Neurizons 2007

Interdisciplinary Meeting on the Neurosciences

May 31st - June 2nd

Max Planck Institute
Experimental Medicine
Göttingen, Germany

Neurizons 2007

May 31st - June 2nd 2007
Göttingen, Germany

Design and Layout	Stephan Junek
Editors	Emilio Fischer Stephan Junek Felipe Opazo Alexandros Poulopoulos Gaston Sendin Kamila Sroka
Group Picture	Emilio Fischer
Cortical Neurons	Alexandros Poulopoulos, adopted by Stephan Junek
Drawings	Laura Weighardt (inside of front cover) Christian Müller (page 14) Saskia Spillner (page 19) Katharina Schwingel (page 21) Charlotte Heise (page 33) Carolin Vorrink (page 34-35) Antonia Uhde (inside of back cover) Joana Teichmann (back cover)
Print	Werbung und Druck, Göttingen
Poster Design	Stephan Junek
Webmaster	Felipe Opazo

Visit the Neurizons 2007 webpage:

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

Welcome

Welcome to Neurizons 2007!

About two years after the first Neurizons took place here in Göttingen, we are happy to welcome more than twice as many participants to this year's symposium on the neurosciences. We are excited that a long list of outstanding scientists has accepted our invitations to contribute to this meeting. Their talks will cover in five sessions a wide range of today's neuroscience topics and questions, from research on the single molecule level, to neural networks, cognitive and behavioural studies. We hope that you will enjoy these lectures and that you will get involved in lively discussions - after the lectures, during the breaks and the poster session. This is what this meeting is for!

But Neuroscience is not only neurotransmitter release and synchronized spikes, not only patch clamp and fMRI. The motivation of many, if not most, scientists to enter this field, originates from questions about who we are and why we are who we are. These questions have been at the centre of philosophical, religious and scientific debates since antiquity, and are thus questions common to probably every (conscious?) person. The increasing number of (neuro)scientists approaching such issues, as well as the recently evolving dialog between philosophers and scientists suggests that finally we might have tools that enable us to address specific aspects of consciousness on a neurobiological level.

We therefore decided to make consciousness and the scientific approach to its study a special topic of this year's Neurizons conference. A number of activities related to this topic will complement the lectures of this meeting.

The symposium will open with a keynote lecture by Semir Zeki on 'The disunity of consciousness'. On Friday evening, we are thrilled to welcome philosopher John R. Searle, to introduce and lead a round table discussion on 'Scientific approaches to the study of consciousness' with some of our invited speakers, and (hopefully all of) you. On Thursday and Saturday we invite you to watch movies that show aspects of consciousness and memory from a more artistic point of view. Finally, we will see how very young artists, school children from the age of 10 to 18 years, perceive and relate to the idea of consciousness in the Neurizons Art Expo. Some examples of their artwork can be found throughout this book.

We hope that you will enjoy all these activities and wish you a pleasant and memorable stay in Göttingen.

The Neurizons 2007 Organizing Committee

Table of Contents

Program Overview

Thursday, 31st of May

12:00 Registration
14:30 Opening Ceremony

Keynot Lecture
15:00 Semir Zeki
The disunity of consciousness

Sensory Systems and Neuronal Networks
16:00 Pierre-Marie Lledo
Wiring newborn neurons with old circuit: what for?
16:45 Emilio Salinas
How behavioral constraints may determine optimal sensory tuning curves
17:30 Coffee Break
18:00 Thomas Euler
Dendritic processing in the retina
18:45 Alain Destexhe
Computing with complex dynamics in cerebral cortex: experiments and modeling

19:30 Buffet
22:00 Movie Night in Cinema *Lumière*
The Eternal Sunshine of the Spotless Mind

Friday, 1st of June

Establishment and Dynamics of Neural Connectivity
9:00 Dietmar Schmucker
Developmental control of synaptic connectivity
9:45 Peter Scheiffele
Signaling and cell adhesion complexes in neuronal network formation
10:30 Coffee Break
11:00 Valentin Nägerl
Rules and Correlates of Synaptic Plasticity
11:45 Pico Caroni
Sustained rearrangements of hippocampal microcircuits in the adult

12:30 Lunch
13:30 Poster Session
14:45 Information Session
Management training for researchers

Large Neuronal Assemblies and Cognition

15:00 Amiram Grinvald
The dynamics of evoked and ongoing activity in the awake monkey
15:45 Andreas Nieder
Coding of quantity information in the primate cortex
16:30 Coffee Break
17:00 Miguel Nicolelis
Title to be annouced
17:45 Pascal Fries
Neuronal communication through neuronal coherence: A putative mechanism behind selective attention
18:30 Wine and Cheese

Perspectives on the Study of Consciouness

20:00 Symposium and Roundtable Discussion
Introduction and Moderation: John R. Searle

Saturday, 2nd of June

Synaptic Structure and Function

9:00 Reinhard Jahn
Neurotransmitter release - a tale of vesicles and SNAREs
9:45 Venkatesh Murthy
Insights from real-time optical imaging of synaptic vesicle recycling
10:30 Coffee Break
11:00 Harvey McMahon
Understanding pathways of endocytosis and exocytosis
11:45 Peter Jonas
The GABAergic interneuron in the network
12:30 Lunch

Mechanisms of Neuronal Dysfunction and Neuroprotection

14:00 Giles Hardingham
Pro-survival signalling from the NMDA receptor
14:45 Konrad Beyreuther
Physiological and pathogenic function of genes involved in Alzheimer disease
15:30 Patrik Brundin
Huntington's disease: more complex than we thought!

18:00 Movie Night in MPI for Experimental Medicine
Das weiße Rauschen (German with english subtitles)
21:00 Party (Institute for Physiology)

Venue
Göttingen

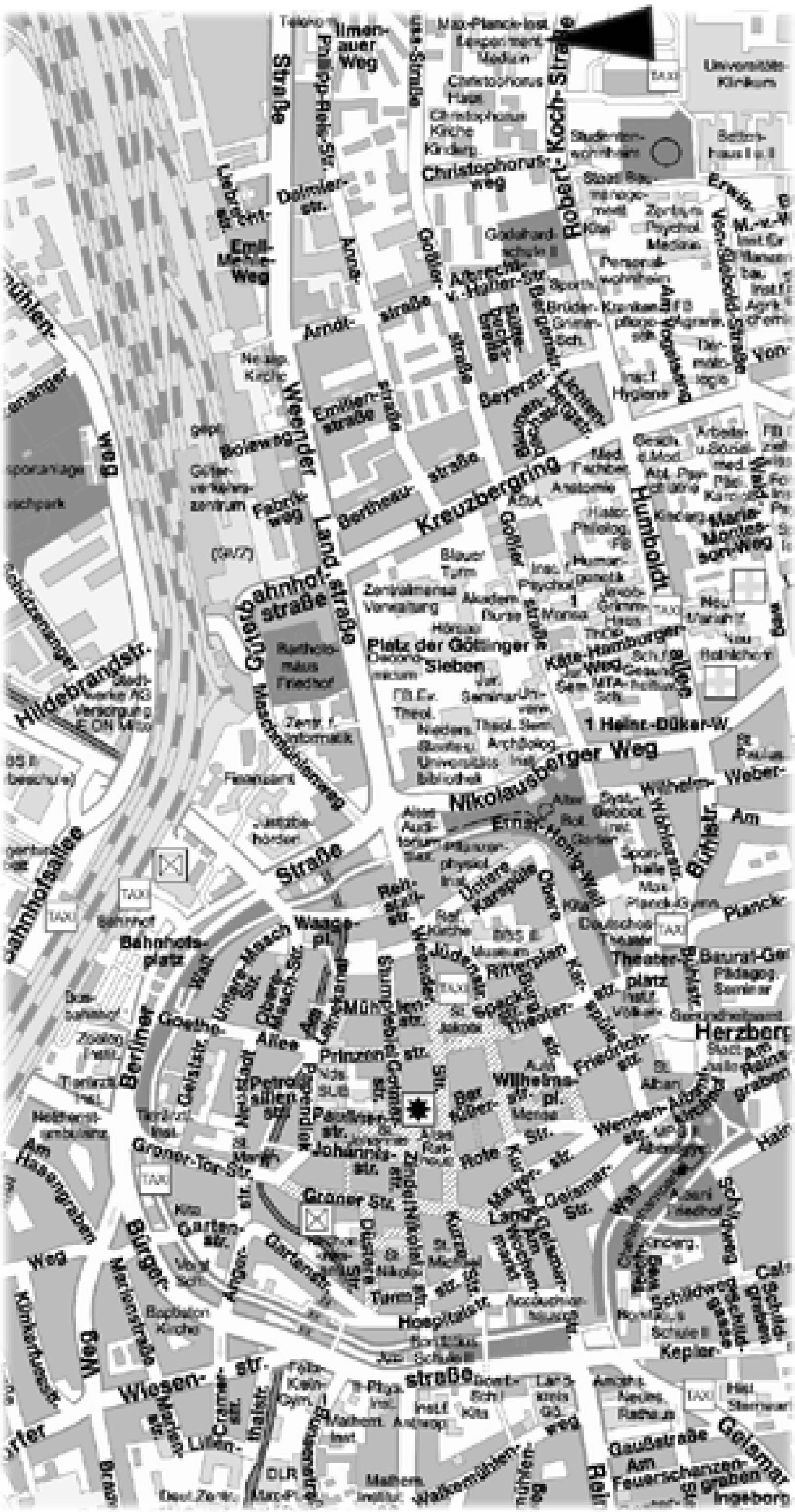
The origins of Göttingen, which is situated in the center of Germany as we know it today, go back to the 10th century. During the middle ages, the village of Gutingi became a wealthy town, due to its membership in the Hanseatic League.

Today Göttingen is mainly renowned for its old University Georgia Augusta, founded in 1737, and its subsequent tradition in scientific research. The list of famous people that were connected in one way or another to Göttingen and its university is long (including 44 Nobel prize laureates). The most important example might be Carl Friedrich Gauss, who spend almost his entire life in this city as a student, Professor for Astronomy and Director of the Observatory. Further scientists affiliated with the university include Max Planck, Wilhelm Weber, Werner Heisenberg, Max Born and Bernhard Riemann. In addition the famous Brothers Grimm held Professor positions and Otto von Bismarck was a student at this university. Not all of them were as loyal as Gauss, for which some people blame the weather to be responsible. During the times of the Third Reich, many of the greatest minds emigrated or were forced to leave, which almost destroyed the scientific community of the university.

Since the 1950s, the university has been rebuilt and Göttingen saw the foundation of the Max Planck Society within its walls, while it became home to four Max Planck Institutes, three of them currently involved in various fields of the Neurosciences. The recent years have seen a particular growth in scientific institutes and organisations, such as the European Neuroscience Institute, the German Primate Center and the Center for Molecular Physiology of the Brain. All these institutes form a unique network of scientific research on various levels, from molecular structures to behavioral research, from computational models to innovative experiments, from basic research to medical applications.

Today Göttingen is one of Germany's lively student cities, with a variety of inviting bars and cafes, a cozy Christmas Market and beautiful timbered houses. Being situated close to the Harz mountains in the center of Germany, it is both a popular destination for tourists and a good starting point for journeys for the Göttingen students.

City Map



from http://stadtplan.goettingen.de

General Information

City Transit

The most convenient way to the Göttingen city center from MPI Experimental Medicine is taking one of three possible bus lines. From the „Robert-Koch-Staße“ bus-stop (1), line 8 buses arrive at quarterly intervals at peak hours and every 30 minutes in the evening. Line 5 and 10 buses arrive at the „Theodor-Heuss-Straße“ (2) bus-stop at similar combined intervals. These stops are marked with black circles on the Göttingen transit map (next page).

While these buses all follow slightly different routes, they converge on the city center. Getting off at the „Markt“ bus-stop brings you just behind the Altes Rathaus (the old Town Hall) and the central square of the city. Lines 8 and 10 also continue on to the train station „Bahnhof“ which is the third stop after „Markt“.

The ride takes less than 15 minutes and the fare price is €1.70 for single tickets, while you can buy 4 tickets together for €5.40. These tickets are purchased directly from the bus driver and should be time-stamped on board. They can be used independently and are good for one hour within which round-trips are possible. Bus-stops are announced in the bus while detailed timetable information can be found at the bus stops.

To return to MPI Experimental Medicine, the same bus lines should be taken from the „Kornmarkt“ bus stop at the corner of Weender and Groner Staße and NOT from „Markt“ bus stop. Getting off at „Robert-Koch-Staße“ (1) for line 8 and „Theodor-Heuss-Straße“ (2) for line 5 and 10 leaves you at a five minute walking distance from the institute. The last bus leaves „Kornmarkt“ for the institute at 23:28.

Taxi services

You can request a taxi at any time from the reception desk in the institute. Fares to the city center or train station will be around €6. You may pick up a cab in front of the train station or behind the Altes Rathaus where they line up.

Posters

All posters are presented in a single poster session on Friday. Posters should be put up on the panels in the lobby of MPI Experimental Medicine before the session begins at 13:30. Poster numbering follows the page numbering of this abstracts book. Please find the panel with the number corresponding to the page your abstract appears in and put up your poster there.

Library and internet access

The Karl Thomas library, adjacent to the main lecture hall in MPI Experimental Medicine, has a collection of journals focusing on the neurosciences. There you will also find five online terminals that can be used. Wireless internet access is also available at the venue site.

Food

Your Neurizons 2007 registration covers basic meals for the duration of the meeting.

With your registration, you will be provided with two lunch vouchers that you can use for Friday and Saturday lunches in the cafeteria of the University hospital (Klinikum mensa) across the street from MPI Experimental Medicine (3). Entering the hospital building, you will find the cafeteria to your left.

On Thursday evening a dinner buffet and on Friday evening a wine and cheese buffet will be provided at the venue.

Depending on the weather, a grill will be set up at the Neurizons Party on Saturday night. The party will take place at the Institute for Physiology, Humboltallee 23.

For extra meals outside the conference, the „Best Western Hotel Am Papenberg“ situated adjacent to the MPI Experimental Medicine campus (4) houses an Italian cuisine restaurant. An asian cuisine restaurant and a Döner fast-food booth are a five-minute walk from the institute turning left at Gosler Straße (5). Other alternatives would involve going towards the city center.

Video projection of talks

All the talks featured in the Neurizons 2007 program will be video projected in the MPI Experimental Medicine cafeteria where 60-80 seats will be available.

Transit Map

Göttinger Verkehrsbetriebe GmbH

Venues

Products for

Illumination
Photolysis
Flash Excitation
FRAP
Deep UV Microscopy
... and more

Rapp OptoElectronic GmbH
+49 (0)40-81 13 30
www.rapp-opto.com
info@rapp-opto.com

Rapp OptoElectronic

Instrumentation for uncaging of Ca^{2+}, glutamate, GABA, IP3, ATP...

Spot release

Deep UV microscopy
* down to 220nm

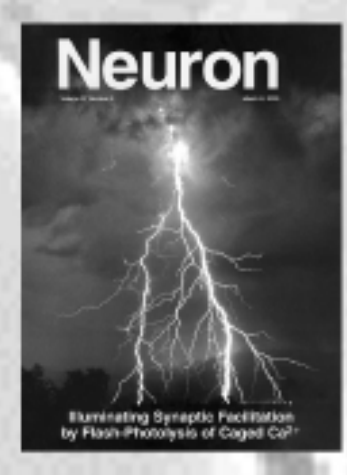
Lasers for all budgets
* continuous and pulsed lasers
* different wavelengths:
  266, 337, 355, 375,
  405, 473, 532 ... 1554nm
* turn-key systems
* fiber optic coupling

LED
* high power LEDs
* visible and UV light (365 nm)
* complete systems with
  microscope coupling

High speed scanner spot illumination
* mapping of neural networks
* computer controlled
* integration in existing set-up
* variable light sources

Experiments using equipment made by Rapp OptoElectronic:

Wölfel M, Lou X, Schneggenburger R (2007), **A Mechanism Intrinsic to the Vesicle Fusion Machinery Determines Fast and Slow Transmitter Release at a Large CNS Synapse**, J Neuroscience 27(12), 3198-3210



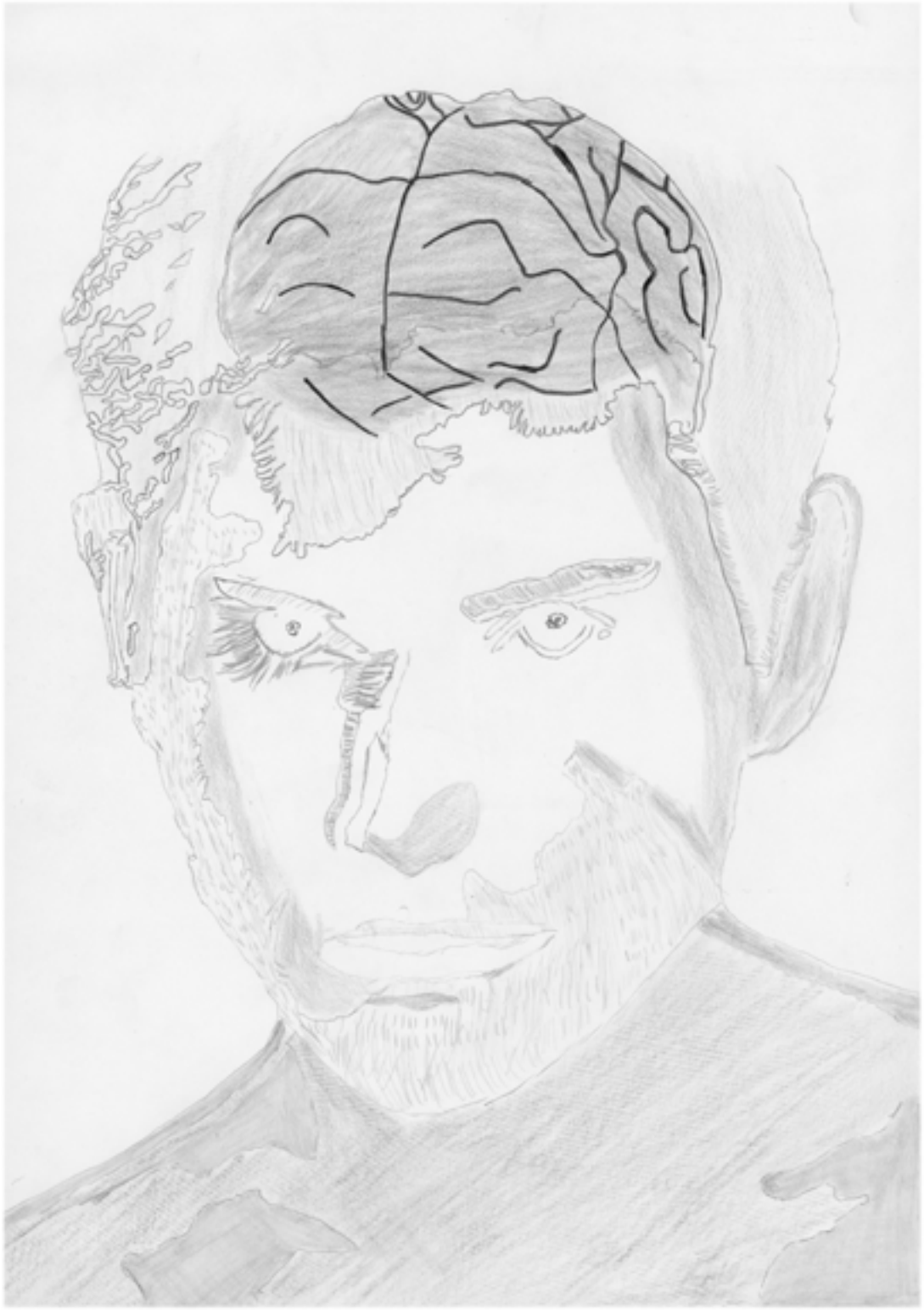
Wadel K, Neher E, Sakaba T (2007), **The Coupling between Synaptic Vesicles and Ca^{2+} Channels Determines Fast Neurotransmitter Release**, Neuron 53, 563-575

Boccaccio A, Lagostena L, Hagen V, Menini A (2006), **Fast Adaptation in Mouse Olfactory Sensory Neurons Does Not Require the Activity of Phosphodiesterase,** J. Gen. Physiol., Vol. 128, 171-184

Adesnik H, Nikoll RA, England PM (2005), **Photoinactivation of native AMPA receptors reveals their real-time trafficking**, Neuron, Vol 48, 977-985

Duguid IC, Smart TG (2004), **Retrograde activation of presynaptic NMDA receptors enhances GABA release at cerebellar interneuron-Purkinje cell synapses**, Nature Neuroscience, Vol. 7, 525-533

- for more references see www.rapp-opto.com -



Organizers

Neurizons 2007 is organized by a group of PhD students of the International Max Planck Research School for Neurosciences Göttingen.
From left to right: Alex Poulopoulos, Felipe Opazo, Kamila Sroka, Stephan Junek, Gaston Sendin, Emilio Erazo Fischer

The Organizers would like to thank the following collaborators. Without their valuable help and ideas this event would not be possible.

Amit Agarwal, Ioanna Bethani, Andreas Bock, Corinna Kalz, Cornelia Cohnert, Kerstin Mauth, Lucian Medrihan, Michael Hörner, Peter Goldmann, Sigrun Greber, Steffen Burkhard and Svea Dettmer.

Research School

The International Max Planck Research School for Neurosciences in Göttingen

The Max Planck Institutes for Biophysical Chemistry, for Experimental Medicine, for Dynamics and Self-Organization, the German Primate Center, the European Neuroscience Institute and the Georg August University of Göttingen cooperate in this International Max Planck Research School for Neurosciences, which is directly linked to the international Master/Ph.D/MD-Ph.D. program of Neurosciences at the University of Göttingen. Entering with a Bachelor's degree the students receive in the first year a practice-oriented training provided by involved laboratories and intensive instruction in small groups. The lectures, courses, and research projects deal with research in the fields of molecular and cellular neurophysiology, neurobiophysics, neuroanatomy, developmental neurobiology, neuropharmacology, neuroendocrinology, and clinical and behavioral neurosciences. In the first year individually supervised lab rotation projects complete the research-oriented program, resulting in a broad theoretical and practical training. A comprehensive examination at the end of the first year qualifies for a three-year Ph.D. project in one of the participating laboratories. Each student is supervised by a thesis committee consisting of three faculty members. The laboratory work is accompanied by seminars and methods courses including training of soft skills, elective courses and participation in international conferences and workshops.

The Master's degree courses in Neurosciences have obtained, in September 2006, the quality label „TOP 10 international Master's Degree Courses Made in Germany", awarded jointly by „Stiftverband für die Deutsche Wissenschaft" and German Academic Exchange Service (DAAD).

Sponsors

The Neurizons 2007 Symposium is financially supported by the following institutions through the International Max Planck Research School for Neuroscience:



The Neurizons 2007 Organizing Committee would like to thank the following sponsors for their support:

Consciousness

What is arguably the oldest and most fundamental of questions that neuroscience is called to address remains on the fringe of active research. Though the nature of consciousness and the relationship of the brain to the mind are hotly debated topics of discussion, researchers tend to avoid them, deterred by ambiguous definitions and gridlocking philosophical dogmata. The study of consciousness is this year´s Neurizons featured topic. The meeting will open with a keynote address by Semir Zeki on the „Disunity of Consciousness". The Friday night Symposium will bring together the speakers and attendees of Neurizons 2007 with philosopher John Searle in a round-table discussion to brain-storm on how researchers can provide framework to scientifically approach the study of consciousness. Finally we get a glimps of how school children perceive consciousness in the Neurizons Art Expo.

Keynote Lecture
Thursday, 31st of May, 15:00

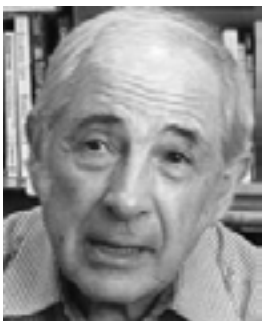
Semir Zeki

Wellcome Laboratory of Neurobiology
University College London, UK

The Disunity of Consciousness

The laboratory of Semir Zeki is devoted to the study of the visual brain, its organization and its functioning in health and in disease.
His team employs several techniques to answer these questions, spanning from anatomical studies to map the structure and connectivity, electrophysiology and electro-encephalography to study the way in which cells constituting the visual brain respond to visual stimuli, up to psychophysics, imaging and studies of patients with lesions, in order to analyse the perceptual capacities and limitations and the location and functioning of the many sub-systems in the visual brain.
More recently, his lab has used the information gained from the study of the brain over the past forty years to examine the relationship of visual art to the functioning of the visual brain, the field which he pioneered and that is referred to as neuroaesthetics.

Keynote Lecture & Round Table Discussion
Friday, 1st of June, 20:00



John R. Searle

University of California
Berkeley, CA, USA

Perspectives on the Study of Consciousness

Chair: Nils Brose

One of the most influential contemporary thinkers, John Searle has set a new framework in the philosophy of mind and in our understanding of artificial intelligence. His work, documented in nineteen books and over two-hundred scholarly articles, has produced concepts such as „the Chinese room argument“ and „Biological Naturalism“ that have been the devoted topics of conferences and have yielded countless awards and distinctions (including the Presidential Award in 2004). The latter concept provides a perspective on consciousness that stands as an alternative to Dualism and Materialism, in effect overcoming the Mind-Body Problem and allowing for the scientific study of consciousness.

Neurizons Art Exposition

Foyer of MPI for Experimental Medicine

We asked children of different age groups to draw a picture expressing what they imagined to be `Bewusstsein´ (consciousness). Students from 10 to 18 years old took part in this „experiment", which was developed during art class at the grammar school Gymnasium Corvinianum in Northeim, near Göttingen. „It was amazing to see how differently the children of the respective age groups approached the topic. Whereas the younger ones mainly understood consciousness in the sense of „awareness" in a certain situation (i.e. of an impending danger or concerning their own feelings), most of the older students pictured consciousness in a broader and more abstract way, including images of the human perception of the outside world via the senses as well as the brain itself. Moreover, the variety of the underlying personal point of view and experience expressed in all of the pictures makes the exposition so interesting", said Cornelia Cohnert, the directing art teacher. A selection of paintings will be exposed during the Neurizons 2007 conference in order to give another perspective on the study of consciousness.

Neurizons Movie Nights

Das weiße Rauschen

Saturday, 2nd of May, MPI Exp. Medicine

Lukas doesn't know it yet, but he's descending into schizophrenia. The film chronicles his breakdown as he begins hearing whispers that grow more and more threatening, eventually telling him that Kati and Jochen find him disgusting and plan to kill him. The only thing that seems to soothe his psyche is the „white noise" of the water running in the shower. One day, in a panic, he jumps from the window of his room, and at the hospital, he and Kati get the terrible diagnosis. Lukas begins taking medication, gets a mundane job, and seems to be functioning fairly well. But despite Kati's best efforts, he can't maintain his sedated new life. He stops taking his medicine and runs off. (amazon.com)

Shown in German with English Subtitles.

The Eternal Sunshine of the Spotless Mind

Thursday, 31st of May, Lumière

This is the story of a guy, Joel, who discovers that his long-time girlfriend, Clementine, has undergone a psychiatrist's experimental procedure in which all of her memory of Joel is removed, after the couple has tried for years to get their relationship working fluidly. Frustrated by the idea of still being in love with a woman who doesn't remember their time together, Joel agrees to undergo the procedure as well, to erase his memories of Clementine. The film, which takes place mostly within Joel's mind, follows his memories of Clementine backwards in time as each recent memory is replaced, and the procedure then goes on to the previous one, which is likewise seen, and then erased. Once the process starts, however, Joel realizes he doesn't really want to forget Clementine, so he starts smuggling her away into parts of his memory where she doesn't belong which alters other things about his memories as well... (IMDB)

Single Electrode High Speed Voltage / Patch Clamp Amplifiers

SEC-10LX

New features of the famous SEC amplifier

- **VCcCC** option:
  Voltage **C**lamp **c**ontrolled **C**urrent **C**lamp
  Ref.: Sutor et al. (2003), Pflügers Arch. 446:133-141
- **DHC** option:
  Dynamic **H**ybrid **C**lamp
  Ref.: Dietrich et al. (2002), J.Neurosci.Meth. 116:55-63
- **MODULAR** option (**SEC-03M**):
  Versatility of Single Electrode Clamping in modular design for maximum flexibility
- **LINEAR VC** and **LINEAR VC x10** option:
  Highly reduced noise for measurements in the low pA range; allows macro and loose-patch recordings

Stimulus Isolators without Batteries and Bipolar Stimulus Generation

ISO-STIM 01D

npi
Electronic Instruments
for the Life Sciences
Experts in Microelectrode Techniques

ELC Series
The "Swiss Army Knife" for Electrophysiology

ELC-03X

Suitable for extracellular recordings with high gain, juxtasomal filling of dyes and DNA, intracellular recordings in CC or VC mode single cell stimulation and electroporation, amperometry and voltammetry, and iontophoresis

ELC-03M

Other npi electronic Instruments for Electrophysiology

- Two Electrode voltage clamp amplifiers
- Loose patch clamp amplifiers
- Temperature control systems
- Bridge-/Intracellular amplifiers
- Extracellular amplifiers
- Stimulus isolators
- Modular system
- Low pass Bessel filters
- Iontophoretic drug application systems
- Pneumatic drug application systems
- Data acquisition hard- and software
- Automatic chlorider
- **ALA Scientific** perfusion systems/accessories
- **Scientifica** micropositioning systems

npi electronic GmbH, Germany
Phone: +49-7141-9730230, Fax:+49-7141-9730240
www.npielectronic.com, support@npielectronic.com

Also represented by npi electronic

PCS-6000 Series

PCS-6000 series combines motorized coarse movement with proven, piezo-controlled fine positioning
Now also with computer control

EXFO burleigh
EXPERTISE REACHING OUT

The POWER of MICROPOSITIONING

PCS-5000/6000 Patch Clamp Micromanipulators
PCS-4100 Low-Cost Patch Clamp Micromanipulator
MIS-5000 Microinjection Micromanipulators
LSS-3000 Ultra Fast Solution Switching Systems
LSS-8000 Inchworm Microdrive
PiezoDrill Inertial Impact Drill
GIBRALTAR Platforms and X-Y Stages
X-Cite 120 Fluorescence Illumination

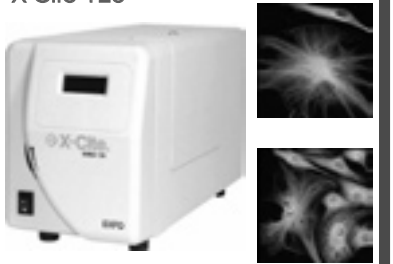
LSS-3000 Series

Ultra-fast positioning system for rapid solution exchange

GIBRALTAR Platform and Motorized X-Y Stage

Complete mounting solution for fixed stage, upright microscopes

X-Cite 120



X-Cite 120 ,the new standard in fluorescence illumination with pre-aligned Intelli-Lamp and 2000 hours lamp life

LSS-8000 Inchworm

LSS-8000 microelectrode positioner with high acceleration, long range and high stability for increased yields

Plenary Lectures

All sessions will be co-chaired by a senior chair and a student

Sensory Systems and Neuronal Networks

Senior chair: Fred Wolf

Pierre-Marie Lledo	Wiring newborn neurons with old circuit: What for?
Emilio Salinas	How behavioral constraints may determine optimal sensory tuning curves
Thomas Euler	Dendritic processing in the retina
Alain Destexhe	Computing with complex dynamics in cerebral cortex: Experiments and modeling

Establishment and Dynamics of Neural Connectivity

Senior chair: Nils Brose

Dietmar Schmucker	Developmental control of synaptic connectivity: Functional role and specificity of diverse surface receptors
Peter Scheiffele	Signaling and cell adhesion complexes in neuronal network formation
Valentin Nägerl	Rules and Correlates of Synaptic Plasticity
Pico Caroni	Sustained rearrangements of hippocampal microcircuits in the adult

Large Neuronal Assemblies and Cognition

Senior chair: t.b.a.

Amiram Grinvald	The dynamics of evoked and ongoing activity in the awake monkey
Andreas Nieder	Coding of quantity information in the primate cortex
Miguel Nicolelis	t.b.a
Pascal Fries	Neuronal communication through neuronal coherence: A putative mechanism behind selective attention

Synaptic Structure and Function

Senior chair: Sam Young

Reinhard Jahn	Neurotransmitter release - a tale of vesicles and SNAREs
Venkatesh Murthy	Insights from real-time optical imaging of synaptic vesicle recycling
Harvey McMahon	Sculpting Cell Membranes: Understanding pathways of endocytosis and exocytosis
Peter Jonas	The GABAergic interneuron in the network

Mechanisms of Neuronal Dysfunction and Neuroprotection

Senior chair: Björn Falkenburger

Giles Hardingham	Pro-survival signalling from the NMDA receptor
Konrad Beyreuther	Physiological and pathogenic function of genes involved in Alzheimer disease
Patrik Brundin	Huntington‘s disease: more complex than we thought!

Pierre-Marie Lledo

Institute Pasteur
Paris, France

Wiring newborn neurons with old circuit: What for?

Pierre-Marie Lledo received a PhD in Life Sciences from the University of Bordeaux after having studied Neurosciences and Pharmacology. In 1992, he joined the CNRS and is head of the "Perception and Memory" laboratory in the Pasteur Institute in Paris since 2001.
Pierre-Marie Lledo is investigating adult neurogenesis, one of the most intriguing and important aspects of the neurosciences. Using the adult olfactory bulb, one of few places with neurogenesis in the mature brain, his group is investigating the differentiation of neural precursors into olfactory bulb interneurons and the integration of these neurons into the operational neural network. This model system provides the possibility to study aspects of cell renewal from endogenous stem cells, such as the molecular cues for cell migration or the control mechanisms that activate or surpress exchange of neurons. Eventually the answers to these questions might open new ways in the treatment of neurodegenerative diseases.

Selected recent publications

Saghatelyan A, DeChevigny A, Schachner M & Lledo P-M. (2004). Tenascin fosters radial migration of neuroblasts in the adult forebrain. Nat. Neurosci. 7, 347-356.

Lledo P-M, Gheusi G & Vincent J-D (2004). Information processing in the mammalian olfactory system. Physiological Reviews.

Carleton A, Petreanu L, Lansford R, Alvarez-Buylla A & Lledo P-M (2003). Becoming a new neuron in the adult olfactory bulb. Nat. Neurosci. 6, 507-518. [Pubmed Abstract]

Emilio Salinas

Wake Forest University
Winston-Salem, NC

How behavioral constraints may determine optimal sensory tuning curves

Emilio Salinas grew up in Mexico City. He obtained a B.Sc. degree in Physics there, at the National Autonomous University of Mexico (UNAM). At that time, he became interested in mathematical models of single neurons and decided to pursue a doctoral degree. He obtained his Ph.D. from Brandeis University in 1996, under the supervision of Larry Abbott. During this time he worked on various projects related to how populations of neurons encode sensory and motor information. He then returned to Mexico to join the laboratory of Ranulfo Romo, where he worked on the analysis and modeling of neurophysiological data from awake, behaving monkeys. In 1999 he went to the laboratory of Terry Sejnowski at the Salk Institute, in San Diego, California, for another postdoctoral stay. There he studied the effects of correlated synaptic inputs on the responses of single model neurons. Emilio Salinas is currently an Assistant Professor and Graduate Program Director in the Department of Neurobiology and Anatomy at Wake Forest University School of Medicine, in Winston-Salem, North Carolina. His current research interests include constructing model neural circuits that are able to switch tasks in a context-dependent way, understanding the optimality of cortical sensory representations, and understanding the role of categorization in memory and learning.

Selected recent publications

Salinas E (2006) How behavioral constraints may determine optimal sensory representations. PLoS Biology 4.

Salinas E (2004) Context-dependent selection of visuomotor maps. BMC Neuroscience 5: 47.

Salinas E (2004) Fast remapping of sensory stimuli onto motor actions on the basis of contextual modulation. J Neurosci 24:1113-1118.

Thomas Euler

MPI for Medical Research
Heidelberg, Germany

Dendritic processing in the retina

Thomas Euler received his PhD at the Max Planck Institute for Brain Research in Frankfurt, after having studied Biology in Mainz and Frankfurt. Following postdoctoral positions at the Harvard Medical School and the Max Planck Institute for Medical Research in Heidelberg, he became a group leader in the latter institute in 2003.
Since his time in Frankfurt, Thomas Euler has been investigating the neurophysiology of the retina. His laboratory being part of the Department of Biomedical Optics, he is applying sophisticated optical methods to study the signal processing that takes place in the early visual system. Elaborate pre-processing of the incoming signals is taking place within the retina, before the information is transmitted to higher brain regions. The research of his group focusses on the processing mechanisms of ganglion cells, which were shown to be responsive to specific complex stimuli, such as edges or directed motion.

Selected recent publications

Hausselt, S.E., Detwiler, P.B., Euler, T., & W. Denk (2006): Computation of the Directional Asymmetry in Starburst Amacrine Cell Dendrites Involves Voltage-Gated Channels. ARVO #2277.

Euler, T., Detwiler, P.D., Margolis, D.J., Hausselt, S., & W. Denk (2006): Eyecup Scope - Optophysiological Recordings of Light-Stimulus Evoked Fluorescence Signals in the Retina. ARVO #5394.

Oesch, N., Euler, T., & Taylor, W.R. (2005): Direction-Selective Dendritic Action Potentials in Rabbit Retina. Neuron 47:739-750.

Alain Destexhe

CNRS
Paris, France

Computing with complex dynamics in cerebral cortex: Experiments and modeling

Alain Destexhe received a PhD in Biophysics amd Nonlinear Dynamics from the University of Brussels in Belgium. He worked as postdoctoral fellow in the group of Terry Sejnowski at the Salk Institute in San Diego, California, and became thereafter Assistant Professor at the University of Laval in Québec, Canada. In 2000, Alain Destexhe joined the CNRS in Gif-sur-Yvette and is leader of the Computational Neuroscience group of this institute.
The research of his group ranges from detailed biophysical models of single neurons to complex behaviour of large neuronal populations. While a big part of the research is devoted to computational models of neurons and networks, innovative experimental techniques such as the dynamic-clamp are developed and utilized in his laboratory. One of the most intriguing aspects of his work might be the research on the genesis of pathologic behaviour such as epileptic seizures from theoretical models of neuronal populations.

Selected recent publications

Rudolph, M., Pospischil, M., Timofeev, I. and Destexhe, A. (2007): Inhibition determines membrane potential dynamics and controls action potential generation in awake and sleeping cat cortex. Journal of Neuroscience: in press.

Zou, Q. and Destexhe, A. (2007): Kinetic models of spike-timing dependent plasticity and their functional consequences in detecting correlations. Biological Cybernetics: in press.

Pospischil, M., Piwkowska, Z., Rudolph, M., Bal, T. and Destexhe, A. (2007): Calculating event-triggered average synaptic conductances from the membrane potential. Journal of Neurophysiology 97: 2544-2552.

Dietmar Schmucker

Department of Neurobiology, Harvard Medical School and
Department of Cancer Biology, Dana-Farber Cancer Institute
Boston, MA, USA

Developmental control of synaptic connectivity: Functional role and specificity of diverse surface receptors

Having started his work on Drosophila at the LMU in Munich, Dietmar Schmucker did his Ph.D. at the Max Planck Institute for Biophysical Chemistry here in Göttingen. Moving to the United States, initially to UCLA, he established his lab in the Dept. of Neurobiology at Harvard Medical School where he made a breakthrough finding in his studies of axon guidance mechanisms in the fly. His work led to the identification of a novel receptor protein with remarkable diversity produced by alternative splicing. His group succeeded in the daunting task of demonstrating that the repertoire of more than 38.000 possible receptors produced from this gene is employed both for neuronal wiring and the innate immune response in the fly.

Selected recent publications

Chen B, Kondo M, Garnier A, Puettmann-Holgado R, Watson F, Hughes M, Lamar DL, Schmucker D. The Molecular Diversity of the Neuronal Receptor Dscam is Functionally Required for Synaptic Targeting in the Somatosensory System. (2006) Cell 125, 607-620.

F L. Watson, R. Puettmann-Holgado, F. Thomas, D L. Lamar, M. Hughes, M. Kondo, V. Rebel, and D. Schmucker. (2005). Extensive Diversity of Ig-Superfamily Proteins in the Immune System of Insects. Science 309, 1874-78.

Schmucker D, Flanagan JG. Generation of recognition diversity in the nervous system. Neuron. 2004 Oct 14; 44(2):219-22.

Peter Scheiffele

Department of Physiology and Cellular Biophysics
Columbia University, New York, NY, USA

Signaling and cell adhesion complexes in neuronal network formation

Peter Scheiffele's work has uncovered key roles of cell adhesion molecules in the formation of synapses. Using a neuron-cell line co-culture system, he identified candidate molecules with synaptogenic properties and opened up a stream of research devoted to the study of trans-synaptic adhesion complexes and their role in the molecular mechanisms of synaptogenesis.

Selected recent publications

Ben Chih, Leora Gollan, Peter Scheiffele, 2006. Alternative splicing controls selective trans-synaptic interactions of the neuroligin-neurexin complex. Neuron 51:171-8.

Philip Buttery, Asim Beg, Ben Chih, Arkady Broder, Carol Mason, Peter Scheiffele, 2006. The diacylglycerol-binding protein alpha1-chimaerin regulates dendritic morphology. Proceedings of the National Academy of Sciences of the United States of America 103:1924-9.

Ben Chih, Holly Engelman, Peter Scheiffele, 2005. Control of excitatory and inhibitory synapse formation by neuroligins. Science 307:1324-8.

Dean C, Scholl FG, Choih J, DeMaria S, Berger J, Isacoff E, Scheiffele P.: Neurexin mediates the assembly of presynaptic terminals. Nat Neurosci. 2003 Jul;6(7):708-16.

Scheiffele P, Fan J, Choih J, Fetter R, Serafini T.: Neuroligin expressed in nonneuronal cells triggers presynaptic development in contacting axons. Cell. 2000 Jun 9;101(6):657-69.

Valentin Nägerl

Department of Cellular and Systems Neurobiology,
MPI of Neurobiology, Martinsried, Germany

Rules and Correlates of Synaptic Plasticity

Valentin Nägerl's work focuses on the study of dendritic spines and their dynamics in response to neuronal activity. He has successfully combined advanced two-photon microscopy and patch-clamp recordings allowing him to observe spinogenesis and changes in spine morphology under conditions of induced synaptic plasticity. From his work, classical paradigms of LTP and LTD are now linked with postsynaptic morphological plasticity.

Selected recent publications

Fonseca R, Vabulas RM, Hartl FU, Bonhoeffer T, Nägerl UV. A balance of protein synthesis and proteasome-dependent degradation determines the maintenance of LTP. Neuron. 2006 Oct 19;52(2):239-45.

Fonseca R, Nägerl UV, Bonhoeffer T. Neuronal activity determines the protein synthesis-dependence of late-phase LTP. Nat Neurosci. 2006 Apr;9(4):478-80.

Kawakami N, Nägerl UV, Odoardi F, Bonhoeffer T, Wekerle H, Flügel A. Live imaging of effector cell trafficking and autoantigen recognition within the unfolding autoimmune encephalomyelitis lesion J Exp Med. 2005 Jun 6

Fonseca R, Nägerl UV, Morris RG, Bonhoeffer T. Competing for memory: hippocampal LTP under regimes of reduced protein synthesis. Neuron. 2004 Dec 16

Pico Caroni

Department of Neurobiology
Friedrich Miescher Institute, Basel, Switzerland

Sustained rearrangements of hippocampal microcircuits in the adult

Prof. Pico Caroni has produced a long line of work that gives insight into the cellular mechanisms that determine the dynamic structure of neuronal connections. Addressing issues such as axonal pruning and synapse remodeling in developing and mature systems, his work aims at uncovering phenomena that underly learning and adaptation.

Selected recent publications

Galimberti I, Gogolla N, Alberi S, Santos AF, Muller D, Caroni P (2006) Long-term rearrangements of hippocampal mossy fiber connectivity regulated by experience in the adult. Neuron (in press)

De Paola V, Holtmaat A, Knott G, Song S, Wilbrecht L, Caroni P, Svoboda K (2006) Cell type-specific structural plasticity of axonal branches and boutons in the adult neocortex. Neuron 49:861-875

Pun S, Santos AF, Saxena S, Lefler S, Caroni P (2006) CNTF-sensitive selective vulnerability and pruning of phasic motoneuron axons in motoneuron disease. Nature Neurosci 3:408-419

Golub T, Caroni P (2005) PI(4,5)P2-dependent microdomain assemblies capture microtubules to promote and control leading edge motility. J Cell Biol 169:151-165

Portera-Cailliau C, Weimer RM, De Paola V, Caroni P, Svoboda K (2005) Diverse modes of axon elaboration in the developing neocortex. PLoS Biol 3:e272

Amiram Grinvald

Department of Neurobiology &
The Grodetsky Center for Research of Higher Brain Functions
Weizmann Institute of Science, Rehovot, Israel

The dynamics of evoked and ongoing activity in the awake monkey

Research at Grinvald's lab focuses on the study of information processing in the mammalian cortex, the relationship between cortical structure & function and the coding employed by neuronal cell assemblies. To tackle these questions, his lab pioneered optical imaging methods based on voltage sensitive dyes and intrinsic brain signals, and combined them with traditional neuroanatomical and neurophysiological techniques.

Selected recent publications

Nelson, DA. S. Krupsky, A. Pollack, E. Aloni, M. Belkin, I. Vanzetta, R. Mordechai, and A. Grinvald. Noninvasive Multi-parameter Functional Optical Imaging of the Eye. Ophthalmic Surgery, Lasers and Imaging, 36(1):57-66, 2005

Vanzetta Ivo, Slovin Hamutal and Omer Didi -Baklash Grinvald Amiram. Columnar resolution of blood volume and oximetry functional maps in the behaving monkey; implications for FMRI. Neuron, 42: 843-54, 2004.19. Grinvald, A. Bonhoeffer, T. Pollack, A. Aloni, E. Ofri, R. and Nelson, D.. High Resolution Functional Optical Imaging; From the Neocortex to the Eye. Ophthalmol. Clin. N Am. 17: 53-67, 2004.

Grinvald, A. Bonhoeffer, T. Pollack, A. Aloni, E. Ofri, R. and Nelson, D.. High Resolution Functional Optical Imaging; From the Neocortex to the Eye. Ophthalmol. Clin. N Am. 17: 53-67, 2004.

Andreas Nieder

Primate NeuroCognition Laboratory, Dept. of Cognitive Neurology & Hertie-Institute for Clinical Brain Research
University of Tübingen, Germany

Coding of quantity information in the primate cortex

Andreas Nieder and his team investigate the neural mechanisms that give rise to numerical competence in monkeys with the aim of elucidating higher mathematical abilities only found in humans. Their technical approach to these questions includes psychophysical tests and multi-electrode recording of groups of single neurons in cortical areas.

Selected recent publications

Nieder A., Merten K. (in press) A labeled-line code for small and large numerosities in the monkey prefrontal cortex. Journal of Neuroscience

Nieder A., Diester I., Tudusciuc O. (2006) Temporal and spatial enumeration processes in the primate parietal cortex. Science 313: 1431-1435.

Nieder A., Miller E.K. (2004) A parieto-frontal network for visual numerical information in the monkey. Proceedings of the National Academy of Sciences of the USA 101: 7457-7462.

Nieder A., Miller E.K. (2004) Analog numerical representations in Rhesus monkeys: Evidence for parallel processing. Journal of cognitive Neuroscience 16: 889-901.

Nieder A., Miller E.K. (2003) Coding of cognitive magnitude: Compressed scaling of numerical information in the primate prefrontal cortex. Neuron 37: 149-157.

Miguel Nicolelis

School of Life Sciences & Brain Mind Institute,
Federal Polytechnic School of Lausanne,
Lausanne,Switzerland

Miguel Nicolelis studies the principles underlying neural coding and how it can orchestrate behaviour. His team developed a multiarray electrode system to simultaneously record the activity of up to 100 neurons in the cortex and used this population code to control a robotic arm. His efforts established a new way of probing how the brain works.

Selected recent publications

Simon SA, de Araujo IE, Gutierrez R, Nicolelis MAL.: The neural mechanisms of gustation. Nature Rev Neurosci 7: 890-901, 2006.

Costa, RM, Lin S-C, Sotnikova, TD, Cyr, M, Gainetdinov, R, Caron, MG, Nicolelis, MAL.: Rapid Alterations in Corticostriatal Ensemble Coordination during Acute Dopamine-Dependent Motor Dysfunction. Neuron 62: 359-369, 2006.

Dzirasa K, Ribeiro S, Costa R, Santos LM, Lin S-C, Grosmark A, Sotnikova TD, Gainetdinov RR, Caron MG, Nicolelis MAL.: Dopaminergic Control of Sleep-Wake States. J. Neurosci. 26:10577-10689.

Lin SC, Gervasoni D, Nicolelis MAL.: Fast modulation of prefrontal cortex activity by basal forebrain non-cholinergic neuronal ensembles. J Neurophysiol 96:3209-3219, 2006.

Pascal Fries

F.C. Donders Centre for Cognitive Neuroimaging
Radboud University, Nijmegen, The Netherlands

Neuronal communication through neuronal coherence: A putative mechanism behind selective attention

Pascal Fries' lab aims at establishing how the different brain areas coordinate their activity with very high temporal precision (in the order of tenth of milliseconds) to enable human and animal cognition. Is oscillatory neuronal synchronization really used to define groups? If so, how do neurons find out to which group they belong and synchronize accordingly? The research in the "Neuronal Coherence" group focuses on answering some of those questions using MEG and EEG on human subjects.

Selected recent publications

Parkes, L. M., de Lange, F. P., Fries, P., Toni, I. and Norris, D. G. (2007): Inability to directly detect magnetic field changes associated with neuronal activity. Magnetic Resonance in Medicine, 57, 411-416.

Zeitler, M., Fries, P. and Gielen, C. C. (2006): Assessing neuronal coherence with single-unit, multi-unit and local field potentials. Neural Computation, 18, 2256-2281.

Womelsdorf, T., Fries, P., Mitra, P. P. and Desimone, R. (2006): Gamma-band synchronization in visual cortex predicts speed of change detection. Nature, 439, 733-736.

Medendorp, W. P., Kramer, G. F., Jensen, O., Oostenveld, R., Schoffelen, J. M. and Fries, P. (2006): Oscillatory activity in human parietal and occipital cortex shows hemispheric lateralization and memory effects in a delayed double-step saccade task. Cerebral Cortex. Epub.

Reinhard Jahn

Department of Neurobiology,
MPI for Biophysical Chemistry, Göttingen, Germany

Neurotransmitter release - a tale of vesicles and SNAREs

Reinhard Jahn is Director of the Department of Neurobiology at the Max-Planck-Institute for Biophysical Chemistry in Göttingen/Germany. After obtaining his PhD degree from the University of Göttingen in 1981, he was a postdoc with Paul Greengard and then became Assistant Professor at the Rockefeller University. Between 1986 and 1991 he led a junior group at the Max-Planck-Institute for Psychiatry in Martinsried/Munich. In 1991 he joined the Faculty of the Departments of Pharmacology and Cell Biology at Yale University, with a joint appointment as HHMI investigator. In 1997 he returned to Germany to assume his present position. Since many years, the research of Reinhard Jahn is focused on the molecular mechanism of neuronal exocytosis and membrane fusion, with particular emphasis on the role of SNARE proteins.

Selected recent publications

Takamori S, Holt M, Stenius K, Lemke EA, Gronborg M, Riedel D, Urlaub H, Schenck S, Brugger B, Ringler P, Muller SA, Rammner B, Grater F, Hub JS, De Groot BL, Mieskes G, Moriyama Y, Klingauf J, Grubmuller H, Heuser J, Wieland F, Jahn R.: Molecular anatomy of a trafficking organelle. Cell.2006 Nov;127(4):831-46

Willig KI, Rizzoli SO, Westphal V, Jahn R, Hell SW.: Abstract STED microscopy reveals that synaptotagmin remains clustered after synaptic vesicle exocytosis. Nature. 2006 Apr 13;440(7086):935-9.

Rizzoli SO, Bethani I, Zwilling D, Wenzel D, Siddiqui TJ, Brandhorst D, Jahn R. : Evidence for early endosome-like fusion of recently endocytosed synaptic vesicles. Traffic. 2006 Sep;7(9):1163-76.

Venkatesh Murthy

Department of Molecular & Cellular Biology,
Harvard University, Cambridge, MA, USA

Insights from real-time optical imaging of synaptic vesicle recycling

Venkatesh Murthy graduated with a degree in Mechanical Engineering from the Indian Institute of Technology, Madras and moved to the United States for graduate school. During his graduate education in Bioengineering at the University of Washington, Seattle, Venki became interested in neuroscience. After switching to the Deparment of Physiology & Biophysics, he got his Ph.D. working with Prof. Eberhard Fetz. The doctoral work was on the role of synchronous neural activity in sensory motor processing in awake behaving monkeys. In 1994, Venki moved to the Salk Institute in La Jolla, California to do postdoctoral work with Professors Terrence Sejnowski and Charles Stevens. Here, he worked on the biophysics and cell biology of synaptic transmission using optical microscopy. He moved to Harvard University in 1999 as an Assistant Professor in the Department of Molecular & Cellular Biology. Here, he has continued to investigate the cell biology of synapses, in particular the synaptic vesicle cycle. In addition, his research has expanded to a study of synaptic plasticity in more intact preparations. He is currently the Morris Kahn Associate Professor of Molecular & Cellular Biology.

Selected recent publications

Hartman, K.N., Pal, S.K., Burrone, J. and Murthy, V.N. 2006. Activity-dependent regulation of inhibitory synaptic transmission in hippocampal neurons. Nature Neuroscience. Epub, 02 April 2006.

Dietz, S.B. and Murthy, V.N. 2005. Contrasting short-term plasticity at two sides of the mitral-granule cell reciprocal synapse in mammalian olfactory bulb. J. Physiol. 569:475-488.

Star, E.N., Newton, A.J. and Murthy, V.N. 2005. Real-time imaging of Rab3a and Rab5a reveals differential roles in presynaptic function. J. Physiol. 569:103-117.

Harvey McMahon

Neurobiology Division, Laboratory of
Molecular Biology, Hills Road, Cambridge, UK

Sculpting Cell Membranes: Understanding pathways of endo- and exocytosis

Harvey McMahon studied Biochemistry at Trinity College in Dublin and then he did his PhD in Neurochemistry at Dundee University in Scotland together with Prof. David Nicholls finishing it in 1990. During graduate studies his work focused on the pharmacology and mechanics of glutamate transmitter release. After one year postdoctoral research in Scotland he became a Howard Hughes Research Fellow with Prof. Thomas Südhof at the University of Texas Southwestern where he studied vesicle fusion mechanisms together with SNARE proteins. In 1995 he was appointed staff scientist and group leader at the Medical Research Council Laboratory of Molecular Biology in Cambridge, where he switched from exocytosis to molecular mechanisms of endocytosis. He got tenured in 2000 and since then his main research field includes clathrin-mediated endocytosis and endocytic proteins that play key roles in the endocytic pathway.

Selected recent publications

Mittal, R., Peak-Chew, S-Y. and McMahon, H.T. (2006) Acetylation of MEK2 and IkB kinase (IKK) activation loop residues by YopJ inhibits signalling. PNAS 103, 18574-18579.

Schmid, E.M., Ford, M.G.J., Burtey, A., Praefcke, G.J.K., Peak-Chew, S-Y., Mills, I.G., Benmerah, A. and McMahon, H.T. (2006) Role of the AP2 beta-appendage hub in recruiting partners for clathrin-coated vesicle assembly. PLoS Biology 4(9), e262.

Gallop, J.L., Jao, C.C., Kent, H.M., Butler, P.J.G., Evans, P.R., Langen, R. and McMahon, H.T. (2006) Mechanism of endophilin N-BAR domain-mediated membrane curvature. EMBO J. 25, 2898-2910.

Peter Jonas

Institute for Physiology
University of Freiburg, Germany

The GABAergic interneuron in the network

Peter Jonas is Professor of Physiology and Head of Department at the Institute of Physiology of the University of Freiburg, Germany. In 1987, he received his MD in Neurophysiology from the University of Giessen, Germany. In 1990, he joined the lab of Dr. Bert Sakmann at the Max-Planck Institute for Medical Research in Heidelberg , where he worked on glutamate receptors. In 1994, he took up a position as an Associate Professor at the Technical University of Munich, Germany. In 1995, he became appointed Full Professor at the Institute of Physiology of the University of Freiburg . He analyzes the function of GABAergic interneurons and the mechanisms of transmitter release from presynaptic terminals, combining cutting edge electrophysiology with computational approaches. He recently received the Leibniz award, the highest German research award.

Selected recent publications

Bartos M, Vida I, Jonas P (2007) Synaptic mechanisms of synchroized gamma oscillations in inhibitory interneuron networks, Nat Rev Neurosci 8:45-56

Bischofberger J, Engel D, Frotscher M, Jonas P (2006) Mechanisms underlying the efficacy of transmitter release at mossy fiber synapses in the hippocampal network. Pflügers Arch Eur J Physiol 453, 361-372

Hefft S, Jonas P (2005) Asynchronous GABA release generates long-lasting inhibition at a hippocampal interneuron-principal neuron synapse Nat Neurosci 8: 1319-1328.

Giles Hardingham

Center for Neuroscience Research
University of Edinburgh, Scotland

Pro-survival signalling from the NMDA receptor

Giles Hardingham received his degree in Biochemistry from the University of Cambridge. He went on to do a PhD with Professor Hilmar Bading at the MRC Laboratory of Molecular Biology, Cambridge on spatial aspects of Ca^{2+} signalling in excitable cell lines. In 1998 he obtained an MRC Research Fellowship to continue working at the LMB on activity-dependent gene expression in neurons. He was also a Fellow of Clare College, Cambridge and Tutor in Molecular Biology. In 2002 he moved to the University of Edinburgh and obtained a Royal Society Research Fellowship to set up his lab. His research interests lie in synapse-to-nucleus signalling and the pro-survival and pro-death consequences of NMDA receptor activation.

Selected recent publications

Soriano F X, S Papadia, F Hofmann, N Hardingham, H Bading and GE Hardingham (2006). Preconditioning doses of NMDA promote neuroprotection by enhancing neuronal excitability. Journal of Neuroscience 26, 4509-18.

Papadia S, P Stevenson, NR Hardingham, H Bading and GE Hardingham (2005). Nuclear Ca2+ and the CREB family mediate a late-phase of activity-dependent neuroprotection. Journal of Neuroscience. 25, 4279-87.

Mckenzie GJ, P Stephenson, G Ward, S Papadia, H Bading, S Chawla, M Privalsky, GE Hardingham (2005). Nuclear Ca2+ and CaM kinase IV specify hormonal- and Notch-responsiveness. J Neurochem 93:171-185.

Hardingham GE, Y Fukunaga and H Bading (2002). „Extrasynaptic NMDARs oppose synaptic NMDARs by triggering CREB shut-off and cell death pathways". Nature Neuroscience 5, 405-414.

Konrad Beyreuther

Zentrum für Molekulare Biologie
Heidelberg, Germany

Physiological and pathogenic function of genes involved in Alzheimer disease

Konrad Beyreuther has been studying Alzheimer Disease (AD) and prion proteins since 1980s. His team's research led to the cloning of amyloid precursor protein (APP) and the discovery of how it is processed into Aß peptides thought to be responsible for the development of AD. Today his lab continues to study how APP, Aß and presenilins lead to neuronal dysfunction and ultimately to the disease.

Selected recent publications

Barnham, K. J., R. Cappai, K. Beyreuther, C. L. Masters and A. F. Hill (2006). Delineating common molecular mechanisms in Alzheimer's and prion diseases. Trends Biochem Sci 31(8): 465-472.

Beyreuther, K., H. K. Biesalski, J. D. Fernstrom, P. Grimm, W. P. Hammes, U. Heinemann, O. Kempski, P. Stehle, H. Steinhart and R. Walker (2006). Consensus meeting: monosodium glutamate - an update. Eur J Clin Nutr.

Kins, S. and K. Beyreuther (2006). Teasing out the tangles. Nat Med 12(7): 764-765; discussion 765.

Kins, S., N. Lauther, A. Szodorai and K. Beyreuther (2006). Subcellular trafficking of the amyloid precursor protein gene family and its pathogenic role in Alzheimer's disease. Neurodegener Dis 3(4-5): 218-226.

Kuan, Y. H., T. Gruebl, P. Soba, S. Eggert, I. Nesic, S. Back, J. Kirsch, K. Beyreuther and S. Kins (2006). PAT1a modulates intracellular transport and processing of APP, APLP1 and APLP2. J Biol Chem.

Patrik Brundin

Department of Experimental Medical Science
Wallenberg Neuroscience Center
Department of Physiological Sciences
Lund University, Sweden

Huntington's disease: more complex than we thought!

Patrik Brundin earned his PhD and MD degrees from the University of Lund in Sweden, where he is currently a professor of Neuroscience and the leader of Neuronal Survival Group. His research focuses on potential therapeutic approaches to cure neurodegenerative disorders. These include neuronal stem cells, neurogenesis in the adult brain and intracerebral transplantation. He also studies the mechanisms of dysfunction in Huntington's disease. Since 1987 he has been involved in clinical trials of intracerebral transplantation in Parkinson's disease patients.

Selected recent publications

Smith R, Chung H, Rundquist S, Maat-Schieman ML, Colgan L, Englund E, Liu YJ, Roos RA, Faull RL, Brundin P, Li JY.: Cholinergic neuronal defect without cell loss in Huntington's disease. Hum Mol Genet. 2006 Nov 1;15(21):3119-31.

Paul G, Ahn YH, Li JY, Brundin P.: Transplantation in Parkinson's disease: The future looks bright. Adv Exp Med Biol. 2006;557:221-48.

Petersen A, Gil J, Maat-Schieman ML, Bjorkqvist M, Tanila H, Araujo IM, Smith R, Popovic N, Wierup N, Norlen P, Li JY, Roos RA, Sundler F, Mulder H, Brundin P.: Orexin loss in Huntington's disease. Hum Mol Genet. 2005 Jan 1;14(1):39-47.

Information Session

Management training for researchers

TRAYSS PRIME gives life science researchers a deeper understanding of management know-how

During this event, scheduled immediately after the poster session, Chrsitina Schütte will give you an overview on workshops offered to young researchers in the biotech field (late PhD students, Postdocs and people just starting their own groups) in the areas of project and research management, management of intellectual property and EU grant applications - Management of international consortia.

The central goal of the initiative is to sensibilize and to upgrade young European researchers in the field of life sciences and health in the Baltic Sea Region on concepts of research management. The program's core topics are innovation management, intellectual property, EU project preparation issues and bioethics.

Poster Abstracts

The Poster Session will take place on Friday, 1st of June, from 1:30 to 3 pm. Posters should be put up from Thursday until Friday at 10 am and should be removed on Saturday before the end of the meeting.

The poster boards are numbered according to the page number at which you can find the respective abstract on the following pages. Each board fits two posters on each side, labeled A and B as in this book.

The e-mail of the corresponding author is indicated in bold face for each abstract below the institution.

Anticonvulsant activities of methanolic extract of roots of paeoni emodi

Abbasi, MS and Wahab, A

Ethel Pharma International, Karachi, Pakistan
Institute of Neurophysiology, Charite-Universitatsmedizin Berlin, 10117 Berlin, Germany
Institute of Pharmaceutical Sciences, Baqai Medical University, Karachi, Pakistan
shafique786_pk@yahoo.com

Purpose: Roots of Paeonia emodi has been used for the treatment of epilepsy in traditional medicine. The purpose of this study was to investigate the anticonvulsant activities of methanolic extract of roots of Paeonia emodi, using well-established animal seizure models.
Method: Methanolic extract of roots of Paeonia emodi was tested for its effects against subcutaneous pentylenetetrazole, strychnine, picrotoxin and bicuculline seizure tests in mice. Acute toxicity test was also carried out.
Results: The plant showed dose dependent significant anticonvulsant activity against pentylenetetrazole-induced clonic seizures. It had weak anticonvulsant effect against pentylenetetrazole-induced tonic seizures. It delayed the onset of hind limb tonic extensor jerks induced by strychnine. It exhibited significant anticonvulsant activities against picrotoxin and bicuculline-induced clonic seizures, whereas it provided weak anticonvulsant activity against bicuculline-induced tonic seizures at higher doses. Furthermore, it's showed acceptable acute toxicity profile. Valproic acid, a standard antiepileptic drug, provided 100% protection to mice against seizures in all the tests.
Conclusion: Our results indicate that compounds present in methanolic extract of roots of Paeonia emodi may be effective for the treatment of generalized tonic clonic, partial, myoclonic and absence seizures in humans, as it significantly inhibited the clonic seizure activity and exhibited weak anticonvulsant effect against tonic seizure in a set of established animal models.

A

Simultaneous EEG Recording and Eye-Tracking During Active Viewing

Acik, A, Hipp, J, Görgen, K, Engmann, S,König, K, Engel, AK

Institute of Cognitive Science, Universität Osnabrück, Germany
aacik@uos.de

Due to methodological constraints, electrophysiological studies of human vision under natural viewing conditions are scarce, with the vast majority of EEG studies explicitly requiring subjects not to move their eyes. These constraints include eye-movement related artifacts in EEG recordings and difficulty obtaining accurate eye-position data under such experimental settings. Here we use a high-speed (1250 Hz) eye-tracker synchronized with a 128-channel EEG system. Employing a regression-based EOG artifact reduction method, we remove eye-movement related artifacts from the recorded data. To quantify the success of this method we compare the ratio of peri-saccadic to peri-fixation variances of EEG signals before and after artifact removal. The drop in this ratio from 2.65 to 1.11 shows that most artifacts have been removed. The accuracy of the eye-tracker, as revealed by validating the calibration before and after experiments, is 0.2° – 0.4°. Applying this method to simple active vision tasks, we report differences between event-related potentials and saccade-related potentials in terms of curve shape and brain activity topographies. These preliminary results are strong proof of concept that EEG recordings during active vision tasks with natural eye movements are possible.

B

Cortical Development and Myelination in the Absence of Schizophrenia Susceptibility Gene Neuregulin1

Agarwal, A., Nave, K-A, Schwab, M.H., Brinkmann, B.G., Radyushkin, K., Ehrenreich, H., Garratt, A. Birchmeier

Max-Planck-Institute for Experimental Medicine, Göttingen, Germany
agarwal@em.mpg.de

A

The human neuregulin-1 gene (NRG1) on chromosome 8p is a confirmed susceptibility gene for schizophrenia (SZ). The gene encodes a family of widely expressed neuronal growth factors. For the central nervous system, multiple functions of NRG1 have been suggested, including neuronal migration, synaptic plasticity, oligodendrocyte development, and myelination, however functional in vivo data are lacking, largely because NRG1 mutant mice die embryonically. While the association of specific SNPs in the NRG1 gene with SZ have been well documented, the effect of the human „at risk" haplotype on the NRG1 expression level and brain development are unknown. As a first step to understand NRG1 dysregulation, we are using conditional mutagenesis to determine the effect of (i) elevated, (ii) reduced, and (iii) complete absence of NRG1 expression on CNS development and behavioural functions in mice. Surprisingly, conditional null mutants with ablation of NRG1 expression in cortical and hippocampal projection neurons, beginning between E12 (NEX-Cre) and P5 (CamKII-Cre), exhibit no obvious defect of cortical development, oligodendrocyte differentiation, and cortical and subcortical myelination. Even in the complete absence of NRG1 signaling from neural cells perinatal oligodendrocyte development is largely uneffected. In contrast, behavioral analysis of mouse mutants with a postnatal onset of projection neuron-specific inactivation of NRG1 display reduced motor activity. These observations suggests that during evolution oligodendrocytes have acquired distinct axonal signals that control myelination independently of NRG1. Normal variations of NRG1 expression appear therefore unlikely to account for myelin abnormalities in schizophrenia but might alter higher cortical functions.

Adaptation and context dependent coding across the whisker pathway

Alenda, A, Maravall, M, Brambilla,M, Bale, M, Petersen, P

Instituto de Neurociencias de Alicante, UMH-CSIC & Faculty of Life Sciences,
University of Manchester, UK
mmaravall@umh.es

B

Adaptation and context dependent coding across the whisker pathway A. Alenda1, M. Brambilla2, M.R. Bale2, R.S. Petersen2, M. Maravall1 1Instituto de Neurociencias de Alicante, UMH-CSIC, 03550 Sant Joan d'Alacant, Spain, 2Faculty of Life Sciences, University of Manchester, Manchester M60 1QD, United Kingdom Neurons in barrel cortex show prominent adaptation to repetitive stimuli. We have recently found that barrel cortex adaptation causes the representation of a whisker movement to depend on the movement's context [1]. We recorded single-neuron responses to continuous, rapidly varying, stochastic whisker movement stimuli in anesthetized rats, and analyzed stimulus-response relationships using spike-triggered covariance. In every neuron with rate adaptation, input-output tuning functions rescaled following changes in stimulus statistics (high versus low variance). This gain rescaling matches input-output functions to the stimulus range and allows neurons to maintain the information that they convey about stimulus features, thus enhancing whisker movement encoding. Here we explore how this adaptation is generated in the whisker pathway. Do rate adaptation and gain rescaling arise cortically, or are they present already at subcortical stages? We performed single-neuron recordings in the anesthetized VPM thalamic nucleus, stimulating with continuous, rapidly varying stochastic waveforms. Neurons showed a wide diversity of behaviours – firing rate adaptation ranged from absent to strongly prominent. We are analyzing whether this diversity in rate adaptation implies that gain rescaling also varies, or whether gain rescaling occurs always. We also recorded single neurons in the trigeminal ganglion and found that they did not adapt to rapidly varying stimuli. Work supported by: HFSP grant RG0043/2004-C, Ministerio de Educación grant BFU2006-04791/BFI, EC Marie Curie International Reintegration Grant MIRG-CT-2004-511273, Royal Society Joint Project Grant, Royal Society Research Grant.

References [1] M. Maravall, R.S. Petersen, A.L. Fairhall, E. Arabzadeh and M.E. Diamond, PLoS Biol 5(2): e19, 2007.

Quantitative analysis of information transmission via activity-dependent short-term synaptic dynamics

Bao, J, Bibitchkov, D, Neher, E

MPI for Biophysical Chemistry, Göttingen, Germany
dbibich@gwdg.de

Chemical synapses can be viewed as information transmission devices in the neuronal system. Short-term synaptic plasticity is a common phenomenon for central synapses. However, the functional role of short-term plasticity is not fully understood, and especially it is of great interest to understand the function of activity-dependent synaptic dynamics. We apply information theory for a quantitative analysis of information transmission. We construct the model of synaptic dynamics based on experimental data of the Calyx of Held and use Poisson spike train inputs to drive model synapses and generate synaptic currents as post synaptic responses (PSRs). The mutual information between inter-spike intervals (ISIs) and PSRs is computed as a quantity evaluating the amount of information about synaptic input contained in the synaptic responses. Activity-dependent recovery is a phenomenon characterized by accelerated refilling of the presynaptic readily releasable vesicle pool with high frequency spiking input. Information analysis quantitatively revealed that the information transmission benefits from the activity-dependent recovery, which suggests that synaptic dynamics play an important role in optimization of information transmission.

A

Topograpghy of the SNAREs

Bar-On, D, Winter, U, Fasshauer, D, Mezer, A,Nachliel, E, Gutman, M, Nudelman, G, Ashery, U, Lang, T

Department of Neurobiochemistry, Tel Aviv University, Israel
barondana@gmail.com

Syntaxin-1A, SNAP-25 and synaptobrevin/VAMP-II form the SNARE complex, which is crucial for vesicle fusion. The formation of the non-productive cis-SNARE complexes between PM-SNAREs counteracts the formation of trans-SNARE complexes between the syntaxin and SNAP-25 located on the PM with the vesicular, synaptobrevin. The formation of SNARE complexes depends on the local availability of the SNARE proteins which exist in a dynamics quasi –equilibrium; formed by the interaction of the SNARE protein and dis-assembled by the continuous action of the ATP dependent NSF and the αSNAP system. Syntaxin-1A is concentrated in cholesterol-rich clusters at the plasma membrane (PM) and generate non-homogenous distribution on the PM. The goal of this research is to examine the SNARE non-homogenous distribution and kinetics on the PM in various advanced molecular, microscopy and computational methods.

Assembly and disassembly of PM SNARE cis complexes were investigated, using the PM sheets preparation. The results suggest two populations of SNAREs, a fast forming one and then a slower one. The complex formation occurs in two phases: an initial fast phase saturating after 10 minutes and followed with a short delay by a second phase that continues slowly until syntaxin is almost quantitatively incorporated into complexes (after 60 minutes).

A possible mechanism to explain these observations is the significant influence of the Syntaxin‘s clusters on the formation of the two phases. As a result of the specific properties of the proteins either in the domain or dispersed in the surrounding membrane, there is a change in the kinetics of SNARE formation; The SNAREs components at the edge of the domains differ in their accessibility from those located at the center of the domains.

To test if the two phases reflect specific cluster biochemistry, we have generated an artificial condition with unclustered, more uniformly distributed syntaxin.

B

Face space model combining texture and geometrical features for fast recognition and novelty detection

Barwinski, M, Rolf, P, Würtz, R

International Graduate School of Neuroscience, Ruhr University Bochum, Germany
Marek.Barwinski@rub.de

We create an artificial face memory using textural as well as geometrical information obtained by processing face images. The texture is represented by a small informative set of principal components of Gabor filter responses [3]. Geometry information are ratios of distances between facial landmarks as well as facial ovals described by fitted ellipses. We correctly find the landmarks using advanced graph matching techniques [2]. We investigate the dimensionality, metric and other properties of constructed memory. We examine its properties to find rationale for exemplar, normbased and absolute coding space face space models. We compare the quality of the face space created with an automatic landmark finding system to the face space generated when actual ground truth information about landmark position is available. The ground truth is obtained via manual labelling in case of photographed human faces or via software in case of human-like faces generated artificially. We show – predictably – that the artificial FaceGen faces generate a face space of lower dimensionality than real faces.

Hippocampal LTD enhances bouton turnover and removes synaptic connections

Becker, N, Nägerl, UV, Wierenga, CJ, Fonseca, R, Bonhoeffer, T

MPI of Neurobiology, Dept. for Cellular and Systems Neurobiology, Martinsried, Germany
naegerl@neuro.mpg.de

Activity-dependent changes in the synaptic connectivity are thought to be the cellular substrate for learning and memory. While many studies have examined structural changes on the postsynaptic side of the synapse, relatively little is known about the role of presynaptic boutons in structural synaptic plasticity. Here, we investigate how boutons are affected by long-term depression (LTD), which we have previously shown to lead to the retraction of spines. Addressing the relationship between synaptic plasticity and neuronal connectivity, we examine the effect of LTD on the structural dynamics of pairs of boutons and spines. We used timelapse two-photon laser scanning microscopy and extracellular field recordings to monitor simultaneously synaptic morphology and activity for up to 5h in mouse organotypic hippocampal slice cultures. We found that LTD induction dramatically increased the turnover of presynaptic boutons, and at the same time decreased the number of putative synaptic contacts between boutons and spines. Beyond the well-established role of dendritic spines, our data reveal a significant, potentially even larger presynaptic contribution to the activity-dependent modifiability of synaptic connections.

The Relationship Between Amplitude Of The Ongoing Alpha Rhythm And Amplitude Of The Visual Evoked Potential

Becker, R, Ritter, P, Villringer, A

Berlin NeuroImaging Center, Charité Universitätsmedizin Berlin, PhD program Medical Neuroscience, Berlin, Germany
robert.becker@charite.de

The relationship between ongoing occipital alpha rhythm (8-12 Hz) and the generation of visual evoked potentials (VEPs) has been discussed controversially. While the „evoked theory" sees no interaction between VEP generation and the alpha rhythm, the „oscillatory theory" (or „phase-reset theory") postulates VEP generation to be based on alpha-rhythm phase-resetting. Previous experimental and model-theoretical results are contradictory. The purpose of our study is twofold: a) point out existing model ambiguities and overlaps on a theoretical basis and b) subsequently disambiguate these models. This was achieved by integrating a variation of pre-stimulus alpha amplitude into the models, which, in the evoked model had no effect on EP amplitudes, but on non-phase-locked ('background') single-trial activity, while in the oscillatory model the EP was directly enhanced by alpha activity. These differential predictions of the two models were then compared to experimental data, where VEPs were assessed in an "eyes open" and "eyes closed" condition in 17 subjects. In agreement with the evoked theory, amplitudes of early components of the VEP were unaffected by increased pre-stimulus alpha-activity and VEP phase-locking decreased. Late VEP component amplitudes (>175 ms), however, were enhanced by pre-stimulus alpha-activity. However, no corresponding difference in concurrent alpha-amplitude in the affected EP time window was observed, discarding the oscillatory theory as possible explanation. In summary, our results support a modulatory but not causative role of alpha activity for VEP generation as it would be implied by the oscillatory theory.

A

The specificity of SNARE pairing in biological membranes is confined to trans-SNARE interactions

Bethani, I, Lang, T, Jahn, R, Rizzoli, SO

Max-Planck-Institute for Biophysical Chemistry, Göttingen, Germany
srizzol@gwdg.de

Soluble N-ethylmaleimide sensitive factor attachment receptor (SNARE) proteins mediate organelle fusion in the secretory pathway. Different fusion steps are catalyzed by specific sets of SNARE proteins. Upon membrane contact, complementary SNAREs interact and assemble into trans-SNARE complexes, thereby inducing fusion of the bilayers. After fusion, the SNAREs find themselves in the same membrane (cis-SNARE complexes) and the complexes can be dissociated by the enzymatic activity of the ATPase NSF. Do SNAREs from different functional sets interact only with their complementary partners? To address this question, we studied the SNAREs mediating the homotypic fusion of early endosomes and exocytosis, respectively. These molecules coexist in the early endosomes of neuroendocrine PC12 cells and virtually exhibit no functional cross-talk, as specific cleavage of exocytic SNAREs by neurotoxins did not impair the fusion of early endosomes. Surprisingly, the different SNAREs occupied similar microdomains in the endosome membrane, and co-precipitation experiments revealed that they form cis-complexes promiscuously. The fact that a significant number of these complexes appeared only under conditions of NSF inhibition strongly suggests that they are true SNARE complexes rather than products of post-solubilization artifacts. In contrast, higher specificity in SNARE-complex formation was found when we mimicked trans-SNARE interactions by adding soluble SNARE molecules onto native membranes. We conclude that SNARE pairing specificity is controlled immediately before (or during) formation of the trans-complexes needed for fusion. Cis-complex formation between neighboring SNAREs in the same membrane is not controlled, involving indiscriminately SNAREs from different sets.

B

Underlying mechanisms in perceptual learning of visual tasks

Censor, N, Sagi, D

Weizmann Institute of Science, Rehovot, Israel
nitzan.censor@weizmann.ac.il

The ability to improve our performance in perceptual tasks by effective practice has been widely documented. However, the underlying mechanisms of such perceptual learning remain largely unknown. Studies using the texture discrimination task have shown that long-term improvements due to practice are specific to basic properties of the stimulus, suggesting that neuronal plasticity in early stages of the human visual system underlies these performance gains. Additionally, studies have shown that intensive training may result in perceptual deterioration, possibly due to saturation of local neuronal networks. Improvement and deterioration during visual training were found to depend on the integrity of the different sleep stages. We used the texture discrimination task to show that over-intense sessions produce performance decrements and interfere with learning. Furthermore, we show that these performance decrements are eliminated following short practice, pointing to a common underlying mechanism. Thus, short training generates consolidation of an effective memory trace and connectivity within the visual network, resistant to saturation and to the performance decrements that are usually induced by over-intensive testing. This novel link between memory generation, perceptual deterioration and memory consolidation may have an essential role in the underlying mechanisms of perceptual learning. Finally, we recorded event-related potentials (ERPs) of subjects performing the texture discrimination task with backward masking. Performance level correlated with the temporal separation between target and mask responses. It seems that performance fails when the mask interferes with the effective processing of the target signal. Practicing the task may improve the temporal separation between target and mask.

Glutamate levels and activity of the T cell voltage-gated potassium Kv1.3 channel in patients with systemic lupus erythematosus

Chatzimanolis A, Papadopoulou-Daifoti Z, Sfikakis PP, Fragiadaki K, Polisidis A, Veriou C, Davaki P, Poulopoulou C

Departments of Neurology, Laboratory of Experimental Neurophysiology, Pharmacology, and Propeudetic Internal Medicine, University of Athens Medical School
cpoulop@med.uoa.gr

Objective. T cell activation in systemic lupus erythromatosus (SLE) has been associated with increased Ca++ responses. KV1.3 channels and extracellular glutamate in T cells have been independently linked with the modulation of stimulated Ca++ influx. In a previous study we demonstrate a mechanistic link between extracellular glutamate and Kv1.3 activity, however neither glutamate homeostasis nor Kv1.3 channel function have been evaluated in (SLE). This study aims at assessing glutamate concentrations in the serum of patients with SLE in correlation with T-cell Kv1.3 channel activity in these patients.

Methods. High-pressure liquid chromatography for glutamate measurements and whole-cell patch-clamp recordings for electrophysiological studies in freshly isolated peripheral human T-cells were used. Results. Glutamate serum concentrations were markedly reduced in patients with either serologically active clinically quiescent (mean+SD: 77+27 μM, n=18) or active SLE (61+36, n=16) versus healthy individuals (166+64, n=24, $p<0.0001$). The biophysical properties of Kv1.3 channels in SLE-derived T-cells studied ex vivo were found unperturbed, however average current amplitudes and, consequently, whole-cell Kv1.3 conductance values were greater in lupus versus control T cells ($p<0.02$). Moreover, Kv1.3 currents recorded from lupus T-cells exposed to glutamate concentrations similar to respective serum levels (50 μM) displayed higher responses by 18.0+2.5% ($p<0.01$) than those in the presence of glutamate concentrations within control serum levels (200 μM).

Conclusion. Low glutamate levels may enhance the in vivo sensitivity of lupus T-cells to (auto)immune stimuli by responding with increased Kv1.3-mediated membrane hyperpolarization. This highlights an as of yet unsuspected disease-related metabolic dysfunction that may have therapeutic implications for patients with SLE.

Doublecortin Supports the Development of Dendritic Arbors in Primary Hippocampal Neurons

Cohen, D, Reiner, O, Segal, M

Weizmann Institute of Science, Rehovot, Israel
orly.reiner@weizmann.ac.il

Doublecortin (DCX) is a microtubule associated protein (MAP) necessary for neuronal migration. In spite of its ubiquitous distribution in dendrites, its possible role in dendrite development has not yet been documented. The present study examined the effects of different expression levels of DCX on the arborization of dendrites in cultured hippocampal neurons. Reduced expression of DCX following RNAi transfection resulted in reduced branch points, total length and complexity of the dendrites. Overexpression of DCX resulted in an increase in branch points and complexity of the dendrites. In contrast to control GFP cells, DCX overexpressing cells maintained highly branched and complex dendritic trees when subjected to reduced neuronal activity by blockade of immature GABA-A receptors. These results suggest that DCX supports developing dendrites, in addition to its role in neuronal migration.

A

Control of neuronal differentiation by satb genes

de Juan, C, Tarabykin, T, Britanova, O

Dept. of Molecular Biology of Neuronal Signals, MPI for Experimental Medicine, Göttingen, Germany
vtaraby@gwdg.de

Satb1 is a transcription factor that seems to be involved in the regulation of tissue-specific organization of chromatin. It is a nuclear protein that regulates transcription by binding matrix attachment regions (MAR) of genomic DNA. Satb2, a close homologue of Satb1, was identified by Victor Tarabykin's group in a subtraction hybridization based screen of genes controlling neural differentiation. Satb2 and Satb1 expression was detected in mutually exclusive subpopulations of developing mouse CNS. We found Satb2 to be expressed exclusively in a subpopulation of postmitotic neurons of the upper layers (II- IV) of the cortical plate. In order to characterize the two subpopulations of cells, two separate approaches are being used. One, we are analyzing a total mouse knockout of Satb2 that was generated in our lab, and two, we have generated a mouse line where the Satb1 coding sequence has been knocked into the Satb2 gene locus, such that the mutant not only lacks Satb2, but also ectopically overexpresses Satb1 in cells with transcriptionally active Satb2 promoter. We have already shown that total knockout of Satb2 leads to several craniofacial abnormalities like strong reduction of the lower jaw. Similar malformations have been shown to occur as a consequence of 2q32-q33 deletions and translocations in humans, leading to craniofacial dismorphologies such as cleft palate, one of the most common congenital defects. This Satb2 knockout also shows malformations in the cerebral cortex. There are, for instance, several migration problems. The lack of corpus callosum in the mutants indicates that Satb2 might play an important role in the establishment of axonal connections between the two cerebral hemispheres. Deletion of Satb2 also led to an up-regulation of Ctip2 expression throughout the cortical plate, in all cells with active Satb2 promoter (and hence expressing the reporter Cre gene), and in the migrating neurons of the intermediate zone. Ctip2 is a transcription factor known to be expressed exclusively in subcerebral projection neurons of layer V, and hence believed to play a role in axonal growth and guidance of Corticospinal motor neurons.

B

Intrinsic basis for adaptive gain rescaling in barrel cortex pyramidal neurons

Díaz-Quesada, M, Maravall, M

Instituto de Neurociencias de Alicante, UMH-CSIC, Sant Joan d'Alacant, Spain
mdiaz@umh.es

Barrel cortex neuronal responses adapt to changes in the statistics of complex whisker stimuli. This adaptation involves an adjustment in neurons' input-output tuning functions, such that their gain rescales to match the range of the current stimulus distribution. Similar phenomena have been observed in other sensory systems, e.g., visual contrast adaptation. In those systems adaptation and gain rescaling often depend on intrinsic properties such as slow afterhyperpolarization (sAHP) currents and sodium current inactivation. However, in barrel cortex adaptation to repetitive stimuli is mediated by synaptic depression; whether intrinsic mechanisms can contribute to adaptation to stimulus statistics is unknown. Here we examine whether intrinsic mechanisms generate adaptive changes in barrel cortex stimulus-response relationships. We performed whole-cell patch-clamp recordings of pyramidal cells in acute slices while injecting stochastic current stimuli. Neuronal firing rates adapted to switches in stimulus distribution, in a manner dependent on the form of the change in distribution. In vivo-like adaptation occurred only for rectified stimuli causing a state of net depolarization. Under those conditions, neurons adjusted their input-output curves, rescaling their gain according to stimulus range as observed in vivo. This adaptation was caused by intrinsic properties. While a calcium-dependent sAHP and sodium current inactivation both contributed, neither mechanism fully explained the behaviour. Therefore, intrinsic properties produce adaptive gain rescaling in barrel cortex on condition that neurons receive rectifying synaptic drive; different intrinsic properties provide partly redundant mechanisms for this behaviour. Work supported by: HFSP grant RG0043/2004-C, Ministerio de Educación grant BFU2006-04791/BFI, EC Marie Curie grant MIRG-CT-2004-511273.

Cortical epileptic network: a combined Transcranial Magnetic Stimulation and eletroencephalography investigation in humans.

Fadini, T, Paulus, W

Department of Clinical Neurophysiology, UKG, Göttingen, Germany
t.fadini@med.uni-goettingen.de

Investigating epileptic brain functioning in vivo is either largely restricted to animal models or to the analysis of spontaneous convulsive events in humans by use of electroencephalography (EEG). The most profitable way to interact directly with the electrical functioning of the epileptic brain in humans is, at the present time, the invasive electrical stimulation by use of surgically implanted cortical electrodes. The method showed here combines a non invasive electromagnetic stimulation, namely transcranial magnetic stimulation (TMS), with a high density EEG recording setup (hd-EEG). By use of 64 Ag/AgCl recording electrodes applied to the scalp it is possible to record, at a sampling rate of 5 kHz, the electrical activity of the brain without interruption due to the saturation of the amplifiers by the current induced by the magnetic pulse itself. The artifact generated by the 400 microseconds long biphasic single cosine cycle pulse is no longer than 10 ms, thus allowing of taking advantage of the temporal resolution of EEG. To standardize spatially the distribution of the responses, obtainable in form of event related potentials (ERPs), the electrodes are disposed on the scalp according to the international 10/20 system. To improve the spatial resolution and limit the filtering effects due to the volume conductor, these are laid at a distance of 3 cm center-to-center and have a diameter of about 1.5 cm (including the area covered by the conductive gel). In order to identify the epileptogenic area and network a coherence and dipole source analysis are performed. The stimulation protocol has been applied on patients affected by idiopathic generalized epilepsy (IGE) and focal epilepsy; both hemispheres have been stimulated symmetrically with reference to the electrodes position. The first results show the dependence of the responses obtained on the site and the intensity of the stimulation, accordingly to the routine electroencephalographic features of the underlying epilepsy type. A comparison between ERPs obtained from stimulation of healthy volunteers and epileptic patients has been done to assess the difference between the responses of the brain cortex under the same stimulation conditions.

Molecular architecture of the presynaptic compartment studied by cryoelectron tomography

Fernandez-Busnadiego, R, Lucic, V, Maurer, U, Kong, G.K-W., Baumeister, W

MPI of Biochemistry, Martinsried, Germany
vladan@biochem.mpg.de

A

Cryoelectron tomography (cryo-ET) allows the three dimensional visualization of cells and other biological material in a frozen, close-to-life state. The samples are vitrified in a cryogenic fluid and directly inserted into the electron microscope (EM). In this manner, harsh treatments such as dehydration or the use of chemical fixatives, necessary for conventional EM, are avoided. We have used cryo-ET to study the ultrastructure of isolated nerve terminals extracted from rat brain. Though separated from the cell body, it has been shown that synaptosomes still retain a high degree of functionality and are able to carry out several rounds of exocytosis under external stimulation. The frozen-hydrated nerve terminals observed in this work typically contain mitochondria, parts of smooth endoplasmic reticulum, a rich variety of cytoskeletal elements and a large number of synaptic vesicles coupled with the exocytic machinery. In most of cases, also a post-synaptic density appears attached to the presynaptic compartment by a dense network of adhesion complexes. Synaptic vesicles are connected to each other and to the cellular membrane by a meshwork of molecular bridges. We have used an automatic segmentation algorithm, previously developed in our laboratory, to study the architecture and connectivity of this network. We have observed that most of the vesicles present at least one connection. Several groups of many interconected vesicles were found. The lenght of these connectors ranges from 20 to 40 nm, being even longer in some cases.

Recording of Ultrafast (600-Hz) EEG Oscillations with Amplitudes in the Nanovolt Range during fMRI- Acquisition Periods

Freyer, F, Ritter, P, Curio, G, Villringer, A

Berlin Neuroimaging Center, Charité – Universitätsmedizin Berlin, Germany
frank.freyer@gmail.com

B

The combination of electroencephalography (EEG) and functional magnetic resonance imaging (fMRI) offers the possibility to non-invasively investigate the human brain with high spatial and temporal precision. However, despite their complementary advantages simultaneous acquisition of EEG and fMRI is accompanied by a number of technical challenges, the most prominent being MR-artifacts due to gradient switching, which obscure the physiological EEG signal over the complete spectral range. Recently, it has been shown that temporal synchronization of EEG and fMRI can drastically improve the commonly used mean template subtraction method for removal of MR-artifacts from the EEG signal, which otherwise only yields satisfactory results for frequencies under 50Hz. Here, we evaluated the quality of synchronized EEG-fMRI acquisition by recording somatosensory evoked high-frequency bursts (HFBs) during MR-acquisition. HFBs are ultrafast (~600Hz) EEG signatures of action potentials, and represent one of the smallest recordable physiological EEG signals. As a quality assessment of MR-artifact removal and recovery of physiological EEG, we tested whether subtle HFB amplitude modulations in the nanovolt-range can be retrieved from MR-artifact afflicted EEG periods. Synchronization of EEG and fMRI improved EEG signal quality after artifact correction so that modulations of HFBs could be identified. Thus, we showed that synchronization of EEG and fMRI allows for truly simultaneous and continuous acquisition of EEG signals in the full spectral range, in particular of HFBs as indices of action potentials during fMRI.

Neurovascular coupling and cerebral metabolic rate of oxygen: effects of brain hypothermia

Fuechtemeier, M, Offenhauser, N, Leithner, C, Steinbrink, J, Kohl-Bareis, M, Dirnagl, U, Lindauer, U, Royl, G

Department of Experimental Neurology, Charité Universitaetsmedizin Berlin, Germany
martina.fuechtemeier@charite.de

A

Background: Neuronal activation is accompanied by a local increase in cerebral blood flow (CBF) and in cerebral metabolic rate of oxygen (CMRO2). Recent studies have raised the question whether neurovascular coupling serves local cooling of activated brain tissue. We addressed this issue by studying the effects of graded hypothermia in a rat model of neurovascular coupling in the somatosensory cortex. In addition, the quantitative relationship between basal CMRO2 and brain temperature changes (Q10 value) was determined. Methods: Whole-body hypothermia over a span of 10K was performed in 6 anesthetized Wistar rats, followed by re-warming. Using Laser Doppler flowmetry and optical spectroscopy, changes in CBF and in hemoglobin concentration were measured through a cranial window. An electrocorticogramm (ECoG) was simultaneously recorded. Spontaneous ongoing activity was measured, interleaved by blocks of functional measurements during electrical forepaw stimulation Results: Hypothermia led to a decrease of spontaneous CBF and CMRO2. The calculated Q10 value for CMRO2 was 3.0 (95% Confidence Interval: 2.6 – 3.4). Parallel to CBF and CMRO2, the power of the ECoG low-frequency-band decreased. Functional changes of CBF and CMRO2 were reduced during hypothermia as well as the amplitudes of somatosensory evoked potentials. Conclusion: 1. With optical methods, spontaneous changes in relative CMRO2 can be quantified, revealing a Q10 for CMRO2 that is well in the range of literature values. 2. During hypothermia, neurovascular coupling is preserved. This applies to CBF changes accompanying spontaneous ongoing activity as well as CBF changes during functional activation.
Keywords: hypothermia; CMRO2; Q10 value; neurovascular coupling; rat Supported by DFG and Hermann and Lilly Schilling Foundation.

Real-time analysis of caspase-3 dependent neuronal cell death

Golbs, A, Heck, N, Luhmann, H

Institute of Physiology, Johannes Gutenberg University Mainz, Germany
heckn@uni-mainz.de

B

Several markers are available to identify cells undergoing programmed cell death, but so far they are only applicable on fixed material. Therefore, no information on the kinetics of apoptosis can be obtained, although apoptosis is a dynamic cell process. Here, we describe a new technique that allows the real-time observation of the onset of apoptosis in primary neurons. Neurons are transfected with a plasmid that codes for a fluorescent protein localized in the soma. Upon activation of caspase-3, which represents the point-of-no-return in the apoptosis process, the fusion protein is cleaved and as a consequence translocates into the nucleus. The onset of apoptosis is thus visualized by translocation of the fluorescent signal from the soma to the nucleus. The translocation process was found to be specific for the apoptosis process as it correlates with the activation of caspase-3 and TUNEL staining. This tool does not require complex detection systems and allows for the first time the analysis of the kinetics of apoptosis in a simple and efficient manner.

Modelling establishment of orientation selectivity and maps in primary visual cortex

Grabska-Barwinska, A, von der Malsburg, C

International Graduate School of Neuroscience, Ruhr University Bochum, Germany
Agnieszka.Grabska-Barwinska@rub.de

Extensive studies of the primary visual cortex did not reveal all the developmental mechanisms so far. It is still a matter of debate, how exactly an orientation specificity and maps are established in the cortex of higher mammals. It was shown, this process does not require fine patterned visual input. We thus simulate the time before eye opening, that is, late prenatal and early postnatal phase. We propose that spontaneous activity at this early time has a form of broad cortical activity waves (as recorded in the retina). These are processed by large populations of cortical neurons and promote reshaping their intracortical connections (here modeled by Hebbian plasticity). At the end of learning, elongated horizontal connections allow neurons to detect orientation in the input stimuli of a low spatial frequency. Continuous arrangement of preferred orientation is the result of activating only periodically located cortical patches at any given time. This is provided by short-range intracortical interactions having the form of a Mexican hat. In contrast to models proposed so far, we do not need to assume fine cortical arrangement and mature retinotopy in the young brain, therefore our model is compatible with a large RF scatter and a variety of spatial phases observed in V1. An established orientation map has a band-pass spectrum, in contrast to Hebbian models based on reshaping afferent connections. We show that orientation maps established in our system provide a truly orientation specific information, in contrast to models based on intracortical haphazard wiring

A

Signal transduction by transmembrane amyloid precursor protein

Gralle, M, Wouters, FS

Cellular Biophysics Group, European Neuroscience Institute, Göttingen, Germany
mgralle@gwdg.de

The amyloid precursor protein (APP) is a transmembrane protein expressed ubiquitously, and at especially high levels in neurons. Regulated proteolytic processing of APP gives rise to biologically active fragments, such as the secreted ectodomain sAPPalpha and the beta-amyloid peptide. Furthermore, it has been suggested that the intact transmembrane APP has a role as signaling molecule, e.g. as adhesion receptor, which might be important for both normal synaptic plasticity and dysfunction in dementia. One of the most well-documented signaling pathways induced by transmembrane APP leads via the G protein G(o) to store-operated calcium entry. We are using fluorescence lifetime imaging microscopy and anisotropy microscopy in neuroblastoma cells to study APP-APP interactions, which might transduce an extracellular signal across the plasma membrane, APP-G(o) interactions, which have already been described to amplify the signal, and their relationship. Of special interest are mutations at codon 717 of APP that induce familial Alzheimer's disease and are constitutional G(o) activators.

B

Expression of mouse Y-box protein 3 (MSY3) in the central nervous system correlates with proliferation of progenitor cells

Grzyb, AN, Huttner, WB, Marzesco, AM, Fabel, KS, Kempermann, G, Taylor, V, Balda, M, Matter, K

Max Planck Institute of Molecular Cell Biology and Genetics, Dresden, Germany
huttner@mpi-cbg.de

A

Our group studies the cell biological mechanisms underlying the switch of neuroepithelial cells from proliferation to neurogenesis in the mouse central nervous system (CNS). Since Y-box proteins are implicated in the control of proliferation and transformation, we investigated the expression pattern and molecular function of Y-box protein 3 (MSY3, also referred to as ZONAB) in the developing and adult CNS. Here we report that MSY3 is highly expressed in the neuroepithelium prior to the onset of neurogenesis, and is downregulated concomitant with the transition of NE cells from proliferation to neurogenesis. In the adult brain, MSY3 is confined to the dentate gyrus of the hippocampus and the subventricular zone, where new neurons are generated throughout life. In the dentate gyrus, MSY3 is expressed in the subpopulation of dividing progenitors, as well as in newly generated neurons, but is absent from mature neurons. Moreover, MSY3 is expressed in nestin-positive progenitors of in vitro grown neurospheres. Thus, expression of MSY3 indicates the presence of proliferating progenitor cells. To reveal the function of MSY3 in the neuroepithelium, we examined its biochemical properties. MSY3 is present in cytoplasmic RNA-containing particles, and on a sucrose density gradient it co-fractionates with ribosomes and actively translating polysomes, suggesting a role in translation. Elucidation of the exact function of MSY3 may provide a novel link between the translational machinery and progenitor cell proliferation.

Human observer learn faster with task-irrelevant temporal order

Hamid, O, Braun, J

Cognitive Biology, Otto-von-Guericke University, FNW/IBIO Haus 1, Magdeburg, Germany
hamid@nat.uni-magdeburg.de

B

We are interested in incidental learning of task-irrelevant context and its possible contribution to cognitive flexibility. The role of task-irrelevant temporal context in the learning of arbitrary visuo-motor associations has so far been studied mostly in primates (e.g., Miyashita, Nature 335:817-820, 1988; Yakovlev et al., Nat Neurosci 1: 310-317, 1998). We developed a paradigm to study this phenomenon in human observers. Eight individuals viewed highly distinguishable, fractal objects and learned (by trial and error) to react with one of four motor responses. One response was rewarded for each object. Certain objects were consistently preceded by other objects, others lacked this temporal context. Otherwise, all objects shared the same frequency and repetition probability. The rate of association learning was significantly higher for objects with consistent predecessors than in objects without consistent temporal context, demonstrating that task-irrelevant temporal context does affect learning in humans. Moreover, the learning rate was also higher than for objects with consistent successors, indicating an asymmetry between future and past events. This may suggest that temporal context affects the learning process directly, rather than indirectly by attracting attention (or other kinds of resources). An ideal learner mode, the responses of which are governed by the sum total of its prior experience, cannot account for these results. We hypothesize that humans use temporal context as a heuristic strategy to simplify complex learning situations.

Visualizing autoimmune processes leading to neural damage in a rodent model for Multiple Sclerosis – focusing on the impact of different T cell subpopulations.

Herz, J, Zipp, F, Brandt, AU, Siffrin, V, Boldakowa, N, Radbruch, H, Asselborn, N

Charité - University Medicine Berlin, Ceclilie-Vogt-Clinic for Molecular Neurology and Max-Delbrück-Center for Molecular Medicine, Molecular Neurology Group, Berlin, Germany
frauke.zipp@charite.de

Introduction: Experimental Autoimmune Encephalomyelitis (EAE) is a demyelinating disease of the central nervous system (CNS), which serves as a model for the human disease Multiple Sclerosis. The initiation of chronic neuroinflammtion is supposed to be mediated by a perivascular accumulation of mononuclear cells preceding the actual infiltration of CNS parenchyma, resulting in demyelination and neuronal damage. Mechanisms underlying these processes and the contribution of different CD4 T cell subsets and CD8 T cells directly in the CNS are not well defined. Methods: We characterized migration patterns of distinct effector as well as regulatory T cell subpopulations in living brain slices by Multi-photon-microscopy. To clarify underlying mechanisms we further investigated the impact of specific chemokine receptor and adhesion molecule blockade involved in migration processes. Results: First analysis revealed a highly motile migration along vessels for differentiated Th1, Th2, Th17 and IL-10-producing regulatory CD4 cells, whereas CD8 T cells move randomly through the whole parenchyma. Specific blockade of CXCR4 on T cells disrupts the typical vessel-associated migration of CD4 T cells. Conclusion/Outlook: Interestingly the observed selective CD4 T cell-vessel-interaction in brain tissue seems to be partly mediated by the T lymphocyte chemoattractant CXCL12. The current further steps of our work are to visualize the interaction of different regulatory and effector T cell populations in the CNS and to verify in vivo relevance of our results by intravital Imaging.

A

Molecular Mechanisms underlying the formation of Juxtaparanodes in myelinated nerve fibers

Horresh, I, Peles, E

Department of Molecular Cell Biology, Weizmann Institute of Science, Rehovot,Israel
ido.horresh@weizmann.ac.il

Myelinated axons are characterized by the formation of functional domains along the nerve, including the node of Ranvier, the paranodal junction and the Juxtaparanodal region (JXP). This molecular architecture enables efficient propagation and rapid transmission of action potentials along the nerve fiber. The Juxtaparanode include a protein complex consisting of the adhesion molecule Caspr2, TAG-1, K+ channels of the Shaker-type Kv1, and scaffold adaptor proteins. Such adaptor proteins are generally divided to two: members of the PDZ-MAGUK family (PSD-93 and PSD-95) and a member of band 4.1 family of cytoskeleton-binding proteins (protein 4.1B). The goal of this study is to elucidate the molecular mechanisms that underlie the formation of the juxtaparanode and to investigate the relations between the molecules comprising this site. In order to accomplish this goal we have implemented genetic manipulations in mice and generated knock-out and transgenic models for most of the juxtaparanodal components. Analysis of these murine models suggests that the complex is probably organized/assembled in a different location and being stabilized to juxtaparanodes of myelinated axons. The role of PDZ-binding proteins that are found clustered to juxtaparanodes (PSD-95 and PSD-93) remains elusive, as they do not play essential role in the physical association or the targeting of the complex to its native site. We demonstrate that TAG-1, a GPI-anchored member of the immunoglobulin superfamily expressed by both the myelinating-Schwann cell and the underlying axon, serves as a navigating compass that allows the proper targeting of entire complex to juxtaparanodes.

B

Albumin mediated damage cascade during neocortical epileptogenesis

Ivens, S, Bechmann, I, Kaufer, D, Heinemann, U, Friedman, A

Institute for Neurophysiology, Charité, Berlin, Germany
sivens@gmail.com

Focal cortical epilepsy is common following different brain insults such as trauma, ischemia and infectious diseases. In many of these insults the blood-brain barrier (BBB) is disrupted. We have recently shown that prolonged cortical BBB opening is associated with high amplitude, slow electroencephalographic activity in humans and hypersynchronized epileptiform activity in rat cortex. However, the mechanisms underlying epileptogenesis after BBB disruption are not known. We used a rat model to disrupt the BBB by application of the bile salt deoxycholic acid or expose the rat cortex to serum albumin in-vivo. Here we show that astrocytic activation occurred within the first 24 hours after treatment, while neuronal epileptiform activity was noted from day 4. Extracellular recordings in-vitro using ion-sensitive microelectrodes showed that astrocytic activation was associated with reduced K+ buffering due to a decrease in Ba2+ sensitive potassium current, suggesting decreased inward rectifying K+ current. PCR analyses and immunostainings confirmed the down regulation of KIR4.1 channels. Reduced K+ buffering lead to potassium accumulation during neuronal activity, subsequently causing NMDA-receptor dependent neuronal hyperexcitability. Serum albumin is rapidly and specifically transported into astrocytes suggesting that it may be a signal for astrocytic activation. Albumin transport into astrocytes was found to be receptor mediated, and could be blocked by antibodies against TGF-beta receptors. Blocking albumin uptake in-vivo significantly reduced the likelihood of epileptogenesis. Our results stress the importance of interactions between brain's blood vessels, astrocytes and neurons in the pathogenesis of focal neocortical epilepsy.

The survival and membrane properties of CA1 hippocampal neurons depend on normal levels of activity in the CREB pathway

Jancic, D, Barco, A, Lopez de Armentia, M, Lujan, R, Kandel, ER, Barco, A

Instituto de Neurosciencias, CSIC, San´t Joan d´Alacant, Alicante, Spain
abarco@umh.es

The CREB pathway plays a significant role in synaptic plasticity and higher cognitive functions. Furthermore, previous studies showed that disruption of the CREB protein leads to neurodegeneration. Here, we investigated the role of CREB in neuronal survival in the mammalian forebrain by comparing the effects of enhanced versus reduced CREB-dependent gene expression. We are using the forebrain-specific tetracycline-regulated gene expression system (tetO/CaMKII-tTA system) to produce double-transgenic mice. To study the consequences of enhancing CREB-dependent gene expression, we use mice expressing a constitutively active form of CREB (VP16-CREB). On the other hand, we investigate the consequences of reduced CREB-dependent gene expression in A-CREB mice, which express a dominant negative CREB variant. Both transgenes are highly expressed in specific subregions of the hippocampus, and the layers 2/3 and 5 of the cerebral cortex. Significant cell loss in the CA1 area is observed in both mutants several weeks upon the transgene induction. Additionally, A-CREB animals show reduced cerebral cortex. In both lines, we found CA1 pyramidal neurons positive for neurosilver staining and active gliosis. However, the gliosis in the A-CREB hippocampus is restricted to CA1 area, while in the VP16-CREB it is present all over the hippocampus at higher extent as shown by immunohistochemistry and the electron microscopy. Only A-CREB CA1 neurons are positive for apoptotic markers, and electronic microscopy reveals the presence of "dark" neurons. Moreover, VP16-CREB animals develop epileptic attacks that frequently lead to their death. Conversely, A-CREB mice have normal life span and no epileptic attack was ever detected in this transgenic line. Our results would indicate that only fine-tuned regulation of CREB-dependent gene expression can promote neuronal survival

Influence of chronic FGL administration on neurogenesis of NCAM deficient mice

Jürgenson, M, Zharkovsky, A, Aonurm, A

Department of Pharmacology, University of Tartu, Estonia
aleksander.zarkovski@ut.ee

Neural cell adhesion molecule (NCAM) is a membrane-associated glycoprotein expressed on the surface of neurons and glial cells. NCAM plays important role in morphogenesis of the nervous system, synaptic plasticity in relation to learning and memory consolidation. Reduced brain plasticity can be the factor of reduction of adult neurogenesis. Recently a peptide derived from a region in NCAM interacting with the third Ig module of the Fibroblast Growth Factor Receptor (FGFR) have been identified. This FGL peptide corresponds to the FG loop region of the second F3 module of NCAM. The aim of the present study was to determine wheather the FGL could affect the neurogenesis in adult NCAM knock-out (KO) mice. In study were examined proliferating cells in adult mice DG by labeling newly generated cells with BrdU combined with immunohistochemisry for markers of neurons and glia. This study revealed that NCAM deficient animals have less BrdU positive survived cells in granular cell layer, and the FGL does improve the survival of the cells. However were also shown that FGL rise the levels of BrdU positive cells in GCL and also in Hilus. FGL also rise the levels of BrdU positive cells in Hilus in control animals. It can be assumed, that NCAM KO animals do have decrease in neurogenesis and FGL does improve that. However the further experiments are needed to explain the effect of FGL.

A

Modulation of the immune response by NK cells in neuroinflammation

Kisiswa, L, Hamann, I, Zipp, F, Infante-Duarte, C

Cecilie-Vogt Clinic for Molecular Neurology, Neuroscience Research Center, Charité University Hospital Berlin, Germany
lilian.kisiswa@charite.de

Multiple sclerosis (MS) is a chronic inflammatory disorder of the central nervous system (CNS). Recent studies indicate that cells of the innate immune system such as microglia cells and natural killer (NK) cells are involved in the disease. We previously demonstrated that the frequency of NK cells expressing the chemokine receptor CX3CR1 is decreased in MS patients. It has also been reported that this receptor is essential for migration of NK cells to the CNS and seems to be involved in neuroprotective activity of microglia. Based on this, we hypothesize that these NK cells may exert regulatory functions in the context of neuroinflammation. Currently, we are investigating whether CX3CR1+ and CX3CR1- NK cells do regulate the immune response differentially by modulating the activity of antigen presenting cells (APC) in distinct ways. We are focusing on the modulation of microglial activity by CX3CR1+ and CX3CR1- NK cells and of possible direct – perhaps neuroprotective - interactions of NK cells with neurons via the CX3CR1/CX3CL1 system. With this study we aim to understand a part of the interaction of innate and adaptive immunity in neuroinflammation by clarifying the cross-talk between NK cells and peripheral and CNS antigen presenting cells.

B

Near-infrared fluorescence imaging of stroke pathophysiology

Klohs, J, Steinbrink, J, Bourayou, R, Grafe, M, Graf, K, Kronenberg, G, Greger, K, Stelzer, E, Lindauer, U,Dirnagl, U, Wunder, A

Experimental Neurology, Deutsches Herzzentrum Berlin,European Molecular Biology Laboratory, Berlin, Germany
jan.klohs@charite.de

Non-invasive imaging of CD40 receptor expression could provide a powerful tool to diagnose stroke-induced inflammation, to assess disease progression, to stratify patients for therapy, and to monitor response to therapeutic intervention. In the present study, we utilised non-invasive planar near-infrared fluorescence (NIRF) imaging to detect stroke-induced brain inflammation in a mouse stroke model. A monoclonal antibody against CD40 labeled with the NIRF dye Cy5.5 was injected intravenously 96 hours after transient middle cerebral artery occlusion (MCAO) in mice. NIRF imaging was performed 16 hours after injection of the compound. In MCAO-mice, that received the Cy5.5-labeled antibody against CD40, high fluorescence intensities were detected through the skull and skin over the affected hemisphere. Corresponding ex vivo NIRF images of the brain and brain sections confirmed localisation of the fluorescence in the ischemic territory. MCAO-mice receiving Cy5.5-labeled IgG as a control did not show fluorescence enhancement over the ischemic hemisphere in vivo. Single Plane Illumination Microscopy (SPIM) of brain sections demonstrated vascular and parenchymal distribution of the CD40 targeting contrast agent. Confocal analysis of tissue sections after immunhistochemistry revealed a co-localisation of the parenchymal Cy5.5-labeled CD40 antibody with activated microglia and monocytes. Co-injection experiments with the green fluorescent cell tracker 6-carboxylfluorescein diacetate into the spleen of MCAO-mice revealed the presence of blood-derived mononuclear cells that were labelled with the CD40 targeting contrast agent. In conclusion, the results show that non-invasive NIRF imaging can be used to visualize stroke-induced brain inflammation in mice with high sensitivity and specificity.

A possible link between endocannabinoids and CCK in stress mechanisms

Kurrikoff, K, Inno, J, Vasar, E

Institute of Physiology, University of Tartu, Estonia
kaidokur@ut.ee

Stress Induced Analgesia (SIA) is probably most important endogenous mechanism mediating analgesia. Recently, attention has shifted towards endocannabinoids in relation to analgesia mechanisms. Evidence has also gathered showing that cannabinoid CB1 receptor is colocalised in the cellular level with cholocystokinin (CCK) in many brain areas. However, its physiological relevance is unknown. We explored the putative CCK-endocannabinoid interaction in SIA mechanisms, using CCK2 receptor knockout (CCK2-/-) mice. SIA was induced via electric footshock and measured via tail-flick. A CB1 antagonist Rimonabant dose dependently blocked development of SIA in wild-type mice, but exerted no effect to CCK2-/- mice. This suggests that CCK2 receptor is necessary for cannbinoid signalling through CB1 receptor. We also analysed gene expression patterns after stress administration. Genes included: CCK, CCK2, endocannabinoid ligand synthesising and degrading enzymes, CB1. Brain areas included: lumbal spinal cord, brainstem, midbrain, striatum (caudate putamen), mesolimbic area (n. accumbens, olfactory tubercle). In wild-type animals, stress induced upregulation of the CCK system in two CNS areas: lumbal spinal cord and mesolimbic area, where we saw increase of CCK2 receptor mRNA. Wild-type animals also displayed strong endocannabinod activation in response to stress in the same two CNS areas, where we saw upregulation of CB1, 2-AG and anandamide synthesizing enzymes. In contrast, in the CCK2-/- animals, stress induced none of these cannabinoid-related changes. We hypothesize that endogenous CCK tone modulates the activation level of endocannabinoids. Current paper may be the first step towards elucidating the essence of CCK-cannabinoid cross-talk and its behavioural importance.

Functional architecture of orientation preference in the developing visual cortex

Leong, J, Huebener, M, Leinweber, M, Mrsic-Flogel, T, Bonhoeffer, T

MPI of Neurobiology; Cellular and Systems Neurobiology, Martinsried, Germany
mark@neuro.mpg.de

Many neurons in the visual cortex respond preferentially to specific ranges of stimulus orientations. In higher mammals, a neuron's preferred orientation is related to its neighbors' by strict spatial rules, thereby effecting a systematic map of orientation preference across the cortical surface. Still, the development of this functional organization is only partially understood. In the ferret, optical imaging of intrinsic signals revealed stably emerging clustering of similarly tuned cells around the time of eye opening. However, the method could not resolve individual neurons' responses, rather only population activity. By contrast, orientation selective single units were identified electrophysiologically more than a week before eye opening, but they were sampled too sparsely to reveal their spatial organization. Here using two-photon calcium imaging, we map orientation preference at subcellular resolution in the developing ferret visual cortex. As early as ten days before eye opening, we find a high proportion of visually responsive neurons distributed uniformly in the cortex. Surprisingly, all such neurons at this earliest time point strongly prefer horizontal stimuli. Days later around the time of eye opening, all orientation preferences are represented, and neurons are clustered according to preferred orientation, but most visually responsive neurons are broadly tuned. From here on, maps emerge as orientation tuning sharpens. Our findings suggest that, during development, many neurons undergo a dramatic shift in orientation preference. The early bias toward the horizontal orientation could be generated by neuronal activity, or reflect activity-independent developmental mechanisms such as anisotropic connectivity during early axon ingrowth.

A

Effects of a 5-day treatment with vinclozolin on the hypothalamo-pituitary axis in young-adult male rats

Loutchanwoot, P, Wuttke, W, Jarry, H

Dept. of Clinical and Experimental Endocrinology, Faculty of Medicine, University of Göttingen, Germany
panida@med.uni-goettingen.de

Vinclozolin (VCZ), a potent anti-androgenic fungicide, has recently attracted much attention because of its potential adverse effects on human health. However, despite its known interference with reproductive function, little efforts have been made to investigate the possible impact of VCZ on a variety of brain functions, particularly the neuroendocrine activity. Therefore we examined the effects of VCZ on gene expression profiles in the brain (MBH/ME, MPOA/AH, striatum, hippocampus) and pituitary of young-adult male rats. 4-month-old male Sprague-Dawley rats were treated daily by gavage for 5 days either with the vehicle olive oil (1 ml/rat), or VCZ (150 mg/kg bw/day). At day 5, animals were sacrificed. The trunk blood was collected and brains and pituitaries were dissected. Levels of serum hormones and gene expressions were measured by RIA and qRT-PCR, respectively. Our results revealed that i) VCZ decreases epididymis weights, and increases serum LH and T levels; ii) VCZ affects hypothalamic expression of the GnRH and estrogen receptors (ER); iii) In the extrahypothalamic areas, VCZ altered expression of the androgen receptor (AR), ER, 5alpha-reductase and aromatase; iv) In the pituitary, VCZ up-regulated expression of the GnRH receptor, LH-beta, gonadotropin alpha-subunit, and TERP-1/-2. Taken together, we report the first evidence that VCZ interferes with the neuroendocrine activity of the hypothalamo-pituitary axis in young-adult male rats. It is suggested that in vivo VCZ is not a 'pure' antiandrogen, since it exerts mixed AR antagonistic/ER agonistic actions in the CNS and pituitary.

B

Selective expression of Wfs1 protein in the central extended amygdala and its implications on behavioural responses

Luuk, H, Innos, J

Department of Physiology, University of Tartu, Estonia
hendrik.luuk@ut.ee

Mutations in the coding region of WFS1 gene cause Wolfram syndrome (DIDMOAD) – a rare autosomal recessive disorder, diagnosed on the basis of early-onset diabetes mellitus and optic atrophy. Wolfram syndrome patients display high clinical pleiomorphism with symptoms ranging from hearing-loss and diabetes insipidus to renal tract abnormalities, mental retardation and psychiatric disorders. In the light of common symptoms of Wolfram syndrome patients, pancreatic beta-cells and the nervous system are clearly most susceptible to the loss of Wfs1 function. Pancreatic beta-cells of Wfs1-deficient mice exhibit impaired glucose stimulated insulin secretion and disturbances in endoplasmic reticulum Ca2+ homeostasis. The aim of our study was to provide a detailed overview of the distribution of Wfs1 protein in the mouse brain and to conduct a preliminary study of the role of Wfs1 protein in behavioural and neuroendocrine responses. METHOD. Wfs1-deficient mice were generated by replacing over 60% of Wfs1 coding sequence with LacZ-cassette. Distribution of Wfs1 protein was revealed by X-gal staining and immunohistochemistry. Homozygous Wfs1 mutant mice were subjected to intraperitoneal glucose tolerance, dark-light and elevated plus-maze tests. RESULTS. We detected selective Wfs1 expression in central extended amygdala and in selected areas of the forebrain and brainstem. Wfs1 mutant mice displayed increased sensitivity to intraperitoneally injected glucose and behaviours indicative of increased anxiety and lower stress tolerance. CONCLUSION. Disruption of Wfs1 gene in mice induces symptoms relating to the impairment of pancreatic beta-cell function and pathological anxiety. Wfs1 protein is a selective marker for central extended amygdala.

Expression of Nkx2.1 in postnatal mouse brain

Magno, L, Krude, H, Nitsch, R, Naumann,T

Institut für Zell und Neurobiologie des Centrums für Anatomie, Charitè Campus Mitte, Charitè Universitätsmedizin- Berlin, Germany
lorenza.magno@charite.de

Coordinated movement requires the intact function and structure of two telencephalic nuclei: the striatum and the pallidum, which together form the basal ganglia. Defects in the basal ganglia lead to disturbed movements clinically described as choreoathetosis, a syndrome caused by different genetic alterations. One of the transcription factors known to be involved in development of this structures is Nkx2.1. This gene is expressed in the hypothalamus and in the medial ganglionic eminence (MGE) of the developing mouse brain. The MGE produces striatum and pallidum and it gives rise to the majority of telencephalic interneurons which tangentially migrate to their final target. Complete deletion of Nkx2.1 results in a distinct brain defect affecting the pallidum, several interneuron populations and the hypothalamus. However little is known about the postnatal expression of this transcriptional factor, therefore, in this work, we analysed Nkx2.1 protein and mRNA in the postnatal mouse brain. We found a strong immunolabelling for Nkx2.1 in the striatum, in the pallidum, in the septal complex, in the basal forebrain, in the pre-optic area, in the hippocampus and in most hypothalamic nuclei, especially in the mammillary bodies, in the lateral ventromedial nucleus, in the arcuate nucleus and in the median eminence. Nkx2.1 expressing cells are a highly heterogeneous population, as demonstrated by the co-labelling with markers for both projection neurons and interneurons (e.g. p75 in the septal complex and parvalbumin in the striatum). This observations suggest a broader function for this gene than what has been described so far.

Deletion of MeCP2 depresses GABAergic synaptic transmission in early postnatal stage of mouse

Medrihan, L, Tantalaki, E, Aramuni, G, Dudanova, I, Missler, M, Zhang, W

Institute of Physiology, University of Göttingen, Germany
lmedrik@gwdg.de

Rett syndrome is a progressive mental disorder with onset of 6 to 18 month after the birth. Loss-of-function mutations in the X-linked gene encoding the transcriptional repressor methyl-CpG-binding protein 2 (MeCP2) are responsible for Rett syndrome. Until now, little is known about the neurobiology of Rett syndrome and the function of MeCP2 in CNS. In the present study, we tested whether deletion of MeCP2 gene would lead to an impairment of synaptic transmission in younger mutant mouse (P7), long before the manifestation of characteristic symptoms (>P30). MeCP2 deficient mice showed no obvious physiological phenotype and no difference in ventilation at postnatal age P7 (data not shown). Despite the inconspicuous phenotype, our investigation revealed that, in the MeCP2 KO mice, GABAergic synaptic transmission is reduced in the brainstem respiratory network.This effect is accompanied by a reduction in the number of GABAergic synapses and changes in the subunit composition of remaining synapses.These results suggest that GABAergic synapses are a primary target of the MeCP2 gene regulation during postnatal development. The early presence of defects in inhibitory neurotransmission may provide a rationale for the timing of future therapeutic interventions in Rett syndrome patients.

A

Investigating structural and dynamical properties of the nervous system of the nematode C. Elegans

Menche, J, Valleriani, A, Lipowsky, R

MPI of Colloids and Interfaces, Department of Theory and Bio-Systems, Golm, Germany
menche@mpikg.mpg.de

We study the nervous system of the nematode Caenorhabditis Elegans, whose complete structure has been reconstructed from serial section electron micrographs (White et al. 1986). In the adult hermaphrodites it consists of 302 nerve cells that are connected by approximately 7000 synapses (chemical connections) and 800 gap junctions (electrical connections). From morphological studies, the neurons can be divided into three groups: sensory neurons, interneurons and motoneurons. Using concepts from graph theory, we analyze the topology of the neural network with respect to the different functions of the neurons and the different types of connections between them. Furthermore, we propose a dynamical model, that takes the distinct mechanisms of electrical and chemical coupling into account and investigate general properties of the information processing in the system.

B

Phase oscillations: a major key to understand disturbances in early information processing

Mueller, R[1], Brockhaus-Dumke, A[2], Popovych, S[2], Kuepper, T[1], Klosterkoetter, J[1]

[1]Department of Psychiatry and Psychotherapy, University of Cologne, Germany
[2]Mathematical Institute, University of Cologne, Germany
ralf.mueller@uk-koeln.de

Recent results concerning schizophrenia suggest disturbances in early information processing, where especially the thalamo-cortical circuit is involved. Because schizophrenia has been conceptualized as a disconnectivity syndrome (Harrison 1999), the precise timing of coupled brain areas is of major interest. We analyzed EEG data (from an auditory double click paradigm) of 32 schizophrenia patients and 32 age and sex matched controls with time-frequency methods (complex wavelets). For four frequency bands (gamma, beta, alpha and theta) we analyzed the time-course of the phases of the oscillations, which correpond to the post-synaptic potentials of synchronized neural populations. Extending a two-phase oscillator model of Tass (2004), we construct a mathematical model of four connected phase-oscillators, representing components of the thalamo-cortical circuit, with one of them describing the oscillation of the thalamus. The stimulus-evoked phase alignment in the two groups differed significantly in the alpha- and beta-frequency band in a time range of 25-100 msec post stimulus and 50-500msec respectively. Simulations of the thalamo-cortical model showed a phase alignment (1) in the same frequency bands and (2) during similar time intervals as in real EEG data. The phase analysis shows detailed differences between controls and schizophrenia patients and is good suited to detect differences in early informations processing. In a second study we also showed, that this method is superior to analyses of averaged event-related potentials (ERPs). The simulations from the mathematical model can give new insights into the understanding of real EEG/MEG data and the underlying time-adjusted neuronal processes.

References: Harrison, P.J., 1999. The neuropathology of schizophrenia. A critical review of the data and their interpretation. Brain 122 (Pt 4) 593-624. Tass PA (2004) Transmission of stimulus-locked responses in two coupled phase oscillators. Phys Rev E 69: 051909.

Clostridium botulinum exoenzyme C3 acts as neurotrophic factor on human neurons

Mühlenstädt, C, Hofmann, F, Brandt, R, Just, I

Dep. of Toxicology, Medical School Hannover, Germany
hofmann.fred@mh-hannover.de

Clostridium botulinum exoenzyme C3 (C3bot) is a member of the ADP-ribosyltransferase family to specifically inactivate RhoA, B and C. C3 exoenzymes are widely used as pharmacological tools to analyze the intracellular functions of Rho GTPases. Beside many other effects, Rho GTPases serve as key regulators in various aspects of neuronal development. This includes neurite outgrowth, differentiation, and axon pathfinding. Recently, we demonstrated in murine hippocampal primary neurons that extracellular application of C3bot and its enzymatically inactive mutant C3botE174Q in nanomolar concentrations induced axonal growth and branching. In order to extend these findings we used the human teratocarcinoma cell line NT2, which can be differentiated by retinoic acid treatment into postmitotic, terminally differentiated and polarized neurons (NT2-N). Application of C3bot or C3botE174Q led to a significantly increased axonal growth in NT2-N cells compared to non-treated control cells. Further truncation of the holo-C3 (211 amino acids), revealed a small fragment consisting of 30 amino acids (C3bot154-182) able to induce the same effects. In contrast, the fragment C3bot181-211 did not induce axonal growth and was therefore used as a negative control. In combination with the observations in murine hippocampal primary neurons these findings suggest a novel neurotrophic function of C3bot that is not mediated by direct inactivation of RhoA. Furthermore, the low concentration required to cause axonotrophic effects suggests a ligand-like interaction with a membrane receptor. Institut für Toxikologie der Medizinischen Hochschule Hannover, Carl-Neuberg-Str. 1, D-30625 Hannover; Abteilung Neurobiologie der Universität Osnabrück, Barbarastr. 11, D-49076 Osnabrück

Downregulation of the scaffolding microdomain proteins Reggie/ Flotillin impairs axon regeneration of zebrafish retinal ganglion cells

Munderloh, C, Wiechers, M, Stuermer, C.A.O.

Dept. Biology, University of Konstanz, Germany
christina.munderloh@uni-konstanz.de

Reggie-1 and -2 (alias Flotillin-2 and -1) were discovered in our lab as two proteins being upregulated during axon regeneration in retinal ganglion cells of goldfish and rat (Schulte et al., 1997; Lang et al., 1998). These observations suggested a function in axon regrowth. To analyse the question if the reggie proteins are causally linked to axon regeneration, we used the zebrafish as a model system with a robust regeneration capability of its central nervous system. Via application of reggie specific morpholinos to the transected optic nerve in vivo, we achieved a downregulation of reggie proteins in the retinal ganglion cells. To quantify the regeneration capability after reggie knockdown, we prepared retina mini-explants and counted the number of axons per mini-explant. Reggie morpholino-treated retinae showed a significant reduction of axons per explant of 30% compared with control morpholino-treated retinae. As suggested by their prominent reexpression upon lesion, the reggies represent neuron intrinsic factors for axon regrowth/ regeneration. Supp. by TRSFB11

A

Polarisation of oligodendrocytes leads to specific targeting of MBP to the plasma membrane

Nawaz, S, Nave , KA, Simons, M

MPI for experimental Medicine, Göttignen, Germany
nave@em.mpg.de

In the nervous system, neurons extend their axons often over long distances, to form synapses with others. This developmentally distinct process is mediated by various molecules. These molecules serve as guidance cues for the neuronal process. They bind to specific receptors on the growth cone of the developing axon and induce downstream signaling cascades, that lead to actin reorganization and axon outgrowth. The result is a sophisticated and dynamic set of cues that enable a growth cone to successfully navigate to its destination, modulating its response to changing environmental cues. It has been shown that the first molecular determinants of neuronal polarity thus far appear to be PI3-kinase and Rap1B, which act upstream of Rho GTPase Cdc42. Recent reports show the involvment of IGF-1 in axonal polarity. The activation of the IGF-1 receptor leads to PI3-kinase activation and its product PtdIns (3,4,5)P3 (PIP3) at the leading edge. Myelinating glia in the CNS are oligodendrocytes. In development they were shown to first migrate to a specific region and then differentiate and form multiple processes. These processes then extend towards the target axon to be myelinated. Our aim is to find the molecular mechanism, which underlies the pathfinding of the oligodendrocyte process. The involvment of PIP3 in process formation and guidance of axonal growth cone, led us to the hypothesis that a similar mechanism might underlie oligodendroglial process formation and guidance. We found PIP3 at the tip of growing processes when oligodendrocyte precursor cell line was co-cultured with neurons. We were able to reverse this effect by inhibition of PI3-kinase with the specific inhibitor Wortmannin. The morphology of the Olineu cells was also altered when treated with Wortmannin.

B

Sip1 regulates proliferation, differentiation and migration in the embryonic mouse neocortex

Nityanandam, A, Tarabykin, V, Miquelajauregui, A, Seuntjens, E, Huylebroeck, D
Max Planck Institute for Experimental Medicine, Göttingen, Germany
Flanders Interuniversity Institute of Biotechnology (VIB7)
University of Leuven, Leuven, Belgium
tarabykin@em.mpg.de

Sip1, or Smad- interacting protein 1, is a transcriptional repressor that plays a role in several neurodevelopmental events. Mutations in Sip1 are known to cause the Mowat- Wilson Syndrome in humans. In the developing mouse cortex, Sip1 is expressed mostly in the differentiating and post- mitotic fields of the cortex and weakly in the proliferative zones. Our analysis of conditional knockout of Sip1 in the cortex revealed several defects in the structure of the neocortex. These include depletion of deep layers of the cortical plate, and premature generation of upper layer neurons. We also found abnormal and ectopic proliferation, decreased and displaced Reelin, increased astrogliogenesis, and hampered migration of neurons born in the neoortex. Expression of the Wnt antagonist Sfrp1 was ectopically upregulated in the entire neocortex, leading us to the hypothesis that Sip1 negatively regulates the expression of Sfrp1 and that ectopic Sfrp1 is responsible for some of the defects seen in the cortex. We also found a reduction in the expression of JNK, an effector of the non- canonical Wnt signaling pathway. When we deleted Sip1 exclusively in postmitotic cortical neurons, we were able to reproduce several early as well as late phenotypic effects mentioned above. We therefore believe that these phenotypic effects might be due to non- cell autonomous effects of Sip1 deletion. We are currently investigating this hypothesis, and also working towards identification of other targets of Sip1 in the neocortex and the molecular cause of the migration defects seen in the Sip1 conditional mutant.

Multi-stable perception: more alternations than meets the eye

Pastukhov, A, Braun, J

Otto-von-Guericke University, Magdeburg, Germany
alexander.pastukhov@nat.uni-magdeburg.de

Visual perception, typically very robust and stable, starts to fluctuate if confronted with ambiguous inputs, like in the case of multi-stable stimuli. However, it can be stabilized by presenting pattern intermittently: in this case dominant percept tends to persist across lapses in stimulation. In the presented study we simultaneously monitored time-evolution of both phenomenal appearance and memory-state of an ambiguously rotating sphere (kinetic-depth effect stimulus). To achieve this, observers reported on a continuously presented KDE pattern, which was interrupted after every second alternation. After each interruption, initial state of the ambiguous stimulus reflected current memory state. We found that it depended on recent history of perceptual alternations, specifically on the relative duration of both percepts. This dependence, which goes beyond the latest instantaneous appearance, is in a sharp contrast with memory-less time-course of phenomenal appearance. We also found that observed memory was surprisingly stable, reversing its state only after a very pronounced imbalance in favor of the last dominant percept. As a consequence, memory and perceptual states often diverged. Observed dissociation shows that ambiguous patterns engage at least two representations, which reverse independently: one controls phenomenal appearance and the other holds cumulative memory of past appearance. Thus multi-stable perception is more complex than previously thought and exhibits more alternations than meets the eye.

Distribution of LSAMP protein expressing neurons in the central nervous system of the mouse

Philips, MA, Luuk, H, Heinla, I, Koks, S, Vasar, E

Department of Physiology, University of Tartu, Estonia
maphilips@gmail.com

Limbic system-associated membrane protein (LsAMP) is a 68-kDa heavily glycosylated protein, structurally characterized by three immunoglobulin domains. LsAMP protein is expressed on the surface of somata and proximal dendrites of neurons where it integrates via a GPI anchor. Several works have proposed that LsAMP protein is limbic system specific expressing in cortical and subcortical regions of the limbic system. LsAMP knockout targeting construct was created by inserting LacZNeo cassette immediately after Lsamp 1b promoter. NLS (nuclear localization signal) was included to LacZ gene which enables to see concentrated LacZ staining in cell nuclei. LsAMP distribution in whole mammalian brain was originally described in rat, with immunohistochemical (Levitt, 1984) and in situ hybridization (Reinoso et al, 1996) labeling. Main difference in our data compared with previous data about LsAMP expression is what we see in cortex. LacZ positive cells label almost exlusively sensory areas of the cortex and the strongest staining is present in barrel field. Our results reveal that Lsamp 1b promoter is transcriptionally most active in cell nuclei that belong to sensory pathways and there are some sensory pathways that can completely mapped by Lsamp-LacZ staining such as auditory, somatosensory and visual pathway. Several LacZ positive anatomical areas that do not belong to sensory pathways: septum, subfornical organ, bed nucleus, dorsal endopiriform nucleus, dorsal peduncular cortex, suprachiasmatic nucleus, amygdala, hypothalamic area, arcuate nucleus, cerebellum. We propose that our data is the first endogenously derived information that besides several limbic areas Lsamp 1b promoter is strongly specific to sensory nuclei.

A

Toll-like receptors modulate adult neurogenesis

Rolls, A, Schwartz, M, Shechter, R, London, A, Ziv, Y, levy, R, Ronen, A, Cohen, H

Weizmann Institute of Science, Rehovot, Israel
michal.schwartz@weizmann.ac.il

Neurogenesis, the formation of new neurons in the adult brain, is considered to be one of the mechanisms by which the brain maintains its lifelong plasticity in response to extrinsic and intrinsic changes induced by stress, physical activity, and learning. We found that Toll-like receptors (TLRs), a family of highly conserved pattern-recognizing receptors, known mostly as a key component of the innate immune activity in mammals, regulate adult hippocampal neurogenesis. We discovered that TLRs are expressed on adult neural stem/progenitor cells (NPCs). Our data further indicates that TLRs are key regulators of cell fate decision in NPCs. Different members of this family of receptors exert distinct and often opposing functions in NPC proliferation and differentiation both in vitro and in vivo. We showed that TLRs affect NPCs via MyD88 and NFκB-dependent pathway. This data emphasizes the novel involvement of a family of receptors capable of sensing variations in the patterns of the extracellular environment, and might therefore be part of the mechanism responsible to the sensitivity and the dynamic variations in the levels of adult neurogenesis.

B

Amyloid-beta peptide modulates Homer1b clustering through NMDAR, VDCC and PI-3K dependent mechanisms

Roselli, F, Almeida, OFX, Riedemann, MT, Defazio, G, Livrea, P, Hutzler, P

MPI for Psychiatry, Munich, Germany
osa@mpipsykl.mpg.de

Amyloid-beta peptide modulates Homer1b clustering through NMDAR, VDCC and PI-3K dependent mechanisms Francesco Roselli (1,2), Marie-Therese Riedemann (1), Giovanni Defazio (2), Paolo Livrea (2), Peter Hutzler (3) and Osborne Almeida (1) (1)Max-Planck Institute for Psychiatry, 80804 Munich, Germany (2)Department of Neurological ad Psychiatric Sciences, University of Bari, Bari, Italy (3) Institute of Pathology, GSF-Forschungszentrum für Umwelt und Gesundheiz, Neuherberg, Germany In its early stages, Alzheimer´s disease (AD) is considered a disease of synapses. In its soluble form, i.e. before aggregation into form insoluble plaques amyloid plaques (a pathological hallmark of AD), amyloid-beta peptide (Ab) modulates several aspects of synaptic function, resulting in the endocytosis of NMDA and AMPA receptors, the degradation of the post-synaptic scaffold proteins PSD-95, and alterations the number of spines. Little is known about the influence of Ab on other post-synaptic structures. We recently found that Ab alters the clustering pattern(?) of Homer 1b/c, a scaffold protein involved in the trafficking and signal transduction of metabotropic glutamate receptors (mGluRs). Within 1 h of applying Ab, we observed significant and dose-dependent decreases the size of Homer clusters. This could be blocked by both NMDAR antagonists and voltage-dependent calcium channel (VDCC) blockers and was shown to require signaling through PI-3K and PKB, but not cdk-5, CamKII, PKC or ERK. Moroever, our results demonstrate that either increased synaptic activity, induced through GABA-A receptor blockade, or increased cAMP levels can prevent this effect of Ab. Lastly, we found that clustering of Shank, a Homer-interacting scaffold protein, is also decreased by Ab. We propose that, besides affecting ionotropic glutamate receptor-related structures, Ab also influences mGluR-related molecules; thus, Ab interferes with synaptic plasticity through multiple modes.

Independent coding of movement duration in a repetitive non-visually guided movement

Motiei-Langroudi, R, Omrani, M, Khoshnoodi, MA, Ghaderi-Pakdel, F, Yazdanpanah, E, Abbassian, A-H, Kavianifar, A, Saberi, A

University College of Science, University of Tehran, Iran
amir.saberi@gmail.com

Temporal information is an embedded feature of our sensory and motor experiences. How is temporal information encoded in the brain? In the two-stage theory of timing, an explicit representation of timing is responsible for the movement initiation while movement duration is coded implicitly. We investigated the correlation of movement duration and amplitude in a repetitive one-dimensional non-visually guided movement to find out if temporal information could be coded independently from movement. Subjects were asked to learn the distance between two points by moving their hands repeatedly along the distance between two sticks, while they could not see their hands and hand path. After a training phase, a delay of either 2 or 20 s was imposed and the subjects were asked to reproduce the learned distance. There was no correlation between distance difference and time difference in either delay condition. In the 20 s delay experiment, in comparison to the 2 s delay experiment, there was a significant increase in distance reproduction error. However, there was no significant change in time differences in either of the experiments. In addition, the time difference between the training and test trials was independent from the direction of the distance difference (i.e., overshot, undershot, or accurate). In conclusion, time may be coded as an independent measure after the delay period, so it should be a kind of explicitly coded information.

Late morphological abnormalities after unilateral parietal lesion of juvenile mice can be prevented by early erythropoietin treatment

Sargin, D, Hassouna,I, Sperling, S, Wichert, S, Hannke, K, Radyushkin, K, Rossner, M, Ehrenreich, H

MPI of Experimental Medicine, Göttingen, Germany
sargin@em.mpg.de

Erythropoietin (EPO) is a hematopoietic growth factor with a range of neuroprotective properties. Using a standardized cryo-lesion model of the right parietal cortex of 4 week-old mice, we found global brain atrophy and distinct cognitive impairment months after lesion which could be completely prevented by early EPO treatment (5000 IU/kg i.p. every other day for 2 weeks after lesion). The present work focuses on (1) understanding the morphological basis of the observed atrophy and the EPO action on glial cells and neurons including neuronal subpopulations, neurogenesis and synaptic density; (2) exploring transcriptome analysis of contralateral hippocampal gene expression at 5 days after lesion, to reveal lesion-induced gene regulation and its prevention by EPO. Here we show that unilateral parietal lesion at early age causes persistent bilateral microglial activation in the hippocampus, consistent with a chronic inflammatory response. Moreover, bilaterally in the cingulate cortex, a slight increase in glial cells but no difference in total number of neurons is found after lesion. However, the parvalbumin expressing GABAergic interneurons are increased in relation to the total number of neurons in hippocampus and cortex. All these consequences of lesion are entirely abolished by early EPO application. Transcriptome analysis revealed a number of lesion-regulated genes involved in cytoskeleton organization and believed to contribute to neurodegenerative processes. Again, upon EPO treatment, these alterations were not seen. Understanding these profound effects of EPO on gene transcription and morphology in our model of global brain atrophy will open new avenues for treatment of neurological and psychiatric diseases.

A

GABA spillover and asynchronous release mediate persistent inhibition in the DNLL

Saunier Rebori, B, Grothe, B, Klug, A, Felmy, F

LMU University of Munich, Germany
saunier@zi.biologie.uni-muenchen.de

There is evidence that suppression of auditory spatial information of lagging sounds occurs in the dorsal nucleus of the lateral lemniscus (DNLL) and is due to GABAergic inhibition which persist several milliseconds beyond the end of stimulation. The mechanisms causing the persistent inhibition (PI) are unknown. One possibility is that PI is due to properties of the GABAergic synaptic transmission itself and not to network properties. To test this hypothesis we performed whole-cell patch-clamp recordings from DNLL neurons in acute brain slices from Mongolian gerbils (P14-P17). GABAergic inhibitory post-synaptic currents (IPSCs) were evoked by stimulating the Commissure of Probst with a bipolar-electrode. The amplitude of single IPSCs evoked depended linearly on the stimulation intensity and fitting the decay time of the IPSCs revealed an overall increase of about 10 ms over the voltage range of the fiber stimulations. The same dependency was met by analyzing the decay half time of the same IPSCs. However, the rise time and time to peak of evoked IPSCs did not change. Pairing two successive stimulation pulses at 10 or 20 Hz indicated that the phasic components of the IPSCs are mainly independent from each other. As for single pulse stimulation, decay time and half width of the second IPSC depended on the strength of fiber stimulation. These results can be explained by spillover from GABAergic nerve terminals onto DNLL principal cells, as well as by a component of asynchronous release prolonging the action of synaptic currents and reducing the firing in DNLL neurons.

B

Site-specific dephosphorylation of of doublecortin (DCX) by protein phosphatase 1 (PP1)

Shmueli, A, Reiner, O, Gdalyahu, A, Sapoznik, S, Sapir, T, Tsukada, M

Weizmann Institute, Rehovot, Israel
orly.reiner@weizmann.ac.il

Mutations in doublecortin (DCX), cause X-linked lissencephaly ("smooth brain") and double cortex syndrome in humans. DCX is highly phosphorylated in migrating neurons. Here, we demonstrate that dephosphorylation of specific sites phosphorylated by JNK is mediated by neurabin II, which recruits the phosphatase PP1. During cortical development, the expression pattern of PP1 is widespread, while the expression of DCX and neurabin II is dynamic, and they are co-expressed in migrating neurons. In vitro, DCX is site-specific dephosphorylated by PP1 without the presence of neurabin II, this dephosphorylation requires an intact RVXF motif in DCX. Overexpression of the coiled-coil domain of neurabin II, which is sufficient for interacting with DCX, and recruiting the endogenous neurabin II with PP1, induced dephosphorylation of DCX on one of the JNK-phosphorylated sites. We hypothesize that the transient recruitment of DCX to different scaffold proteins; JIP-1/2, which will regulate its phosphorylation by JNK, and neurabin II, which will regulate its dephosphorylation by PP1 play an important role in normal neuronal migration.

Status epilepticus (SE) - induced gene expression: identification of new epileptogenesis related genes

Stefaniuk, M, Lukasiuk, K

The Nencki Institute of Experimental Biology, Warsaw, Poland
mstefani@nencki.gov.pl

In approximately 30% of patients epilepsy develops as a result of brain damaging insult (such as stroke, head trauma or SE). It is believed that alterations in gene expression following such insults are critical for the circuitry remodeling which underlies the appearance of spontaneous seizures. The identification of new epileptogenesis-related genes might contribute to designation of new targets for therapeutic intervention during the epileptogenic phase. On the base of our previous microarray analysis a number of candidate genes that might be involved in the development of the disease was identified. The candidate genes included a number of unknown genes (EST – expressed sequence tags). The aim of this study was to validate those data, clone and characterize new epileptogenesis-related genes. For this study rat model of temporal lobe epilepsy (TLE) was used. To induce SE rats were injected with kainic acid or pilocarpine. The brain tissue was collected at 1, 4, 14 day after induction of SE. In situ hybridization was performed using radioactively labeled oligonucleotide probes. The genes that revealed SE-induced alterations in expression were cloned using 5' RACE technique and sequenced. To identify nature of cells that express gene of interest, cRNA probe was synthesized and dual in situ/immunohistochemistry staining was performed. Investigated transcripts were detected mainly in neurons. Bioinformatic analysis of sequences revealed their homology to already known genes or predicted ones that were identified in other species. Further analysis will be conducted to provide more data that could be beneficial for understanding their function.

A comparison of the expression changes of wolframin in C57Bl/6 and 129S6/SvEv mice after exposure to cat odor

Raud, S, Sütt, S, Kõks, S, Vasar, E

Department of Physiology, Biomedicum, University of Tartu, Estonia
silva.sutt@ut.ee

Recent studies have reported that 129S6/Sv and C57Bl/6 strains show different anxiety behaviour. It has been shown, that wolframin (Wfs1) gene could be significant in susceptibility for mood disorders. The aim of the present study was to find out the wolframin expression changes in C57Bl/6 and 129S6/SvEv/Tac female mice in mesolimbic area and temporal lobe using quantitative real-time PCR. A cloth containing cat odor was used to induce the ethologically relevant anxiety reaction in mice. The animals were divided into three groups: naive, mice exposed to the control cloth and the cloth impregnated with the cat odor. The analysis of behavioral recordings established that cat odor induced anxiety in C57Bl/6 but not in 129S6/Sv strain animals. In mesolimbic structure the wolframin expression was decreased in C57Bl/6 mice 1.8 times after exposure to the control odor and 2 times after exposure to the cat odor compared to the naive animals. In temporal lobe the expression of wolframin in C57Bl/6 mice was decreased after exposure to the cat odor 1.4 times compared to the naive animals. There were no significant wolframin expression changes between different groups in 129Sv mice in the mesolimbic area and temporal lobe. These results clearly indicate, that wolframin is a possible new target of the regulation of anxiety.

A

A statistical framework incorporating temporal and mutual correlations in a neural network ensemble

Tchumatchenko, T, Wolf, F, Geisel, T

Max Planck Institut for Dynamics and Self-Organization, Göttingen, Germany
tatjana@nld.ds.mpg.de

The Membrane Potential (MP) of a neuron can be modelled as a weighted sum of postsynaptic potentials. In the cerebral cortex a single neuron is exposed to a large number of synaptic inputs, each of which is induced by a single incoming spike. We describe the MP fluctuations as a correlated Gaussian process with a temporal correlation function, as it is first introduced in [1, 3. supplement]. We show how this model can be generalized to the case of N neurons and thus offer a concise unifying statistical framework to understand the interactions between multidimensional neural point processes (spike trains) arising from the underlying pairwise MP correlations, which dominate the collective behaviour of neural networks [3]. These models are important, because cognitive brain functions arise from collective dynamics of neural networks, but as pointed in [2] the research on multivariate point process models capturing the intrinsic features of neurons is sparse.

[1] B. Naundorf, F. Wolf, and M. Volgushev. Unique features of action potential initiation in cortical neurons. Nature, 440:1060–1063, 04 2006.

[2] E. N. Brown, R. E. Kass, and P. P. Mitra. Multiple neural spike train data analysis: state-of-the-art and future challenges. Nat Neurosci, 7(5):456–461, May 2004.

[3] E. Schneidman, M. J. Berry, R. Segev, and W. Bialek. Weak pairwise correlations imply strongly correlated network states in a neural population. Nature, April 2006.

B

Regulatory molecules in progenitor cell niche of adult monkey subventricular zone

Tonchev, AB, Yamashima, T, Chaldakov, GN, Okano, H

Division of Cell Biology, Medical University - Varna, Bulgaria
atontchev@yahoo.com

We aimed to identify putative molecular signal that could be involved in the regulation of progenitor cells in the adult monkey subventricular zone (SVZ). We labeled newly generated cells in adult macaque monkeys with the DNA synthesis indicator bromodeoxyuridine (BrdU), and their phenotype by a panel of cell-selective markers. We investigated the expression of growth factors and their receptors, and of developmentally regulated transcription factors in putative precursor cells. Monkey SVZ precursors expressed type-selective sets of transcription factors known for their involvement in embryonic neocortical patterning, including Pax6, Emx2, Sox1-3, Ngn1, Dlx1,5, Olig1,3 and Nkx2.2. Analysis of transcription factor protein expression by uncommitted neural or committed neuronal precursors revealed that these two cell types were positive for distinct panels of transcription factors. We further found that Flt1, a receptor for vascular endothelial cell growth factor (VEGF), was expressed by actively proliferating progenitors, and smaller fractions of mitotic progenitors were positive for the neurotrophin receptor TrkB or the hematopoietic receptor Kit, while immature neurons expressed Flt1 and the neurotrophin receptor TrkA. In addition, SVZ astroglia, ependymal cells and blood vessels were positive for distinctive sets of ligands/receptors, which we characterized. We provide a molecular phenotypic analysis of cell types comprising adult monkey SVZ, and suggest that a complex network of secreted and nuclear signals may regulate neurogenesis in this niche in adult primates. The knowledge on the mechanisms regulating adult primate SVZ progenitors would probably have an impact on future restorative therapies for human neurological diseases.

The Coupling between Synaptic Vesicles and Ca^{2+} Channels Determines Fast Neurotransmitter Release

Wadel, K, Neher, E, Sakaba, T

Research Group Biophysics of Synaptic Transmission, MPI for Biophysical Chemistry, Göttingen, Germany
kwadel@gwdg.de

Synaptic vesicles of the readily releasable pool are released in two distinct kinetic phases upon sustained stimulation. However, the underlying mechanisms of this heterogeneity in release probability remained unclear. For fast and synchronous release to occur, vesicles have to be both primed and positioned closely to Ca(2+) channels. By combining electrophysiological recordings of the pre- and postsynaptic compartments of the calyx with Calcium imaging and uncaging, we investigated which of the two is the more decisive factor. Uniform elevation of intracellular [Ca(2+)] via calcium uncaging was able to elicit rapid release even when the fast releasing vesicles had been depleted previously. The Ca(2+) sensitivity of remaining vesicles was reduced no more than 2-fold, which is insufficient to explain the slowdown of the kinetics of release (10-fold) observed during a depolarizing pulse. Therefore the incorporation of synaptic vesicles in regions of high Ca(2+) channel density - rather than fusion competence - is the rate limiting step for action-potential driven neurotransmitter release.

EphA4-dependent axon guidance is mediated by the RacGAP alpha-chimaerin

Wegmeyer, H[1], Egea, J[2], Gezelius, H[3], Rabe, N[3], Varoqueaux, F[1], Brose, N[1], Klein, R[2], Kullander, K[3],Betz, A[1]

[1]Department of Molecular Neurobiology, MPI of Experimental Medicine, Göttingen, Germany
[2]Department of Molecular Neurobiology, MPI of Neurobiology, Martinsried, Germany
[3]Department of Neuroscience, University of Uppsala, Uppsala, Sweden
email@missing!!!

During nervous system development outgrowing axons are guided by attractive and repulsive cues, before establishing specific connections with distant targets. In the growth cone of the growing axon this process requires tightly regulated remodelling of the actin cytoskeleton in response to the modulation of the activity of Rho GTPases. In the present work we investigated the involvement of the RacGAP alpha-chimaerin in this process.
We generated alpha-chimaerin deficient and hypomorph mice. These mice exhibit a hop gait. Morphological analysis revealed a broadened dorsal funiculus and corticospinal tract fibers aberrantly recrossing the midline of the spinal cord. The same was observed in EphA4 and ephrinB3 deficient mice. EphA4 positive neurons are key components of the local spinal cord circuits that generate locomotion, the central pattern generators (CPGs). To investigate the involvement of alpha-chimaerins in CPG function we examined locomotor activity in alpha-chimaerin deficient mice. Electrophysiological recordings from isolated spinal cords show an uncoordinated left right activity. Growth cone collapse assays with cultured neurons of alpha-chimaerin deficient mice revealed an impaired response to ephrin stimulation. On the molecular level we show that alpha-chimaerins interact with EphA4 and become tyrosine phosphorylated.
Our results show that the lack of alpha-chimaerins during nervous system development leads to incorrect axonal pathfinding decisions of EphA4 controlled growth cones. These data indicate that alpha-chimaerins act downstream of Eph receptors in Rac regulated actin cytoskeleton modulation during growth cone collapse.

A

Influence of noise and speed-accuracy tradeoff on perceptual decision-making processes in the human visual systems

Wenzlaff, H, Bauer, M, Heekeren, H

MPI for Human Development, Berlin, Germany
wenzlaff@mpib-berlin.mpg.de

An important question in perceptual decision making is how decision makers adjust their decision criterion to optimally trade-off speed and accuracy of their decisions. Stochastic diffusion models provide a framework to describe perceptual decision making. In these models, a decision is formed by continuously accumulating sensory information until one of two response criteria (boundary or threshold) is reached and the response is elicited (e.g., a button press). In the present study, we investigated the influence of noise and speed-accuracy tradeoff in a face-house discrimination task. In three gradings, noise was added to the stimuli to reduce the sensory evidence. Additionally, subjects were instructed to respond either as fast or as accurate as possible in an alternative mode. This was reinforced by differential feedback for either too slow or incorrect responses depending on the instruction. Images were shown for 100 ms. We hypothesized that in the speed instruction the boundaries would be lower. Data were modelled using the EZ diffusion model (Wagenmakers, in press). Results from five subjects showed that the noisier the images were the longer the subjects needed to respond and the more errors they committed. In the speed condition compared to when emphasizing accuracy, response times were significantly faster but also significantly more erroneous. These data are well in line with predictions from the EZ diffusion model. As a next step, we will characterize the neural correlates of decision processing and changes due to the instructions using magnetencephalography. Data will also be modelled.

B

Influence of spatial and contextual precuing on reach reaction times in monkey and human

Westendorff, S, Gail, A, Klaes, C

Sensorimotor Group BCCN Göttingen, Germany
swesten@gwdg.de

When we make goal directed arm movements, our nervous system has to integrate spatial information about the location of multiple objects, and contextual information to decide which object to reach for. We investigated the dynamics of this sensory-context integration. In a choice reaction time task with partial movement precuing human and monkey subjects had to perform reaches that were instructed by two cues presented simultaneously or sequentially: A spatial cue that instructed a movement direction and a color cue that indicated whether the subjects had to reach for the direction of the spatial cue (pro reach) or the opposite direction (anti reach). Each cue could be presented before or after a variable memory period, leading to four conditions: Both cues before (early) or after the memory period (late), spatial cue early and color cue late (spatial early) or vice versa (color early). Preliminary results show longer reaction times for conditions where context information (color) is presented late compared to conditions where it is presented early. This indicates an independent and faster processing of spatial compared to context information. There is also a trend for anti reaches to be initiated later with late spatial cuing, as shown earlier in monkey. These findings are the basis for further electrophysiological studies in monkeys.

Disrupting SNARE complexity – Biophysical investigations of NSF/SNAP-mediated SNARE complex disassembly

Winter, U, Fasshauer, D

MPI for Biophysical Chemistry, Göttingen, Germany
uwinter@gwdg.de

The formation of ternary SNARE-complexes is known to draw apposing biological membranes close to each other and eventually enable them to fuse. After fusion these extremely stable complexes are dissociated into their single SNARE-components to allow further rounds of fusion to occur. The disassembly reaction is endothermic and therefore needs to be fuelled by the AAA-ATPase NSF (N-ethylmaleimide sensitive factor) and its cofactors α-, β- and γ-SNAP. However, only little is known about how the disassembly enzymes attack four-helix bundle SNARE complexes. In order to investigate the reaction in molecular detail we established several in vitro FRET and fluorescence anisotropy readouts for the neuronal SNARE complex consisting of syntaxin1a, synaptobrevin2, and SNAP25. For all three neuronal SNAREs several single cysteine variants exist to which fluorescent dyes can be specifically attached. The fluorescence intensities of the dyes change upon interaction of the respective proteins and allow for recording of the speed of the disassembly process. By comparison of disassembly kinetics of SNARE complexes in solution to that of complexes incorporated into liposomes we attempt to determine possible influences of membrane-anchorage on the efficacy of SNARE disassembly. To characterize possible differences between the mammal machinery to that of other organisms we have also performed measurements using the yeast homologues of NSF/αSNAP called sec18 and sec17 respectively.

Neuromodulatory effects on stimulus- versus pharmacologically-induced gamma oscillations in rat hippocampus in vitro.

Wojtowicz, A, van den Boom, L, Chakrabarty, A, Behrens, C, Heinemann, U

Institute of Neurophysiology, Johannes Müller Ctr. of Physiology, Charité-Universitätsmedizin Berlin
anna-wojtowicz@wp.pl

A

Gamma frequency oscillations have been observed in a variety of brain structures, amongst them the hippocampal formation, which plays a key role in memory formation and shows oscillatory activity in the theta/gamma frequency band during specific behavioural states. Hippocampal gamma oscillations can be obtained in vitro by tetanic stimulation, by pharmacological activation of metabotropic glutamate receptors, and via cholinergic excitation by the acetylcholine receptor agonist carbachol (CCh). High frequency stimulus (100Hz for 400ms) applied to stratum radiatum (SR) of CA1 results in brief epochs of gamma oscillations in stratum pyramidale (SP) of CA1 with initial frequencies of 70-100 Hz. The stimulus induced gammas are thought to be responsible for a local synchronization. In contrast application of 20μM carbachol or 0.15μM kainate induces persistent oscillations, both in area CA1 and CA3, in the low gamma band (30-40 Hz), which can provide for widespread synchronization. In the present study we compared the pharmacological properties of stimulus induced gamma oscillations to CCh- and kainate-induced gamma oscillations. We observed that stimulus induced oscillations were augmented by dopamine, serotonin and norepinephrine, while CCh- and kainate-induced oscillations revealed significantly reduced power values under the influence of these neurotransmitters. These findings suggest that within hippocampal networks two distinct mechanisms might exist for the generation of slow and fast gamma oscillations.

Involvement of epigenetic mechanisms in a pure- and Trichostatin A induced-ischemic preconditioning model

Yildirim, F, Harms, C, Meisel, A, Bösel, J, Kronenberg, G, Harms, U, Fink, KB, Endres, M

Department of Experimental Neurology, Clinic for Neurology, Charité Medical School, Berlin
ferah.yildirim@charite.de

B

Alterations in chromatin structure through covalent histone modifications cause alterations in epigenetic regulation of gene expression. Acetylation is one of these histone modifications and acetylation of histones leads to a more open chromatin structure, thereby increasing the probability of gene expression. Here, we study involvement of epigenetic mechanisms in ischemic preconditioning, a phenomenon known as a tolerant tissue state to otherwise noxious ischemic insult. Firstly, in a pharmacologically-induced preconditioning model, we demonstrate that pre-treatment with a histone deacetylase inhibitor trichostatin A (TSA) increases histone acetylation levels in primary cortical neurons and protects from oxygen-glucose deprivation, a model for ischemic cell death in vitro. We identified gelsolin, an anti-excitotoxic and anti-apoptotic protein, as a mediator of neuroprotection by TSA. TSA enhanced histone acetylation at the gelsolin promoter region, and upregulated gelsolin messenger RNA and protein expression in a dose- and time-dependent manner. The neuroprotective effect of TSA was completely abolished in neurons lacking gelsolin gene expression. Together, we demonstrate that the enhancement of gelsolin gene expression correlates with neuroprotection induced by the inhibition of histone deacetylation. Secondly , in a pure model of ischemic preconditioning, we demonstrate that a short exposure to oxygen-glucose deprivation protects primary cortical neurons from following longer, otherwise lethal oxygen-glucose deprivation. Enzyme activity assay and western immunoblotting showed enhanced histone acetyltransferase activity as well as increased histone acetylation levels after ischemic preconditioning. In conclusion, in our experimental models histone acetylation levels are increased in neurons after exposure to the preconditioning stimuli. We characterized detailed mechanism(s) underlying a causative link between increased histone acetylation and neuroprotection.

Attenuation of EGFR signaling by ER targeting of the Rhomboid intra-membrane serine proteases

Yogev, S, Shilo, BZ, Schejter, E

Weizmann Institute of Science, Rehovot, Israel
benny.shilo@weizmann.ac.il

EGF receptor (EGFR) signaling plays a cardinal role in directing developmental decisions in both vertebrates and invertebrates. Ligand processing in the signal-sending cell involves proteolytic cleavage, which, in Drosophila, is carried out by the Rhomboid (Rho) intra-membrane serine proteases. Spitz, the main EGFR ligand in Drosophila, is retained as an inactive transmembrane precursor in the ER. Star, a type II transmembrane protein escorts Spitz to the late endosome, where the complex is cleaved by Rho-1, leading to secretion of Spitz and inactivation of Star. We have found that two novel Rhomboids, Rho-2 and Rho-3, which function during oogenesis and eye development, respectively, are active in the ER as well as in the late endosome. Our work indicates that Rhomboid activity in the ER attenuates EGFR signaling, mainly due to premature cleavage and inactivation of the chaperone Star. Besides being a mild EGFR activator, Rho-3 can also attenuate Rho-1 dependent signaling, by virtue of its earlier encounter with the ligand-chaperone pair. Thus, in rho-3 mutants, Rho-1 dependent EGFR hyperactivation is observed in the developing eye. ER cleavage of Star also sensitizes the system to Star gene dosage. Indeed, Star haplo-insufficiency is a hallmark of eye development, which we have now observed also during oogenesis, where the ER active Rho-2 mediates EGFR signaling. Thus, ER targeting of Rhomboids is a novel tier of regulation over ligand secretion, which is employed in tissues that require low levels of receptor activation.

QEEG Spectral Analysis of Implicit Self-Face Recognition

Yudiarso, A

Faculty of Psychology, Surabaya University, Indonesia
yudiarso@hotmail.com

Some studies indicate that the prefrontal cortex with possible right hemisphere lateralization, may be a preferential component in self-recognition using explicit task experiment. It was not clearly defined how face recognition process in implicit learning. The aims of this research was to describe lateralization and to explore electrical neuron activities using statistical difference EEG power between implicit self face recognition and other familiar and unknown face recognition in four frequencies (delta, theta, alpha and beta) An EEG spectral analysis or QEEG (Quantitative Electroenchepalography) was employed to analysis 14 right handed healthy subjects (19 – 26 year old). There was a different process of implicit self face recognition and other face recognition. This result support N400 for self related object recognition and P300 for familiar face recognition. No lateralization for self face recognition. This result was contradicted with idea that self face recognition was lateralized at right hemisphere. This result support pararel distribute processing for face recognition.

Localized regulation of axonal RanGTPase controls retrograde injury signaling in peripheral nerve

Yudin, D, Fainzilber, M, Hanz, S, Willis, D, Gradus, T, Hieda, M, Yoneda, Y, Twiss, JL

Weizmann Institute of Science, Rehovot, Israel
dima.yudin@weizmann.ac.il

The RanGTPase gradient of high RanGTP in the nucleus versus very low levels in cytoplasm is a fundamental characteristic of eukaryotic cells that provides directionality to importin-mediated nucleocytoplasmic transport. Importins also fulfill a cytoplasmic role in the transport of signaling complexes from axon to cell body in injured peripheral neurons. Here we show that the RanGTPase system regulates this mechanism in axonal cytoplasm. RanGTP is found in axonal cytoplasm in the sciatic nerve, in association with CAS and importin alpha. Following injury, localized translation of RanBP1 stimulates RanGTP dissociation from importins and subsequent hydrolysis, thereby allowing binding of newly synthesized importin beta and signaling cargo proteins to importin alpha. Temporal gradients of RanGTP in axons thus enable the regulation of importin-cargo interactions at cytoplasmic sites distant from the nucleus.

A

Postlesional loss of denervated dendrites: The role of microglia

Zimmermann, A, Bechmann, I, Kwidzinski, E, Pivneva, T, Kettenmann, H

Charité, Centrum of Anatomy, Institute of Cell- and Neurobiology, Berlin, Germany
Bechmann@med.uni-frankfurt.de

Entorhinal cortex lesion (ECL) is a well established model to study the postlesional adaptive alteration as well as the cellular and molecular mechanism during the de- and regeneration processes in the denervated hippocampus. One aspect of the postlesional alterations after ECL is the loss of denervated distal dendrites of parvalbumin-expressing interneurons. This phenomenon has been regarded as active "retraction" and the maintenance of denritic segments was consequently believed to require the specific synaptic input from the entorhinal cortex. Microglia, the immunocompetent cells of the mammalian central nervous system (CNS), and infiltrating blood-derived mononuclear cells have been shown to infiltrate the zones of axonal degeneration, to phagocytose myelin debris. We have demonstrated that interfering with microglial recruitment protects dendrites from "retraction". Here, we studied the interaction of microglia with denervated dendrites after ECL. To this end, we analyzed hippocampal sections at different time points after ECL by immunocytochemical double staining using confocal laser scanning microscopy. Subsequently, three dimensional reconstructions revealed parvalbumin-positive material from dendritic segments located on the surface of cell bodies and branches of activated microglia two days after lesion. Immunostaining of such activated microglia with the lysosome/endosome-marker Lamp-1 provided evidence for the phagocytic activity of these cells. Astrocytes also expressed Lamp-1 in areas of degeneration, but this signal was never found in close relation to parvalbumin-positive dendrites. In conclusion, microglia are directly attached to denervated dendrites and seem to phagocytose dendritic segments.

B

Direct activation of the ion channel TRPA1 by Ca^{2+}

Zurborg, S, Heppenstall, PA, Yurgionas, B, Jira, JA, Caspani, O

Klinik fur Anaesthesiologie und operative Intensivmedizin, Charité Universitatsmedizin Berlin, Germany
paul.heppenstall@charite.de

TRPA1 is an excitatory ion channel that is expressed in nociceptors and activated by irritant compounds. The endogenous role of TRPA1 is unknown, although several putative functions such as a noxious cold sensor or receptor operated channel have been suggested. Here we have used calcium imaging and patch clamping to examine the function of TRPA1 in detail. We tested several potential agonists of TRPA1 and found that it is activated by intracellular calcium in a concentration dependent manner. We also found that, like other TRP channels, TRPA1 is slightly voltage-dependent and that calcium activates the channel by shifting the voltage dependence to more physiological potentials. TRPA1 has an EF-hand-like domain in the N-terminus and we deleted and substituted several amino acids to determine their role in calcium sensitivity. We could show that there are at least two key amino acids within the domain that are necessary for the calcium sensitivity. In agreement with some previous studies, we found that TRPA1-expressing cells are responsive to cold. However, in patch-clamp experiments we saw that this response was not direct. Instead, we propose that cold evokes a general rise in calcium levels in cells that then secondarily activates TRPA1. In conclusion, our data suggests that calcium is the endogenous ligand for TRPA1.

Activation of the Calyx of Held triggers distinct responses in two types of glial cells

Müller, J, Kettenmann, H, Reyes-Haro, D, Nolte, C, Pivneva, T

Max-Delbrück-Centrum für molekulare Medizin, Berlin, Germany
kettenmann@mdc-berlin.de

The Calyx of Held is a giant presynaptic terminal forming an axo-somatic contact to the principal neuron in the medial nucleus of the trapezoid body. It is a glutamatergic synapse playing an important role in sound location and is designed for rapid signal transmission with high fidelity. In the last few years this preparation has been used to study mechanisms of synaptic transmission and plasticity since both, pre- and postsynaptic elements are accessible to physiological recording and manipulation. In the present study, we have studied the glial elements associated with the Calyx synapse by using acute slices of the brain stem of young (P8-P10) mice. We found two morphologically distinct types of cells in close association with the Calyx synapse, one characterized by passive membrane currents (passive cells), the other by voltage gated currents (complex cell). Upon electrical stimulation of the afferent fibres crossing the midline of the brainstem slice, we were able to elicit postsynaptic responses in the complex cell that were sensitive to CNQX, an antagonist of AMPA/kainate type glutamate receptors. In the passive cell, only a small CNQX-insensitive response was observed probably due to a fibre volley. We could, however, unmask a slow current component triggered by repetitive high frequency stimulation when glutamate uptake was blocked by TBOA. This current was sensitive to CNQX indicating the activation of AMPA/kainate receptors also in the passive cells. We also studied the two cell types on the ultrastructural level and found synaptic-like structures between the Calyx and complex cells. For passive cells, we observed close apposition between pre- and postsynaptic neuronal membranes, but no obvious synaptic structures. Our data show that two types of glial cells can receive distinct functional input from one synapse.

List of Participants

A

Abbasi Muhammad Shafique
Ethel Pharma International
Karachi, Pakistan
shafique786_pk@yahoo.com

Acik Alper
Institute of Cognitive Science,
Universität Osnabrück
Osnabrück, Germany
aacik@uos.de

Agarwal Amit
MPI for Experimental Medicine
Göttingen, Germany
agarwal@em.mpg.de

Alenda Andrea
Instituto de Neurociencias
San´t Joan d´Alacant, Spain
a.alenda@umh.es

B

Baeva Nevena
Int. Grad. Program Medical Neurosciences Charite
Berlin, Germany
nevena_baeva@yahoo.com

Bao Jin
Max-Planck Insititute for Biophysical Chemistry
Göttingen, Germany
jbao@gwdg.de

Bar-On Dana
Tel Aviv University
Tel Aviv, Israel
barondana@gmail.com

Barwinski Marek
International Graduate School of Neuroscience Ruhr University Bochum
Bochum, Germany
Marek.Barwinski@rub.de

Becker Nadine
Max Planck Institute of Neurobiology,
Dept. for Cellular and Systems Neurobiology
Martinsried , Germany
nbecker@neuro.mpg.de

Becker Robert
Berlin NeuroImaging Center,
Charité Universitätsmedizin Berlin, PhD program Medical Neuroscience
Berlin, Germany
robert.becker@charite.de

Bethani Ioanna
Max-Planck-Institute for Biophysical Chemistry
Göttingen, Germany
ibethan@gwdg.de

Bharti Vijay
Indian Veterinary Research Institute(IVRI)
India
vijaykbharti@rediffmail.com

Bibitchkov Dmitri
Max-Planck Institute for Biophysical Chemistry
Göttingen, Germany
dbibich@gwdg.de

Biesemann Christoph
Max-Planck-Institut für experimentelle Medizin
Göttingen, Germany
biesemann@em.mpg.de

Bonnas Christel
Experimental Neurology, Universitätsklinikum Charité
Berlin, Germany
christel.bonnas@charite.de

Brachmann Katharina
Germany
krypta@web.de

Braun Jochen
Otto von Guericke Universität Magdeburg / Institut für Biologie
Magdeburg , Germany
nicole.albrecht@nat.uni-magdeburg.de

Breunig Esther
Institute of Physiology, Department of Neurophysiology and Cellular Biophysics
Göttingen, Germany
ebreuni@gwdg.de

Bungers Simon
MPI for Experimental Medicine
Göttingen, Germany
bungers@em.mpg.de

C

Censor Nitzan
Weizmann Institute of Science
Rehovot, Israel
nitzan.censor@weizmann.ac.il

Chatzimanolis Alexandros
Medical School of Athens
Athens, Greece
hatzimanolis@msn.com

Chowdhury Dhrubajyoti
Ruhr University
Bochum , Germany
dhruba_kolkata@yahoo.com

Cohen Dror
Weizmann Institute of Science
Rehovot, Israel
dror.cohen@weizmann.ac.il

Coquery Nicolas
Molecular Psychiatry - Psychiatry and Psychoterapy Clinic
Berlin, Germany
nicolas.coquery@charite.de

Corsham Leonie
Göttingen, Germany
leonie.corsham@gmx.de

D

de juan Camino
MPIem
Göttingen, Germany
romero@em.mpg.de

Denter Denise
Institute of Physiology and Pathophysiologie
Mainz , Germany
denter@uni-mainz.de

Díaz-Quesada Marta
Instituto de Neurociencias de Alicante (UMH-CSIC)
San´t Joan d´Alacant, Spain
mdiaz@umh.es

Dietz Gunnar P. H.
Neurologische Universitätsklinik Göttingen
Göttingen, Germany
gdietz@gwdg.de

F

Fadini Tommaso
NEUREST, Department of Clinical Neurophysiology, UKG
Göttingen, Germany
t.fadini@med.uni-goettingen.de

Fernandez-Busnadiego Ruben
Max-Plack-Institut für Biochemie
Martinsried , Germany
ruben@biochem.mpg.de

Ferreira Ana
Charité - Universitätsmedizin Berlin
Berlin, Germany
ana.ferreira@charite.de

Fischer Julia
German Primate Center
Göttingen, Germany
fischer@cog-ethol.de

Frahm Jens
Biomedizinische NMR Forschungs GmbH am MPI fuer biophysikalische Chemie
Göttingen, Germany
jfrahm@gwdg.de

Freyer Frank
Berlin Neuroimaging Center, Charité – Universitaetsmedizin Berlin
Berlin, Germany
frank.freyer@gmail.com

Fuechtemeier Martina
Department of Experimental Neurology, Charité Universitaetsmedizin Berlin
Berlin, Germany
martina.fuechtemeier@charite.de

G

Gadjanski Ivana
University Clinic Göttingen
Göttingen, Germany
igadjan@gwdg.de

Gail Alexander
German Primate Center / Bernstein Center for Computational Neuroscience
Göttingen, Germany
agail@gwdg.de

Gansert Juliane
European Neuroscience Institute Göttingen
Göttingen, Germany
jganser@gwdg.de

Garrido Manuel
Department of Neurology, UKG
Göttingen, Germany
pardilho@yahoo.com
Geumann Ulf
MPI for Biophysical Chemistry
Göttingen, Germany
ugeuman@gwdg.de

Ghani Kakhki Mahdi
Institute of Human Genetics
Berlin, Germany
mahdi.ghani@charite.de

Gharat Amol
IIT Bombay
Bombay, India
amolgharat@iitb.ac.in

Gliem Sebastian
Department of Neurophysiology and Cellular Biophysics
Göttingen, Germany
Sebastian.Gliem@web.de

Golbs Antje
Johannes Gutenberg Universität Mainz; Institut für Physiologie
Mainz , Germany
golbs@uni-mainz.de

Görgen Kai
Institute of Cognitive Science, Universität Osnabrück
Osnabrück , Germany
kgoergen@uos.de

Govindarajan Nambirajan
European Neuroscience Institute
Göttingen, Germany
govindarajan@em.mpg.de

Grabska-Barwinska Agnieszka
International Graduate School of Neuroscience Ruhr University Bochum
Bochum, Germany
Agnieszka.Grabska-Barwinska@rub.de

Gralle Matthias
Cellular Biophysics Group, European Neuroscience Institute
Göttingen, Germany
mgralle@gwdg.de

Groenewold Erik
BCN Neuroimaging Centre/University Medical Centre Groningen
Groningen, Germany
esgroenewold@gmail.com

Grzyb Anna
Max Planck Institute of Molecular Cell Biology and Genetics
Dresden , Germany
grzyb@mpi-cbg.de

H

Haenicke Joachim
Otto-von-Guericke University Magdeburg
Magdeburg , Germany
joachim.haenicke@student.uni-magdeburg.de

Halemani Nagaraj
Dept. Neurobiology, Max Planck Institute for Biophysical Chemistry
Göttingen, Germany
nhalema@gwdg.de

Hamid Oussama
Cognitive Biology, Otto-von-Guericke University, FNW/IBIO Haus 1
Magdeburg , Germany
hamid@nat.uni-magdeburg.de

Heinzel Sebastian
Uniklinik für Psychiatrie und Psychotherapie (Labor für Psychophysiologie & Fkt. Bildgebung)
Germany
H1el@gmx.de

Hernandez Amezquita Javier Matias
Max Planck Institute for Biophysical Chemistry
Göttingen, Germany
mhernan@gwdg.de

Herz Josephine
Charité – University Medicine Berlin, Cecilie-Vogt-Clinic for Molecular Neurology
Berlin, Germany
josephine.herz@charite.de

Ho Matthew
Center for Biochemistry, University of Cologne
Cologne, Germany
sai.ho@uni-koeln.de

Hoon Mrinalini
Max-Planck-Institute for Experimental Medicine
Göttingen, Germany
hoon@em.mpg.de

Horresh Ido
Weizmann Institute of Science
Rehovot, Israel
ido.horresh@weizmann.ac.il

Innos Jürgen
Department of Physiology, University of Tartu
Tartu, Estonia
innos@ut.ee

I

Ivanovic Aleksandra
Max-Planck-Institut für Experimentelle Medizin
Göttingen, Germany
ivanovic@em.mpg.de

Ivens Sebastian
Institut für Neurophyisologie, Charité
Berlin, Germany
sivens@gmail.com

J

Jancic Dragana
Instituto de Neurosciencias, CSIC, UMH, San´t Joan d´Alacant
San´t Joan d´Alacant, Spain
djancic@umh.es

Jürgenson Monika
Department of Pharmacology, University of Tartu
Tartu, Estonia
monikaj@ut.ee

K

Kaping Daniel
German Primate Center / CNL
Göttingen, Germany
dkaping@gwdg.de

Kavianifar Atria
University of Tehran
Tehran, Iran
at.kavyani@gmail.com

Kisiswa Lilian
Cecilie-Vogt Clinic for Molecular Neurology
Berlin, Germany
lilian.kisiswa@charite.de

Klaes Christian
Sensorimotor Group BCCN Göttingen
Göttingen, Germany
cklaes@dpz.gwdg.de

Klohs Jan
Medical Neurosciences Charite Universitaetsmedizin
Berlin, Germany
jan.klohs@charite.de

Kong Geoffrey Kwai Wai
MPI für Biochemie
Martinsried , Germany
kong@biochem.mpg.de

Kuczera Tanja
European Neurosciece Institute
Göttingen, Germany
tkuczer@gwdg.de

Kurrikoff Kaido
Institute of Physiology, University of Tartu
Tartu, Estonia
kaidokur@ut.ee

L

Leinweber Marcus
MPI of Neurobiology
Martinsried , Germany
leinweber@neuro.mpg.de

Leong Jonathan
Max Planck Institute of Neurobiology
Martinsried , Germany
leong@neuro.mpg.de

Lipstein Noa
Max planck institute for experimental medicine
Göttingen, Germany
Lipstein@em.mpg.de

Lochte Anja
DPZ
Göttingen, Germany
alochte@gwdg.de

Loutchanwoot Panida
Department of Clinical and Experimental Endocrinology, Faculty of Medicine, University of Goettingen
Göttingen, Germany
panida@med.uni-goettingen.de

Luetcke Henry
Max-Planck Institute for Biophysical Chemistry
Göttingen, Germany
hluetck@gwdg.de

Luo Ling
European Neuroscience Institute
Göttingen, Germany
aureole83112@hotmail.com

Lutz Christoph
Laboratoire de Neurophysiologie et Nouvelles Microscopies - Université Paris Descartes
Paris, France
christoph.lutz@univ-paris5.fr

Luuk Hendrik
Department of Physiology, University of Tartu
Tartu, Estonia
hendrik.luuk@ut.ee

M

Magno Lorenza
Institut für Zell und Neurobiologie des Centrums für Anatomie, Charitè Campus Mitte, Charité
Berlin, Germany
lorenza.magno@charite.de

Mansouri Ahmed
MPI for Biophysical Chemistry, Dept of Molecular Cell biology
Göttingen, Germany
amansou@gwdg.de

Maslarova Anna
Charité
Berlin, Germany
anna.maslarova@charite.de

Medrihan Lucian
Institute of Physiology
Göttingen, Germany
lmedrik@gwdg.de

Menche Joerg
Max Planck Institute of Colloids and Interfaces, Department of Theory and Bio-Systems
Golm , Germany
menche@mpikg.mpg.de

Moon Ho-Seoung
Analytische Philosophie Universität Göttingen
Göttingen, Germany
highmoon66@yahoo.de

Mueller Jochen
MDC für molekulare Medizin
Berlin, Germany
j.mueller@mdc-berlin.de

Mueller Ralf
Department of Psychiatry and Psychotherapy, University of Cologne
Cologne, Germany
ralf.mueller@uk-koeln.de

Mühlenstädt Corinna
Medizinische Hochschule Hannover Institut für Toxikologie
Hannover , Germany
c.muehlenstaedt@web.de

Munderloh Christina
University of Konstanz
Konstanz , Germany
tina@pisco.de

N

Nagel Florian
University of Göttingen, Department of Neurology
Göttingen, Germany
fnagel@gwdg.de

Nawaz Schanila
MPI for experimental Medicine
Göttingen, Germany
nawaz@em.mpg.de

Neher Erwin
Max-Planck-Institut fuer biophysikalische Chemie
Göttingen, Germany
eneher@gwdg.de

Nicoletti Cecilia
Charite
Berlin, Germany
cecilia.nicoletti@charite.de

Nityanandam Anjana
Max Planck Institute for Experimental Medicine
Göttingen, Germany
nityanandam@em.mpg.de

O

Örsal Arif Suphi
International Graduate Program Medical Neurosciences
Berlin, Germany
arif.oersal@charite.de

Öz Pinar
MSc/PhD/MD-PhD program Neurosciences
Göttingen, Germany
pinaoz@gmail.com

P

Padrón Oscar
Charité Universitätsmedizin Berlin
Berlin, Germany
oscarignacio1981@yahoo.com

Pastukhov Alexander
Cognitive Biology, Otto-von-Guericke University
Magdeburg , Germany
alexander.pastukhov@nat.uni-magdeburg.de

Philips Mari-Anne
University of Tartu, Department of Physiology
Tartu, Estonia
maphilips@gmail.com

Poulopoulou Cornelia
Medical School of Athens
Athens, Greece
cpoulop@med.uoa.gr

R

Rawson Randi
University of Utah; Program in Neuroscience
Salt Lake City, Utah, USA
randi.rawson@utah.edu

Reimann Henning
Max Plank Institut für experimentelle Medizin
Göttingen, Germany
reimann@em.mpg.de

Reisinger Ellen
Max-Planck-Institut for experimental Medicine, Dept. Molecular Neurobiology
Göttingen, Germany
reisinger@em.mpg.de

Ribic Adema
German Primate Center
Göttingen, Germany
aribic@cnl-dpz.de

Richter Diethelm W.
Department of Neuro- and Sensory Physiology
Göttingen, Germany
d.richter@gwdg.de

Rizzoli Silvio Max
Planck Institute for Biophysical Chemistry
Göttingen, Germany
srizzol@gwdg.de

Rolls Asya
Weizmann Institute of Science
Rehovot, Israel
asya.rolls@weizmann.ac.il

Roselli Francesco
Max Planck Institute for Psychiatry
Munich , Germany
fraroselli@mpipsykl.mpg.de

Rue Cabre Laura
European Neuroscience Institute Goettingen
Göttingen, Germany
laurarue@gmail.com

S

Saberi Amir
University of Tehran
Tehran, Iran
amir.saberi@gmail.com

Sabine Hofer
Biomedizinische NMR Forschungs GmbH am Max-Planck Institut für biophysikalische Chemie
Göttingen, Germany
shofer1@gwdg.de

Sandu Alexandra – Maria
University of Bucharest
Bucharest, Romania
rock_girl_me@yahoo.com

Sargin Derya
Max Planck Institute of Experimental Medicine
Göttingen, Germany
sargin@em.mpg.de

Saunier Rebori Bernadette
LMU University of Munich
Munich , Germany
saunier@zi.biologie.uni-muenchen.de

Schael Sylvia
Center for Biochemistry, Medical Faculty, University of Cologne
Cologne, Germany
sylvia.schael@uni-koeln.de

Schulz Jörg B.
Department of Neurodegeneration and Restorative Research
Göttingen, Germany
jschulz4@gwdg.de

Shetty Aparna
Centre for Molecular Neurobiology
Hamburg , Germany
aparna.shetty@zmnh.uni-hamburg.de

shmueli anat
Weizmann institute
Rehovot, Israel
anats@weizmann.ac.il

Shypitsyna Aleksandra
University of Konstanz
Konstanz , Germany
Aleksandra.Shypitsyna@uni-konstanz.de

Soykan Tolga
IMPRS in Molecular Biology – Göttingen
Göttingen, Germany
tolga_soykan@hotmail.com

Stefaniuk Marzena
The Nencki Institute of Experimental Biology
Warsaw, Poland
mstefani@nencki.gov.pl

Stradomska Alicja
University of Goettingen, Center for Physiology and Pathophysiology
Göttingen, Germany
astrado@gwdg.de

Sumakovic Marija
European Neuroscience Institute
Göttingen, Germany
sumakovicmara@yahoo.com

Sütt Silva
Department of Physiology, University of Tartu
Tartu, Estonia
silva.sutt@ut.ee

T

Tchumatchenko Tatjana
Max Planck Institut for Dynamics and Self-Organization
Göttingen, Germany
tatjana@nld.ds.mpg.de

Thoms Sven
Pädiatrie II
Saarbrücken , Germany
cellbiol@gmail.com

Tonchev Anton
Division of Cell Biology, Medical University – Varna
Varna, Bulgaria
atontchev@yahoo.com

Treue Stefan
DPZ
Göttingen, Germany
treue@gwdg.de

V

Vavatzanidis Niki
Charité, Berlin
Berlin, Germany
niki-katerina.vavatzanidis@charite.de

Veriou Charis
Medical School of Athens
Athens, Greece
hverios@tellas.gr

W

Wadel Kristian
Max Planck Institute for Biophysical Chemistry
Göttingen, Germany
kwadel@gwdg.de

Wegmeyer Heike
Max-Planck-Institute of Experimental Medicine
Göttingen, Germany
wegmeyer@em.mpg.de

Weigel Arwed
University of Göttingen
Göttingen, Germany
aweigel1@gwdg.de

Weller Sabine
Department of Pediatrics II, Georg-August-University Göttingen
Göttingen, Germany
s.weller@med.uni-goettingen.de

Wenzlaff Hermine
Max Planck Institute for Human Development
Berlin, Germany
wenzlaff@mpib-berlin.mpg.de

Westendorff Stephanie
Sensorimotor Group BCCN Göttingen
Göttingen, Germany
swesten@gwdg.de

Winter Ulrike
MPI for Biophysical Chemistry
Göttingen, Germany
uwinter@gwdg.de

Wirmer Andrea
Johann-Friedrich-Blumenbach Institut für Zoologie und Anthropologie Göttingen
Göttingen, Germany
andrea_wirmer@yahoo.de

Wittnam Jessica
European Neuroscience Institute
Göttingen, Germany
jessicawittnam@gmail.com

Wojtowicz Anna
Institute of Neurophysiology, Johannes Müller Ctr. of Physiology, Charite´-Universitätsmedizin Berlin
Berlin, Germany
anna-wojtowicz@wp.pl

Y

Yao Lijun
Max Plank Institute of biophysical chemistry
Göttingen, Germany
lyao@gwdg.de

Yildirim Ferah
Department of Experimental Neurology, Clinic for Neurology, Charite Medical School
Berlin, Germany
ferah.yildirim@charite.de

Yogev Shaul
Weizmann Institute of Science
Rehovot, Israel
yogev.shaul@weizmann.ac.il

Yong Shin
Max Planck Institute for Experimental Medicine
Göttingen, Germany
shin@em.mpg.de

Yudiarso Ananta
Faculty of Psychology, Surabaya University, Indonesia
Surabaya, Indonesia
yudiarso@hotmail.com

Yudin Dima
Weizmann Instiutte of Science
Rehovot, Israel
dima.yudin@weizmann.ac.il

Z

Zhang Shuo
Max-Planck-Institute for Biophysical Chemistry
Göttingen, Germany
szhang1@gwdg.de

Zimmermann Anja
Charité, Centrum of Anatomy, Institute of Cell- and Neurobiology
Berlin, Germany
a.zimmermann@charite.de

Zink Sabrina
Max Planck Institute for biophysical chemistry
Berlin, Germany
szink@gwdg.de

Zurborg Sandra
Klinik fur Anaesthesiologie und operative Intensivmedizin, Charite Universitatsmedizin Berlin, Campus Benjamin Franklin, (Medical Neurosciences)
Berlin, Germany
sandra.zurborg@charite.de

Program at A Glance

Thursday, 31st of May

12:00 Registration
14:30 Opening Ceremony

Keynot Lecture
15:00 Semir Zeki
The disunity of consciousness

Sensory Systems and Neuronal Networks
16:00 Pierre-Marie Lledo
Wiring newborn neurons with old circuit: what for?
16:45 Emilio Salinas
How behavioral constraints may determine optimal sensory tuning curves
17:30 Coffee Break
18:00 Thomas Euler
Dendritic processing in the retina
18:45 Alain Destexhe
Computing with complex dynamics in cere bral cortex: experiments and modeling

19:30 Buffet
22:00 Movie Night in Cinema *Lumière*
The Eternal Sunshine of the Spotless Mind

Friday, 1st of June

Establishment and Dynamics of Neural Connectivity
9:00 Dietmar Schmucker
Developmental control of synaptic connectivity
9:45 Peter Scheiffele
Signaling and cell adhesion complexes in neuronal network formation
10:30 Coffee Break
11:00 Valentin Nägerl
Rules and Correlates of Synaptic Plasticity
11:45 Pico Caroni
Sustained rearrangements of hippocampal microcircuits in the adult

12:30 Lunch
13:30 Poster Session
14:45 Information Session
Management training for researchers

Large Neuronal Assemblies and Cognition
15:00 Amiram Grinvald
The dynamics of evoked and ongoing activity in the awake monkey
15:45 Andreas Nieder
Coding of quantity information in the primate cortex
16:30 Coffee Break
17:00 Miguel Nicolelis
Title to be annouced
17:45 Pascal Fries
Neuronal communication through neuronal coherence: A putative mechanism behind selective attention
18:30 Wine and Cheese

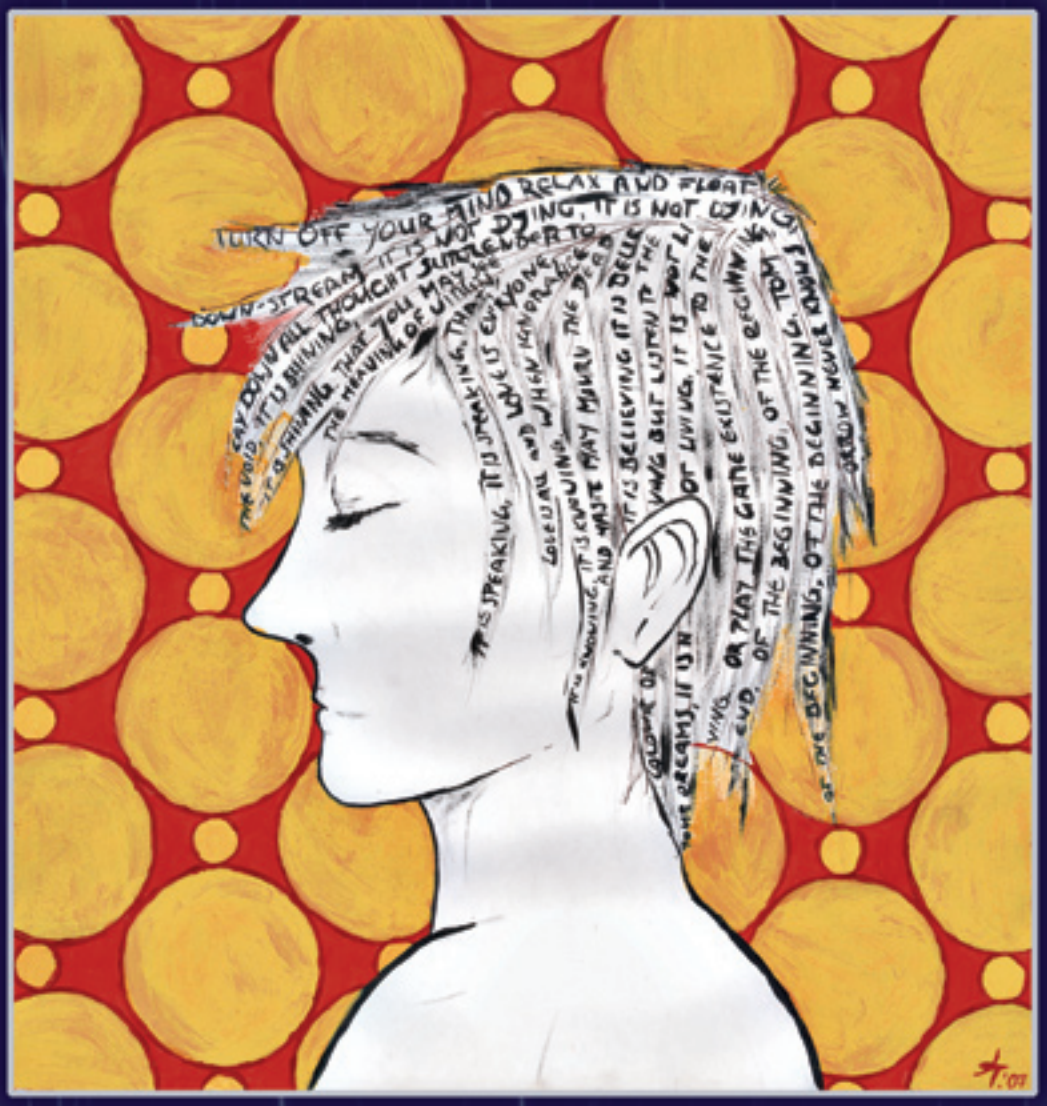
Perspectives on the Study of Consciouness
20:00 Symposium and Roundtable Discussion
Introduction and Moderation: John R. Searle

Saturday, 2nd of June

Synaptic Structure and Function
9:00 Reinhard Jahn
Neurotransmitter release - a tale of vesicles and SNAREs
9:45 Venkatesh Murthy
Insights from real-time optical imaging of synaptic vesicle recycling
10:30 Coffee Break
11:00 Harvey McMahon
Understanding pathways of endocytosis and exocytosis
11:45 Peter Jonas
The GABAergic interneuron in the network
12:30 Lunch

Mechanisms of Neuronal Dysfunction and Neuroprotection
14:00 Giles Hardingham
Pro-survival signalling from the NMDA receptor
14:45 Konrad Beyreuther
Physiological and pathogenic function of genes involved in Alzheimer disease
15:30 Patrik Brundin
Huntington's disease: more complex than we thought!

18:00 Movie Night in MPI for Experimental Medicine
Das weiße Rauschen
(German with english subtitles)
21:00 Party (Institute for Physiology)


TURN OFF YOUR MIND RELAX AND FLOAT
DOWN-STREAM IT IS NOT DYING
LAY DOWN ALL THOUGHT SURRENDER
THE VOID IT IS BELIEVING
IT IS FRIGHTENED THAT YOU MAY
THE HEAVENS OF
SPEAKING, IT IS
AND HATE PRAY
OF LIVING
OR PLAY THE GAME
OF THE BEGINNING
END
OF THE BEGINNING
'07