutant mice have become important to study developmental processes as well as genetic diseases. For example, oligodendrocytes are glial cells highly specialized for enwrapping CNS axons with multiple layers of membranes, known to provide electrical insulation for rapid impulse propagation. We found that oligodendrocytes are also essential for maintaining the long-term integrity of myelinated axons, independent of the myelin function itself. The mechanisms by which oligodendrocytes support long-term axonal survival are still under investigation. The importance of glial cells as the “first line of neuroprotection”, however, is illustrated by several myelin-associated diseases in which axonal neurodegeneration contributes to progressive disability. These range in humans from peripheral neuropathies (CMT1) to spastic paraplegia (SPG2), and presumably multiple sclerosis (MS) and certain forms of psychiatric disorders. We are developing transgenic animal models for some of these diseases, in order to dissect the underlying disease mechanisms and, in the case of CMT1A, have used these models to design novel therapeutic strategies.

The glial “decision” to myelinate an axonal segment is partly controlled by the axon itself, but the signaling mechanism is not understood. We have found that axonal neuregulin-1 (NRG1) is the major determinant of myelination in the peripheral nervous system. We are now investigating NRG1 dysregulation also in CNS myelination, using quantifiable behavioural functions in mice. By combining genetics with environmental risk factors for schizophrenia (in collaboration with H. Ehrenreich) we will explore the hypothesis that NRG1, a known human schizophrenia susceptibility gene, points to an important role of myelinating glia in some psychiatric disorders.

Selected Recent Publications


Luis A. Pardo

Group Leader, Max Planck Institute for Experimental Medicine

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

Major Research Interests

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

We also try to understand the mechanisms underlying the role of ion channels in tumors, regarding both permeation properties as well as non-canonical functions.

Selected Recent Publications


Walter Paulus

Professor of Clinical Neurophysiology

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

Major Research Interests

We intend to understand and modulate cortical plasticity in man. This is mainly done on a behavioural, imaging and electrophysiological level. We use (motor) learning paradigms, evaluate them by behavioural techniques and by recording EMG; EEG or fMRI data in the context with connectivity analyses. We develop and/or apply stimulation techniques such as repetitive transcranial magnetic stimulation (rTMS), transcranial direct current stimulation, alternating current stimulation or random noise stimulation (tDCS, tACS, tRNS). TMS induces a short electric current in the human brain. Both rTMS and electric stimulation techniques offer the prospect of inducing LTD and LTP like effects in the human brain. Diseases in our focus are Parkinson’s disease, epilepsy, migraine, stroke and dystonia.

The Department of Clinical Neurophysiology pursues other research areas such as Neurorehabilitation in conjunction with the Bernstein Centre of Computational Neuroscience and with the Company Otto Bock. Another focus concerns Hereditary Neuropathies in collaboration with the MPI for Experimental Medicine, speech disorders with a focus on stuttering and others (overview researcher ID A-3544-2009).

Selected Recent Publications


Diethelm W. Richter

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

Major Research Interests

Neurotransmitters, neuromodulators, and peptide hormones are known to activate metabotropic receptor proteins that control ion channels or second messenger cascades. These receptors regulate an intracellular network of interacting signal transduction pathways by means of G-proteins. Thus, receptors transmit extracellular signals to intracellular proteins and other chemical factors. These signals are normally not transduced in a stereotype manner, but they are integrated in a space- and time-dependent manner, resulting in highly dynamic and variable cellular responses. The specific nature of the cellular response depends on individual cell types that may differ in the expression pattern of receptor subtypes or of intracellular signaling factors. Our research group concentrates on the spatial organization of various subtypes of serotonin receptors and targets an understanding of the highly localized regulation of molecular interactions occurring simultaneously at many sites of a neuron. The goal is to achieve a refined understanding of the parallel signal processing within networks of chemical signal pathways and to clarify their effects on the properties of the neuron as a whole.

Another task addressing complex brain functions is to transfer this knowledge about molecular signaling within cells to the integrated function of neuronal networks. The problem is that modulation of network systems cannot be predicted simply on the basis of cellular reactions, because subgroups of diversely wired neurons mostly express heterogeneous receptor profiles.

Selected Recent Publications


Silvio O. Rizzoli

Group Leader STED Microscopy of Synaptic Function

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

Major Research Interests

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

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

Selected Recent Publications


*equal contribution
Moritz Rossner

Group Leader, Gene Expression

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

Major Research Interests

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

Selected Recent Publications


Detlev Schild

Professor of Physiology

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

Major Research Interests

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

Using a combination of electrophysiological techniques, single molecule detection, photochemical and high resolution imaging techniques as well as computational and modeling methods, we are studying the biophysical and physico-chemical details of:
- the primary coding processes,
- the synaptic transmission in glomerula
- the generation of the neuronal chemotopic map as well as
- the processes and mechanism of odor learning and memory.

Selected Recent Publications


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 (Germany)
- Dr. rer. nat. (PhD) 2000, University of Hannover
- Dr. med. (Medical thesis), University of Göttingen
- 2002 – 2006 Postdoc with Robert C. Malenka at Stanford University Medical Center (USA)
- Independent group leader (Emmy-Noether/DFG) at the European Neuroscience Institute Göttingen (ENI-G), since 2006

Major Research Interests

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

Selected Recent Publications


Manuela Schmidt

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

Major Research Interests

The perception of and appropriate reaction to external and internal stimuli is critical for survival. In vertebrates, chemical, mechanical (from pleasant touch to painful contact) and thermal stimuli are detected by specialized somatic sensory neurons which transfer these signals via the spinal cord to the brain. An important subset of these neurons, so-called nociceptors, senses noxious stimuli. Consequently, their activation mediates nociception and leads to the sensation of pain. Pain is the single most common symptom for which patients seek medical assistance. While acute pain has served as a protective mechanism throughout evolution to guard the body against injury, pain can also become chronic and highly debilitating. Unfortunately, chronic pain imposes substantial challenges to medical practice: current therapies can be effective for short-term treatment however many do not provide sufficient relief to chronic conditions or cause strong side-effects. Therefore, a deeper understanding of the molecular mechanisms underlying both, acute and chronic pain is crucially needed.

Our research focuses on the comparative and quantitative analysis of somatosensory signaling networks in established mouse models of acute and chronic pain. To this purpose our lab employs interactomics, genetic profiling, calcium-imaging, electrophysiology, neuronal tracing and mouse behavioral studies in order to address key questions:

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

Selected Recent Publications


Michael Sereda

Major Research Interests

Tetraspan myelin proteins play an important role in CNS and PNS myelination. We have generated a transgenic rat model of the most frequent human neuropathy, Charcot-Marie-Tooth disease type 1A (CMT1A). This disease is associated with a partial duplication of chromosome 17 and we have proven experimentally that the underlying cause is overexpression of the PMP22 gene. Transgenic rats expressing additional copies of this gene share characteristic clinical features of the human disease, including muscle weakness, reduced nerve conduction velocities, and marked Schwann cell hypertrophy resulting in onion bulb formation. PMP22 overexpression may result in defects of intracellular protein trafficking. The rat model allows to address the molecular pathology of CMT1A in more detail than previously possible with human biopsy material. We are specifically interested in the ultrastructural analysis of presymptomatic Schwann cells at early disease stages. Moreover, we are applying the tools of biochemistry and radioactive labeling of protein synthesis (ex vivo) to study the kinetics of myelination and intracellular protein sorting.

When bred to homozygosity, PMP22 transgenic rats completely fail to elaborate myelin and Schwann cells appear to be developmentally arrested at the “promyelin” stage. However, all myelin genes which mark the mature Schwann cell phenotype are normally expressed. Thus, a several-fold PMP22 overexpression causes a novel uncoupling of the molecular and morphological parameters of Schwann cell differentiation.

Steroid hormones have recently been identified as coregulators of Schwann cell function and peripheral myelination. Progesterone increases the expression of PMP22 in Schwann cell cultures and in the peripheral nervous system in vivo. In an attempt to lower PMP22 overexpression, we applied the progesterone receptor antagonist Onapristone to CMT-rats. Daily administration of progesterone elevated the steady-state levels of Pmp22 and Mpz mRNA in the sciatic nerve, resulting in enhanced Schwann cell pathology and a more progressive clinical neuropathy. In contrast, administration of the selective progesterone receptor antagonist reduced overexpression of Pmp22 and improved the CMT phenotype, without obvious side effects, in wild-type or transgenic rats. Taken together, these data provide proof of principle that the progesterone receptor of myelin-forming Schwann cells is a promising pharmacological target for therapy of CMT-1A. We are currently planning follow-up studies to pave the way to clinical application.

In summary, the CMT rat allows a better understanding of the cellular disease mechanism operating in human CMT1A, and should be helpful in the analysis of modifier genes, epigenetic factors, and in the evaluation of experimental treatment strategies.

Selected Recent Publications


Mikael Simons

Group Leader of Centre for Biochemistry and Molecular Cell Biology

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

Major Research Interests

Mechanisms of myelin biogenesis and repair

The myelin sheath is one of the most abundant membrane structures in the vertebrate nervous system. It is formed by the spiral wrapping of glial plasma membrane extensions around the axons, followed by the extrusion of cytoplasm and the compaction of the stacked membrane bilayers. These tightly packed membrane stacks provide electrical insulation around the axons and maximize their conduction velocity. Axonal insulation by myelin not only facilitates rapid nerve conduction but also regulates axonal transport and protects against axonal degeneration. Damage to the myelin sheath, as it for example occurs in multiple sclerosis (MS) results therefore in severe neurological disability also as a result of neurodegeneration. Our main goal is to come up with new approaches of how to promote remyelination in demyelinating diseases such as MS. To realize this goal we need to understand how myelin is formed during normal development.

Selected Recent Publications


Jochen Staiger

Professor of Neuroanatomy

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

Major Research Interests

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

Selected Recent Publications


Judith Stegmüller

Group Leader, Cellular and Molecular Neurobiology

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

Major Research Interests

Growing evidence implicates intrinsic mechanisms such as the ubiquitin proteasome systems (UPS) in brain development and disease. Our focus lies on the role of the UPS in axon growth and regeneration. We are particularly interested how E3 ubiquitin ligases regulate these processes. To further enhance our understanding of the UPS in the central nervous system, we are also seeking to identify novel brain-specific E3 ligases and to determine their role in various aspects of neuronal development.

To address these research objectives, we apply molecular and cell biological and biochemical techniques. We also use mouse models to gain comprehensive insight into the ligases of interest and to complement in vitro studies with meaningful in vivo experiments.

Selected Recent Publications

Nicole von Steinbüchel-Rheinwall

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

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

Major Research Interests

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

Medical Sociology
- Assessment of the Consequences of Technology in Medicine
- Professionalisation

Selected Recent Publications


Anastassia Stoykova

Privatdozentin, Developmental Biology, Max Planck Institute for Biophysical Chemistry

- 1973 – 1988 Research Associate, Bulgarian Academy of Sciences, Sofia
- 1987 PhD, Institute Molecular Biology, Bulg. Acad. Sci., Sofia
- 1989 Habilitation (neurochemistry), Sofia
- 1989 Habilitation (developmental biology), Faculty of Medicine, University Göttingen
- since 2008 Independent Research Group Leader MPI-bpc (W2, MPG Minerva Program)
- since 2010 Adj. Professor at the University of Göttingen

Major Research Interests

Composed of six cellular layers, the mammalian neocortex is a modular structure with many functional areas in which the neurons have specific morphology, number, connections and unique physiological properties. Our group is interested in understanding the molecular and cellular mechanisms involved in specification of the immense diversity of the cortical neurons in order to be generated in a correct time, number and place during development. We have recently identified sets of genes with a differential expression between distinct domains and layers of the embryonic mouse cortex. To study the function of selected candidates in the transcriptional control of neurogenesis, we combine approaches for targeted gene inactivation or gene activation in transgenic mice using the conventional and conditional knock-out strategies with biochemical, morphological, gene expression, tissue culture methods and techniques for gene transfer in isolated brain or living mouse embryos.

With one gene, the transcription factor Pax6, we are further ahead in understanding its function. Pax6 is a critical gene for neocortical development, endowing the pluripotent radial glial progenitors with neurogenic ability and controlling the cortical patterning, including layer and area formation. Our current research focuses in unraveling genetic mechanisms by which Pax6 regulates these developmental processes with a special emphasis on its role in the control of neuronal subtype identity. We address these questions by studying the function of genes recently identified by us to act as Pax6 targets or Pax6 protein partners controlling its neurogenic function. We further aim to get insight into Pax6 dependent mechanisms involved in generation of stem/progenitors cells and their regenerative properties in neurogenic zones of the adult brain.

Selected Recent Publications


Walter Stühmer

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

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

Major Research Interests

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

Selected Recent Publications


Stefan Treue

**Professor, Director of the German Primate Center**

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

**Major Research Interests**

Research at the Cognitive Neuroscience Laboratory is aimed at understanding the neural basis of visual perception. Vision is an active process that is far more than a passive registration of our environment. Rather, on its way from the eyes to and through the cortex, visual information is modulated by numerous processes that enhance some aspects while diminishing others. One of these processes is attention, i.e. the ability to filter out unwanted information and concentrate the brain’s processing abilities on relevant information.

The accurate representation of visual motion in the environment is one of the most important tasks of the visual system. Correspondingly, research in the laboratory concentrates on this ability as a model for sensory information processing in general.

We use various techniques. While our emphasis is on electrophysiology, i.e. the recording of the activity of neurons in the visual cortex of macaque monkeys and measuring human perceptual abilities with psychophysical methods, we also use theoretical approaches and functional brain imaging.

Using these techniques, we have been able to elucidate how motion information is represented in primate cortical area MT and how attention changes that representation and correspondingly the percept of the visual environment.

**Selected Recent Publications**


Andreas Wodarz

Professor of Stem Cell Biology

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

Major Research Interests

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

Selected Recent Publications


Fred Wolf

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

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

Major Research Interests

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

The brains of humans and animals arguably are among the most complex systems in nature. Over the past decade, theoretical neuroscience - the use of quantitative theories, mathematical modelling and advanced quantitative data analysis methods for the study of brain function - has started to provide powerful new approaches for understanding the neuronal basis of perception, 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-organization in the dynamics of cortical networks. In particular, we have developed novel approaches to model and predict the dynamics 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


Fred Wouters

Professor, Laboratory for Molecular and Cellular Systems

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

Major Research Interests

The focus of our research is the regulation and role of the neuronal cytoskeleton in the modulation of neuronal shape and motility during chemotactic processes. The growing neuronal growth cone probes its environment for the chemical composition of its substrate and the presence of neighbouring cells. The former information is sampled by cell adhesion receptors in focal adhesion structures that, next to their sensing function also perform a structural function in that they provide the cell with a means to exert force on its substrate. We are primarily interested in the signal transduction processes that regulate these effects and the cross-talk between the different motility systems.

The main interest areas in this question are; 1. The role and molecular mechanism of lipid raft-resident cell adhesion molecules in the remodelling of the membrane cytoskeleton, 2. Dynamic control of growth cone protein content by local proteolysis and chaperone function during chemotactic responses, 3. Role and mechanism of the neuronal exocyst complex as critical landmarks for dendritic/axonal neuritogenesis.

Our group has a related interest in the pathophysiological mechanism of neurodegeneration by intracellular aggregation of the tau protein, as occurs in Alzheimer’s disease. As tau is an intrinsically unstructured protein that can undergo remarkable conformational changes upon binding to microtubules and in the Alzheimer-related aggregation condition, it presents an ideal model system for the biophysical analysis of protein conformational change and protein interactions. Our research depends on the development and application of advanced microscopy techniques, primarily; fluorescence lifetime imaging microscopy (FLIM), and Förster resonance energy transfer (FRET) microscopy, in combination with a range of GFP-based optical biosensors and novel bioconjugation approaches for organic dyes, and protein biochemical/molecular biological techniques to resolve and quantify biochemical reactions and conditions in living cells.

Selected Recent Publications


Graduate Program Committee
Prof. Dr. André Fiala
Prof. Dr. Ralf Heinrich
Prof. Dr. Michael Hörner
PD Dr. Swen Hülsmann
Prof. Dr. Gregor Eichele (Spokesperson IMPRS)
Dr. Silvio Rizzoli
Prof. Dr. Dr. Detlev Schild (Chair)
Dr. Judith Stegmüller
Prof. Dr. Fred Wouters
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