Bernstein Network Computational Neuroscience

Bernstein Newsletter

Recent Publications

A Key to the World of Our Mind's Eye – Brain Computer Interface – Retina Implant – EEG Predicts Learning Success – Light Switch inside the Brain

Meet the Scientist

Daniel Durstewitz

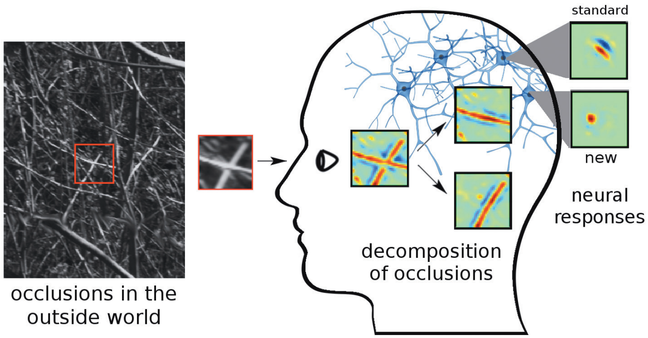
News and Events

Personalia – Bernstein Conference 2013 – 1st Bernstein Sparks Workshop – BCCN Freiburg Conference – Bernstein Day 2013 – Brain Awareness Week 2013

06/2013

A key to the world of our mind's eye

In 1981, the neuroscientists Hubel and Wiesel were awarded the Nobel Prize for the discovery of brain cells that react with high activity to the edges of objects in images. Their findings have shown that our brain activity is related to features such as edges of objects. Later on, mathematical models were able to explain why neurons respond to certain object features. These models describe how the brain generates an internal image—yet, so far, they reflect rather insufficiently the actual structure of natural images. Occlusions between objects are ignored, for instance, although they are ubiquitous in the visible world. A certain type of nerve cell—only known for a few years—is difficult to be described with the current simplified models.



In everyday life, we often see objects occluding each other, such as a branch of a bush hiding another in this figure (red box). The image of the two objects is projected into the brain in which specialized nerve cells react to certain image traits with increased activity. To understand the image, the brain has to decompose it into its original components (here: the two branches). A new mathematical model of this decomposition now predicts that there must be many nerve cells responding to globular features in order to understand occlusions (box "new"). This type of cells has been observed for some time, but up to now has never been linked to visual occlusions.

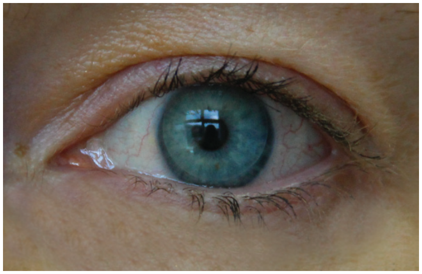
Researchers at the Bernstein Focus Neurotechnology Frankfurt, at the Goethe-University Frankfurt and at the Frankfurt Institute for Advanced Studies have now shown that the behavior of these new brain cells can be better characterized in computational models when further information is taken into account. In the study, the scientists compared conventional models with one taking occlusions between objects into account. The new descriptive model was better at predicting the functional traits of this special type of nerve cells. The result also provides hints at the function of these neurons: „There are other possible explanations why there are such cells in our brain," says Jörg Lücke, „but our results indicate the encoding of occlusions as the most plausible explanation at hand."

The researchers involved believe that the newly acquired knowledge can crucially advance the development of automated image and video analysis technology. „We still know very little about how our brain understands and interprets images. At the same time, our brains—as well as the brains of animals—are still far superior to today's computer programs in the task of image understanding," said Lücke. An improvement of so-called computer vision techniques would have a variety of applications. An application Lücke and colleagues are currently busy working on is the analysis of microscopy images for automated cancer detection.

Bornschein J, Henniges M, Lücke J (2013): Are V1 simple cells optimized for visual occlusions? A comparative study. PLoS Computational Biology 9(6): e1003062.

One step closer to brain computer interfaces

Brain stem infarcts, paraplegia, or amyotrophic lateral sclerosis: Severe diseases of the central nervous system such as these may render the affected patients completely helpless. Some patients might not even be able to control a single part of their body to make contact with their environment. For many years, brain researchers all over the world have been working on the development of brain computer interfaces (BCIs) to reduce these people's suffering. BCI systems aim to transform human thoughts into control signals for computers. In this way, the patient should be able to communicate with his family, care takers, and the environment. Now, researchers at the Bernstein Group Bremen and the Center for Cognition Science at the University of Bremen have made an important step towards BCIs. They were able to demonstrate in long-lasting experiments with macaques that the visual system is suitable for constructing a reliable and astonishingly fast brain computer interface.



Current research follows two approaches for BCIs: non-invasive and invasive systems. Non-invasive systems analyze the activity of the brain recorded outside the head. Their disadvantage is the very limited information content of the measured brain activity. Invasive systems go closer to the origin of the electrical signals in the brain, and thus enable a more precise measurement of activity patterns with higher information content. In such experiments, electrodes are implanted directly in the brain of rhesus monkeys and humans. Typically, the electrodes are inserted into the motor cortex. But what other possibilities exist when this approach is not suitable?

A new alternative has been developed at the Center for Cognition Research at Bremen University. The researchers investigated whether it is possible to construct a permanent brain computer interface by applying electrodes implanted over the surface of the visual cortex.

In the study, macaques were trained to shift their visual attention between two objects displayed in their visual field without moving their eyes. Electrodes on the surface of the cortex reliably measured the animal's brain activity for many years and without producing any health problems. When analyzing the data, it turned out that just a short period of the measured signals (of less than a second) was sufficient to determine towards which of the two objects the animal had focused its attention. This demonstrates that it is in principle possible to translate electrical signals of visual attention measured on the surface of the brain to reliable control signals.

Text: University of Bremen, Translation: BCOS

Rotermund D, Ernst UA, Mandon S, Taylor K, Smiyukha Y, Kreiter AK, Pawelzik KR (2013): Toward high performance, weakly invasive brain computer interfaces using selective visual attention, Journal of Neuroscience, 33(14): 6001-6011.

Implant provides blind persons with better sense of orientation

Will the blind soon be able to visually orientate themselves in daily life? Hope comes from a clinical study headed by Prof. Dr. Eberhart Zrenner at the Bernstein Center Tübingen and the Centre for Ophthalmology of the University Tübingen. The medical scientists there examined nine blind patients suffering from hereditary retinal degeneration to whom they had previously implanted the new subretinal electronic optic chip “Alpha IMS” of the Retina Implant AG company (Reutlingen). The first results have now been presented in the Proceedings of the Royal Society.

The implant tested in the published study is currently the only retina implant worldwide with such a high pixel density. Containing 1500 pixels, it allows a visual field of 11 to 15 degrees of visual angle and provides a black and white image with contours in approximately 9 shades of gray. Compared with results from an earlier pilot study, the new implant achieved an even higher visual acuity. Moreover, the new device is the only implant currently used in clinical trials in which the light absorbing part resides within the eyeball, so that natural eye movements are involved in the visual process. The actual chip, collecting the light information from the image and converting it into graded electrical currents, is surgically placed under the retina; the thin power supply cable enters the eye through the sclera and is connected to a retroauricular subdermal coil. Here the power is transmitted wirelessly. The new wireless power supply allows for more patient mobility in daily life, so that a greater number of patients could use the chip for visual experience in their daily routine. The patients were able to recognize objects such as trees, furniture, dishes and cutlery on a table, or headlights at night. Some patients were also capable of interpreting facial expressions, or reading letters.

A blind patient activates his subretinal Alpha IMS Chip on the street. The implant enables him to recognize objects such as trees, furniture, dishes and cutlery on a table, or headlights at night. Some patients are even capable of interpreting facial expressions, or reading letters.

Zrenner explains: “This study offers additional indications that our subretinal implant method may help some patients with retinal degeneration to regain their visual abilities—without the necessity of externally visible devices.”

Text: University Hospital Tübingen / Retina Implant AG (mod.)
Translation: BCOS

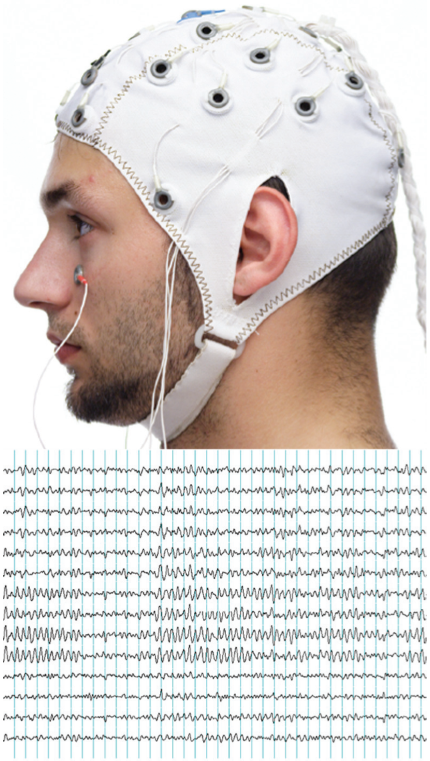
Stingl K et al. (2013): Artificial vision with wirelessly powered subretinal electronic implant Alpha IMS, Proceedings of Royal Society B, 280 (1757): 20130077.

EEG activity predicts learning success

How well we learn depends on genetic aspects, the individual brain anatomy, and, not least, on attention. A research team from Berlin, Bochum, and Leipzig has revealed the reason why some people are worse at learning than others. The main problem seems not to be that learning processes are inefficient per se, but that the brain insufficiently processes the information to be learned.

In their study, the scientists induced learning processes in participants that do not require attention. During the experiment, the researchers stimulated the participants' sense of touch for 30 minutes by electrically stimulating the skin of the hand. Before and after this passive training, they tested the so-called "two-point discrimination threshold", a measure of the sensitivity of touch. On average, the passive training improved the discrimination threshold by twelve percent—but not in all of the 26 participants.

Using EEG recordings, the team studied why some people learned better than others. In subjects who responded well to the sensory stimulation, the EEG revealed characteristic changes in brain activity, more specifically in the alpha waves. The higher the alpha activity was before the passive training, the better the people learned. In addition, the more the alpha activity decreased during passive training, the more easily they learned. Hence, a high level of alpha activity may be a marker of the readiness of the brain to exploit new incoming information. Conversely, a strong decrease of alpha acti-vity during sensory stimulation indicates that the brain processes stimuli particularly efficiently. The results, therefore, suggest that perceptual learning is highly dependent on how accessible the sensory information is. The alpha activity, as a marker of constantly changing brain states, can serve as an indicator for this accessibility.



EEG alpha waves.

"How the 'alpha' rhythm is able to exercise an influence on the learning capacity is currently being examined with computer models", explained Petra Ritter. "Only when we begin to understand the complex processing of information in the brain, will we be able to intervene in these processes in a targeted manner, in order to alleviate cases of disruptions". "An exciting question now is to what extent the alpha activity can be deliberately influenced with neurofeedback", explains Hubert Dinse. "This could have enormous implications for therapy after brain injury or, quite generally, for the understanding of learning processes."

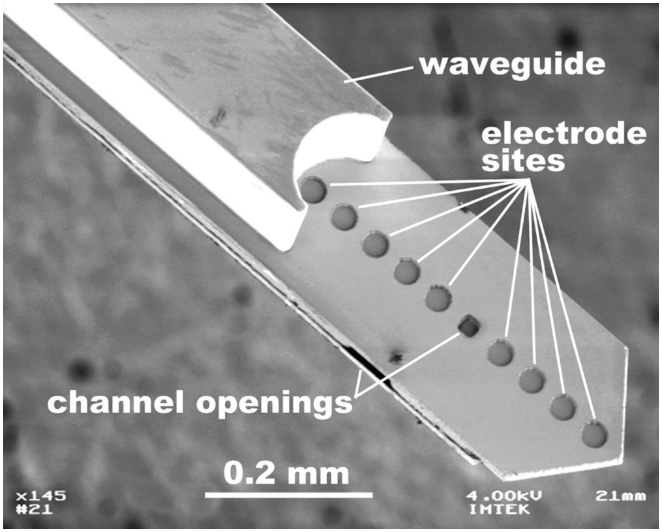
The development of new therapeutic approaches is the aim of the Bernstein Focus project "State Dependencies of Learning", that Ritter coordinates, as well as of the international 'Virtual Brain' Project in which her team participates, and of the 'Neural Plasticity Lab' at Ruhr-Universität Bochum headed by Dinse.

Text: Ruhr-Universität Bochum / Berlin Charité University Hospital (mod.)

Freyer F, Becker R, Dinse HR, Ritter P (2013): State-dependent perceptual learning, Journal of Neuroscience, 33(7): 2900-2907.

A light switch inside the brain

Activating and deactivating individual nerve cells in the brain is something many neuroscientists wish they could do, as it would help them to better understand how the brain works. Birthe Rubehn and her colleagues from the Bernstein Center of the University of Freiburg and the Department of Microsystems Engineering (IMTEK) as well as the Friedrich Miescher Institute for Biomedical Research in Basel have now developed a micro-implant that allows them to genetically modify specific nerve cells, control them with light stimuli, and measure their electrical activity—all at the same time.



Scanning electron micrograph of a multimodal shaft's tip. The picture shows nine platinum electrode sites (circular openings) for the measurement of electrical signals, injection channels for fluids (rectangular openings), and a concave waveguide for optical stimulation.

The team used an innovative genetic technique that brings nerve cells to change their activity by shining light of different colors onto them. In so-called optogenetics, genes from certain species of algae are inserted into the genome of another organism, for instance a mouse. The genes lead to the inclusion of light-sensitive pores for electrically charged particles into a nerve cell's membrane. These additional openings allow neuroscientists to control the cells' electrical activity.

However, only technical devices like the new implant from Freiburg and Basel makes this principle actually practicable. The device, at its tip only a quarter of a millimeter wide and a tenth of a millimeter thick, was constructed on the basis of polymers, a special kind of plastic that has been proven to be safe for implantation into the nervous system. Contrary to probes developed so far, it is capable of injecting the substances necessary for genetic modification, emitting light for the stimulation of the nerve cells, and measuring the effect through various electrical contacts—all at once.

This novel 3-in-1 tool paves the way for completely new experiments in neurobiology. Initial experiments in which the researchers implanted prototypes into mice were successful. Besides optimizing the technique for serial production, the scientists want to develop a second version whose injection channel dissolves over time, reducing the implant's size even further.

Text: Gunnar Grah, Bernstein Center Freiburg (mod.)

Rubehn B, Wolff SBE, Tovote P, Lüthi A, Stieglitz T (2013): A polymer-based neural microimplant for optogenetic applications: Design and first in vivo study. Lab Chip, advance article, 13, 579-588.

© private

Daniel Durstewitz

Saturday evening, just before closing time—how do we know in which butcher shop of the town we will still be most likely to get a Sunday roast? And how are we able to remember the shopping list with the side dishes that we have just bought at the supermarket? Working memory, decision-making, learning of implicit rules and anticipation of events as parts of higher behavioral performances belong to the research areas of Daniel Durstewitz. He investigates how these behaviors are neurally implemented and what happens when these processes are disturbed in mental diseases. Since May 2010, Durstewitz has been the coordinator of the new Bernstein Center Heidelberg-Mannheim.

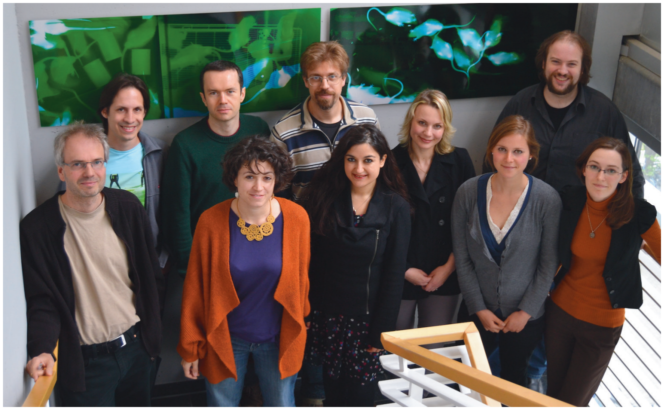
A native of Lower Saxony, Durstewitz studied psychology and later on also computer science at Technische Universität Berlin. During his PhD studies in the lab of Onur Güntürkün at Ruhr-University Bochum he came in closer contact with neurobiology. For his investigations of the prefrontal cortex, he carried out biophysical modeling of prefrontal neurons and networks and also conducted behavioral experiments in pigeons and neuroanatomical studies. Since that time, he has been particularly interested in the bridge between the diverse micro- and macroscopic levels of nervous system description. How do specific ion channels affect the transfer function of single neurons, and how does that in turn impact on the dynamics of the entire neural network? How does the activity of these networks then ultimately lead to observable behavior? Analyzing the connection between the different description levels—molecule, cell, network, behavior—is the primary goal of Durstewitz' research. „In my mind, we have to understand the structural and biophysical basis of neuronal dynamics in order to bridge the gap between physical processes in the brain and behavior," says the scientist.

With his PhD in the bag, Daniel Durstewitz relocated for two years to the Computational Neurobiology Lab at the Salk Institute for Biological Studies in La Jolla, USA. „The lighthearted exploratory creativeness in American science and the tremendous importance of an interdisciplinary, non-hierarchical and open discussion culture for the generation of new ideas has strongly influenced my own attitude," says Durstewitz. At the Salk, he deepened his knowledge in theoretical research on neural processing using dynamic system approaches and learned electrophysiological techniques. At the beginning of the millennium he returned to Bochum where he was the head of the Emmy Noether Research Group „Computational Neuroscience" until he was offered a faculty position at the University of Plymouth in England in 2005.

Since 2008, Durstewitz has been working at the Central Institute of Mental Health (CIMH), based in Mannheim, where he and his team have established the field of computational neuroscience on site. One of his main work areas comprises the mathematical modeling of neurons and neural networks, such as the prefrontal cortex and hippocampus, which are associated with higher cognitive functions. Although in the past Durstewitz had primarily been interested in higher cognition from a basic science perspective, working at the CIMH has shifted his focus more to medical aspects. For his projects within the Bernstein Center, the 46-year-old neuroscientist examines dysfunctions of the prefrontal cortex and the hippocampus as in schizophrenia or depression.

One of his major research areas consists in the study of the molecular and genetic determinants of cognitive dysfunction in these diseases. By means of computer models, Durstewitz' group simulates the effects of certain risk genes on neural dynamics. The gene CACNA1C, for example, encodes a subunit of high-voltage-gated calcium channels. Distinct gene variants are associated with different conductivities of this channel and thus carry varying risk for schizophrenia. Using statistical data analysis from the viewpoint of nonlinear dynamics and machine learning, Durstewitz also tries to reconstruct network dynamics from experimental data to analyze in detail the consequences of different calcium channel variants on—for instance—neuronal attractor states and oscillations in the prefrontal cortex.

Another of his research areas is studying the possibilities for pharmacological intervention using realistic computer models of pathological network conditions as they occur in schizophrenia or depression. These studies depend on a wealth of data obtained from in vivo, in vitro and anatomical studies, and are continuously validated via experimental predictions. Based on neural models constructed that way, the Durstewitz group investigates which pharmacologically addressable parameter settings could be changed to restore a "healthy" state



The Durstewitz' group.

in the simulated model networks. In a sense, Durstewitz attempts to treat the disease in the simulated mathematical model. This new research approach is also called „in silico neuropharmacology", because the discovery process ultimately takes place on silicon chip-based computers. In the future, Durstewitz plans to test the pharmacological cocktails coming out from his simulation studies in collaborations within the Bernstein Center using in vivo preparations.

A final area of Durstewitz' research within the Bernstein context is to identify potentially patho-physiological conditions or their antecedents from network dynamics reconstructed from fMRI or EEG measurements. On this basis, he hopes to find new biomarkers, which indicate underlying conditions of disorders even before the full onset of the disease. „The goal is to detect subtle pathological changes as early as possible in order to act preventively on the course of the disease by medication or behavioral therapies."

As coordinator of the Bernstein Center Heidelberg-Mannheim, he particularly likes integrating the different project results within a common theoretical framework, as well as working with students and designing a specific training program for his area of expertise. Since 2011, Daniel Durstewitz has also taken over the Heisenberg Professorship for Theoretical Neuroscience at CIMH. With so much responsibility, the father of two children has not much time left to actively run „lab work" himself. His research group—half of them being theoretical physicists, and the other half being electrical engineers, bio-mathematicians, and physiologists—performs most of the actual work. However, Durstewitz, who refers to science as his major hobby, cannot do completely without directly working on scientific problems himself: „In the evenings after 8 pm, I sit down at my desk and analyze some data on my own, or work on methodological tools."

9th Bernstein Conference takes place in Tübingen

This year's Bernstein Conference will be organized by BCCN Tübingen under the direction of Matthias Bethge and will take place in Tübingen from September 25-27. For the first time, the Bernstein Conference will host a series of workshops of topical interests taking place before the main conference on Sept. 24-25.

As in past years, the Bernstein Award will be ceremonially conferred at the beginning of the conference. Before the prize giving ceremony, a press conference provides journalists the opportunity to get information about the awardee and his/her research.

Within the framework of the third "NeuroVision Film Contest", short films visualizing neuroscience topics can be submitted in advance of the conference. The winners will be determined during the conference and announced along with the winners of the fourth edition of the Brains for Brains Award, awarded by the Bernstein Association for Computational Neuroscience. A "Science Slam" also offers the general public the possibility to learn about new brain research findings.

www.bernstein-conference.de

Opening Lecture "Duet"
Tony Movshon   Eero Simoncelli

Physiology of Vision
Anitha Pasupathy
Pieter Roelfsema
Martin Usrey

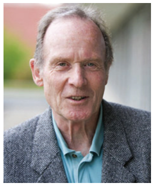
Decision Making
Carlos Brody
Alla Karpova
Adam Kepecs

Bernstein Conference 2013

Computational Vision
Pietro Perona
Ruth Rosenholz
Antonio Torralba

Cortical Dynamics and Circuits
David Fitzpatrick
Alfonso Renart
Nathalie Rochefort

Personalia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Ernst Bamberg (BFNT Göttingen, MPI of Biophysics Frankfurt) was honored—along with five other leading scientists—with this year's "Brain Prize" of the Grete Lundbeck European Brain Research Prize Foundation for the joint development of "optogenetics". With one million euros, the Danish Brain Prize is the most highly remunerated award in the neurosciences. It was awarded for the third time.

www.nncn.de/nachrichten-en/ernstbambergbrainprize/


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Eberhart Zrenner (BCCN and University of Tübingen) received the Hector Research Award 2012 for his outstanding scientific achievements in the investigation of causes of inherited retinal degeneration, ocular toxicology, clinical electrophysiology and the development of subretinal electronic retinal implants to restore vision in the blind. The Hector Foundation II awards the prize that comes with a 150.000 € purse, for special achievements in the field of medical research.

www.nncn.de/nachrichten-en/hectorfellow/

1st Bernstein Sparks Workshop held in Delmenhorst

The first Bernstein Sparks Workshop was entitled: “Towards Long-Term Cortical Neuro-Interfaces” and took place on March 6-10, 2013, at the Hanse Wissenschaftskolleg (HWK) Delmenhorst. Within the framework of this workshop, about 50 national and international renowned scientists, postdocs, graduate students and company representatives came together to discuss state of the art and challenges with the development of cortical neuroimplants for brain-computer interfaces and neuroprostheses in talks, poster demonstrations and a discussion round from the points of view of various disciplines. The topics ranged from the neuroscientific basics and new technological developments from microelectronics and microsystems technology, telemetrics and electrode technology up to first medical applications.

Welcome address by Klaus Pawelzik (BFNL Sequence Learning, BGCN and University of Bremen)

The local organizers were Klaus Pawelzik (BFNL Sequence Learning, BGCN and University of Bremen), Andreas Kreiter (BGCN and University of Bremen), Steffen Paul, Walter Lang, David Rotermund and Agnes Janssen (University of Bremen). They were supported by Simone Cardoso de Oliveira, Kerstin Schwarzwälder (BCOS), Dorothe Poggel and Marion Daniel (HWK).

Bernstein Sparks Workshops are a forum for intensive dialogue between worldwide renowned experts on current research topics in which major developments are currently taking place. They are meant to contribute to “kindling” key scientific processes that could trigger breakthroughs in research or in assessing new application fields.
www.nncn.de/nachrichten-en/sparksworkshop/

BCCN Freiburg Conference

On March 18-20, 2013, the Bernstein Center Freiburg (BCF) hosted a conference on “Dynamics of Neuronal Systems” with more than 120 invited guests. Stefan Rotter, Director of the BCF, was responsible for the scientific program. After a brief review by Ad Aertsen, Coordinator of the Bernstein Center for Computational Neuroscience Freiburg (BCCN Freiburg), on the history and achievements of the Center in Freiburg, invited speakers, in particular current and former BCF junior scientists, presented their research results in talks and during a poster session. Breaks, conference dinner, and an informal “get-together” offered plenty of opportunities for the attendees to discuss current scientific issues and meet their former colleagues.
www.nncn.de/nachrichten-en/bccnfreiburgconference/

Stefan Rotter, Director of the BCF (left) and Ad Aertsen, Coordinator of the BCCN Freiburg (right).

Bernstein Day 2013

To document the prominent role of brain research within the future European research strategy, the European Commission has decided to declare May 2013 as the European Month of the Brain. Its goal was to increase awareness of the successes and future challenges of brain research by a variety of events and activities. The Bernstein Network Computational Neuroscience participated in this campaign with the “Bernstein Day” on May 6, 2013. On this day, Bernstein members organized a number of activities at various locations distributed all over Germany. Here is an overview of all organized events.

www.nncn.de/nachrichten-en/bernsteindaybrainnews/

Bernstein Collaboration in Aachen

Talk: Schalllokalisation
Speaker: Prof. Hermann

Talk: Synaptische Transmission
Speaker: Prof. Hermann, Dr. Wirth

Bernstein Center Berlin

Programming tutorial: Models of higher brain functions
Organizer: Dr. Sprekeler

Bernstein Focus Learning in Berlin, Project: Memory in Decision Making

Talk with discussion: Understanding the neuronal basis of honeybee learning and memory formation–Doctoral students of the joint project are talking about their research
Organizer: Prof. Eisenhardt

Bernstein Focus Learning in Berlin, Project: State Dependencies of Learning

Video publication: The virtual brain project
Organizer: Dr. Ritter

Bernstein Group / Bernstein Award Udo Ernst / Bernstein Focus Learning in Bremen

Series of lectures: Vom Gehirn zum Chip - Perspektiven der Neurowissenschaften in Bremen
Speaker: several Bernstein members

German-US American Collaboration in Düsseldorf

Mini symposium: Bernstein Tag des Gehirns 2013
Speaker: several Bernstein members

Interdisciplinary Center for Neuroscience Frankfurt

Talk: Der ferngesteuerte Wurm - Optogenetische Methoden revolutionieren die Neurowissenschaften
Speaker: Prof. Gottschalk

Bernstein Center Freiburg

Talk and concert: ‘Science Jam Nr. 1‘
Speaker: Prof. Bach
Jazz Trio: Wolfgang Fernow, Felix Borel, Schroeder

Bernstein Center / Bernstein Focus Neurotechnology in Göttingen

Movie show: Inception (Christopher Nolan, 2010)
Organizer: Prof. Wolf

Bernstein Center Heidelberg-Mannheim

School talks
Speakers: several Bernstein members

Bernstein Facility Simulation and Database Technology in Jülich

Talk with live stream: The Bernstein Facility Simulation and Data Base Technology –breaking the complexity barrier
Speaker: Prof. Morrison

Talk with live stream: Japan-German Collaboration in the Bernstein Network –neuronal correlates of active vision
Speaker: Dr. Ito

Bernstein Focus Learning and Bernstein Collaboration in Konstanz

Talk and Workshop: Hirnforschung bei Insekten - was wir von Bienen über unser Gehirn lernen können
Speaker: Dr. Szyszka
Organizer: Dr. Szyszka, Prof. Galizia, Dr. Kleineidam

German US-American Collaboration in Lübeck

Movie show: Am seidenen Faden (Katarina Peters, 2004)
Organizer: Dr. Eggers, Prof. Marshall, Prof. Martinetz

Bernstein Group in Magdeburg

Talk: Rauschen im Gehirn
Speaker: Prof. Braun

Bernstein Center Munich

Talk: Behavioral and theoretical studies concerning the processing of interaural temporal disparities conveyed by high-frequency, complex stimuli
Speaker: Prof. Trahiotis
Introduction: Prof. Herz, Prof. Behrend

Movie show: Blow Up (Michelangelo Antonioni, 1966)
Introduction: Dinu Patirniche

Bernstein Center Tübingen

Talk: Hirn und Selbstveränderung - verträgt sich das?
Speaker: Prof. Birbaumer

Bernstein Events during Brain Awareness Week 2013

The Brain Awareness Week is a global campaign aiming at increasing public awareness about the progress and benefits of brain research. Every March, universities, hospitals, government agencies, patient groups, etc. organize creative and innovative activities to educate and excite people of all ages about the brain and brain research. Supported by the Dana Alliance for Brain Initiatives and European Dana Alliance for the Brain and many local initiatives, the 18th Brain Awareness Week took place from March 11-17, 2013.

Bernstein members actively participated in the Brain Awareness Week 2013, too. In Berlin, lectures, workshops, readings, discussions, movie screenings with subsequent expert discussions, and exhibitions were organized with participation of the Bernstein Center Berlin. Scientists of the Bernstein Center and Bernstein Focus Neurotechnology Göttingen contributed to the Göttingen "Day of the senses" by offering demonstrations and experiments about hearing, seeing, smelling, tasting, and the skin senses to the attendees. In Heidelberg, researchers from the Bernstein Center Heidelberg-Mannheim were involved in a teacher's workshop of the German Neuroscience Society (Neurowissenschaftliche Gesellschaft, NWG) on "Optical techniques in brain research."

www.nncn.de/termine-en/baw2013/
www.dana.org/brainweek/

Upcoming Events

Date	Title	Organizers	URL
Aug. 3-4., 2013, Bejing, China	Workshop: "Intelligence Science"	R. A. Koene, X. Tang, J-D Zucker, U. Ernst (BPCN 2010, BGCN Bremen) als Mitglied des Programmkomitees	www.nncn.de/termine/intelligencescience
Aug. 25-29, 2013, Bremen	European Conference on Visual Perception	U. Ernst (BPCN 2010, BGCN Bremen), C. Grimsen, D. Wegener, A. Janssen	www.nncn.de/termine/ecvp2013
Aug. 27-29, 2013, Stockholm, Sweden	6th INCF Congress on Neuroinformatics	International Neuroinformatics Coordinating Facility (INCF)	www.neuroinformatics2013.org
Sept. 1-6, 2013, Zürich, Switzerland	G-Node Summer School: Advanced Scientific Programming in Python	N. Chiapolini, Z. Jedrzejewscy-Szmek (G-Node), T. Zito (BCCN Berlin, G-Node)	www.python.g-node.org/wiki
Sept. 24-27, 2013, Tübingen	Bernstein Conference 2013 Workshops: Sept. 24-25, 2013 Main Conference: Sept. 25-27, 2013	M. Bethge (BPCN 2006, BCCN Tübingen), J. Macke, J. Lam, F. Wichmann (alle drei BCCN Tübingen)	www.bernstein-conference.de
Okt. 6-11, 2013, Freiburg	BCF/NWG Course: Analysis and Models in Neurophysiology	S. Rotter, U. Egert, A. Aertsen, J. Kirsch (alle Bernstein Center Freiburg), S. Grün (BCCN Berlin, D-J Collaboration)	www.bcf.uni-freiburg.de/events/conferences-workshops/20131006-nwgcourse

The Bernstein Network

Chairman of the Bernstein Project Comittee: Andreas Herz

The National Bernstein Network Computational Neuroscience (NNCN) is a funding initiative of the Federal Ministry of Education and Research (BMBF). Established in 2004, it has the aim of structurally interconnecting and developing German capacities in the new scientific discipline of computational neuroscience and, to date, consists of more than 200 research groups. The network is named after the German physiologist Julius Bernstein (1835–1917).

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