

Bernstein Network Computational Neuroscience

Bernstein Newsletter



Recent Publications

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RECENT PUBLICATIONS

Getting the picture – Decisions are made in the forebrain

Without us even noticing our brain is constantly making decisions. Does the picture show a man or a woman? Even when the image is blurred, our brain usually interprets the information correctly. Scientists around Felix Blankenburg from the Bernstein Center Berlin and Charité and Hauke Heekeren from the project „Complex Human Learning“ within the Bernstein Focus: learning and at the Freie Universität Berlin investigate how this works. For quite some time, experts have suspected that a certain forebrain region – the dorsolateral prefrontal cortex – is involved in decisions. Using transcranial magnetic stimulation (TMS), the researchers switched this area off for a short period of time. Then, they asked their twelve subjects to decide as fast as possible whether a noisy stimulus on a screen contains a car or a face. The result: when the brain region was inhibited, people hesitated longer and chose the wrong alternative more often. The image quality did not influence the effect.

Thus, the researchers showed for the first time that the human dorsolateral prefrontal cortex has a causal influence on decision making. “With this study, we were able to close the gap between the state of knowledge acquired in animals and in humans in this respect. We are now a step closer to understanding the brain regions involved in decision making,” says Blankenburg. “However, this doesn’t mean that we know how the different areas interact yet.”

A computer model supported the scientists’ reasoning. It allows separating factors such as visual processing of sensory stimuli from decision-making. The model also captures how decisions are made under different conditions, such as in poor-quality images. “The combination of theoretical models with TMS can help ascribe causal and functional role to brain areas involved in various cogni-



Man or woman? Our brain makes the right decisions within fractions of a second, though the information is inaccurate.

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tive processes. This model gives us new opportunities to estimate parameters from our behavioral data that play a role in decision-making,” explains Marios Philiastides, first author of the study.

The drift-diffusion model suggests that the process of decision-making is not linear. Its behavior is comparable to a share price. Random effects result in a fluctuation of the course. A broker establishes an upper and lower limit for selling the stock. The more positive or negative information is known about the company, the stronger the price moves in one direction. The process of collecting information for decision-making corresponds to the fluctuating stock prices, while the decision itself corresponds to passing the limits. The model explains, both, why we have different response times, and why sometimes we take the wrong decisions.

Nowadays, the model is used for many purposes, including the investigation of attention and memory. The findings could also be used to develop new therapies for diseases such as depression or obsessive-compulsive disorder, in which decision making is impaired.

[Philiastides M, Auksztulewicz R, Heekeren H, Blankenburg F \(2011\): Causal role of dorsolateral prefrontal cortex in human perceptual decision making. *Current Biology* 21\(11\): 980-983](#)



Virtual vertigo

Our eyes must be tightly coupled with our sense of balance to provide sharp and jitter-free images. If the adjustment is disturbed, our view is blurred and we get dizzy. Scientists at the Bernstein Center Munich, the Ludwig-Maximilians-Universität (LMU) München and the Integrated Research and Treatment Center IFB^{LMU} have now deciphered an important step of this interaction: Whether certain neurons transmit information about the start or the duration of the movement depends entirely on a single type of membrane channel and the cells' interconnections.

Just three steps in the brain are necessary for processing data from the vestibular system and transferring them to the eye muscles. This allows the visual system to adjust to head movements within a fraction of a second. While in the first and last step, information is mainly transferred from the sensors and to the muscles, respectively, the second step is where the essential processing takes place. Scientists found that neurons with different properties are involved in this step: one type is only active during the initiation of a movement, while the other type sends signals during the entire movement. Recently, Stefan Glasauer from the Bernstein Center Munich and at the LMU and his PhD student Christian Rössert, in collaboration with Hans Straka, Neurobiologist from the LMU, have found out why this is so. In

their study, presented in the Journal of Neuroscience, they used the already well-understood balance organ of grass frogs.

Based on experimental data, the scientists created computer simulations that reproduced the information processing of these nerve cells. "In the simulation, we can supply the cells with any combination of ion channels, connect them in any way, and measure their behavior," explains Glasauer about the advantages of the models. And even more: "We can even make the simulated frog jump, in order to test its data processing," says Glasauer. First, the researchers examined in a simulated single cell the influence of certain membrane channels on the transmission of incoming stimuli. They found that cells with two different membrane channels have different functions: channels with the first type were suitable for the processing of the exact movement initiation time, while the other type discharged for the entire stimulus duration. In simulations with a number of nerve cells, Glasauer and Rössert found that the interconnection of the cells also plays an important role in processing. "The combination of experimental biology and modeling significantly helped in understanding essential basics of sensorimotor information processing," says Glasauer.

Besides others, patients with cerebellar damage could benefit from these research results. The affected individuals have problems in compensating for rapid head movements by appropriate eye movements, but no problems in compensating for smooth movements. This might be due to a deficit in one of the two cell types. The highly efficient neuronal processing could also serve as a model for jitter-free camera systems that are applied, for example, in driver assistance systems of cars or helicopters.

Rössert C, Moore L, Straka H, Glasauer S (2011): Cellular and network contributions to vestibular signal processing: impact of ion conductances, synaptic inhibition, and noise. *J. Neurosci.* 31(23): 8359-8372



Getting dizzy: researchers investigate the causes of vertigo in the grass frog Rana temporaria.

© Anne Burgess (mod), Wikimedia



Measuring the world by the brain

For the first time, researchers at Bernstein Center Berlin, Humboldt Universität zu Berlin, and NeuroCure Cluster of Excellence explain how the cellular architecture of spatial memory is related to its role in orientation. In the journal *Neuron*, they present a new technique with which they could examine the activity and interconnection of individual neurons in freely moving animals. This method allowed them to identify the circuits with which rats capture and learn the spatial structure of their environment.

As of yet, it is hardly understood, which cells in our brain communicate when with each other. So far, scientists had to choose: they either investigated structure and connectivity by staining the cells or they measured their activity. To capture both simultaneously was assumed to be almost impossible, particularly in freely-moving animals. Now, Michael Brecht from the Bernstein Center Berlin and his colleague Andrea Burgalossi were able to solve these problems with a new method.

In collaboration with the Technische Universität Berlin, they developed a novel stabilization mechanism for the recording electrode. This allowed them to label cells in the spatial memory system of the rat (the medial entorhinal cortex) and at the same time to record their activity in freely-moving animals exploring their environment. Anatomical analysis provided important information about the interconnections of the recorded cells. With this new method, the scientists could for the first time visualize the neuronal circuits involved in spatial memory formation.

In the rat's spatial memory system, two major cell types contribute to orientation and spatial memory formation. When rats explore an environment, a subset of cells are active at the intercept points of a virtual grid spanning the entire surface of the environment. These cells, known as "grid cells", are believed to



The specific wiring of two distinct cell types is the basis of our spatial memory.

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form a map-like representation of the environment, which enables the animal to "measure" distances and to estimate its position in space. The other cell type is active only when the animal faces a certain direction. These cells seem to act like a compass for the animal. How grid and head-direction cells cooperate for orientation and spatial learning was previously unknown. Michael Brecht and Andrea Burgalossi now noted that these two functional cell types are organized in well-defined anatomical patches, and they are strictly separated from each other. By visualizing the connections between the two cell types, the researchers could also reconstruct how they cooperate for the emergence of spatial memory.

Interestingly, they discovered very selective interconnections between the two systems of cells, which could enable the animal to integrate the spatial map information with the heading-direction information. These so-called "microcircuits" might therefore constitute the basic neural units for generating a global sense of spatial orientation. Alzheimer's disease has its origin in the medial entorhinal cortex. Patients often suffer, besides other things, from disorientation. Knowledge about the organization and the interconnections between cells in this region of the brain could therefore also contribute to a fundamental understanding of Alzheimer's disease.

[Burgalossi A, Herfst L, von Heimendahl M, Förste H, Haskic K, Schmidt M, Brecht M \(2011\): Microcircuits of functionally identified neurons in the rat medial entorhinal cortex. *Neuron* 70 \(4\): 773-86](#)



Thinking outside the column

For more than 50 years, a dominating assumption in brain research was that nerve cells in the cortex of the brain are organised in the form of microscopically small columns. Subsequently, it became a textbook standard that connections are created predominantly between nerve cells within these columns. In a review article for the journal “Frontiers in Neuroscience”, Clemens Boucsein from the Bernstein Center Freiburg und Martin Nawrot from the Bernstein Center Berlin and colleagues show that this view has to be revised: Input from cells that lie outside this column plays a much more important role than hitherto assumed.

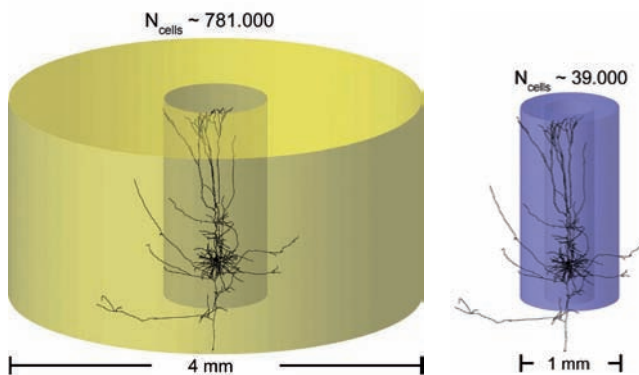
It was one of the great discoveries of the 20th century neurosciences that nerve cells lying on top of each other in the cortex react to the same stimulus – for example edges of different orientation that are presented to the eye. Investigations of the connectivity between nerve cells further supported the

assumption that these column-like units might constitute the basic building blocks of the cortex. In the following decades, much research was conducted on cortical columns, not least because the investigation of long-range connections within the brain is a very complicated affair.

But now, these assumptions about a columnar cortex structure come under scrutiny. New experimental techniques allow the tracing of connections over long distances. Boucsein and his colleagues at the University of Freiburg refined a technique to use laser flashes to specifically activate single nerve cells and to analyse their connections. These experiments led to surprising results: Less than half of the input that a cortical nerve cell receives originates from peers within the same column. Many more connections reached the cells from more distant, surrounding regions.

The experiments also revealed that these horizontal connections operate very accurately in terms of timing. To the scientists, this is an indication that the brain may use the exact point in time of an electrical impulse to code information, a hypothesis that is gaining more and more experimental support. These new insights into structure and function of the brain suggest that the idea of a column-based structure of the cortex has to be replaced by that of a densely woven tapestry, in which nerve cells are connected over long distances.

Text: Gunnar Grah, Bernstein Center Freiburg



Wide cylinder, not slender column: a nerve cell of the cortex receives much of its input from the wider surroundings (yellow), not just from the narrow column (blue) of its direct vicinity

[Boucsein C*, Nawrot MP*, Schnepel P und Aertsen A \(2011\): Beyond the cortical column: abundance and physiology of horizontal connections imply a strong role for inputs from the surround. Front. Neurosci. 5:32. doi: 10.3389/fnins.2011.00032, * equal contribution](#)



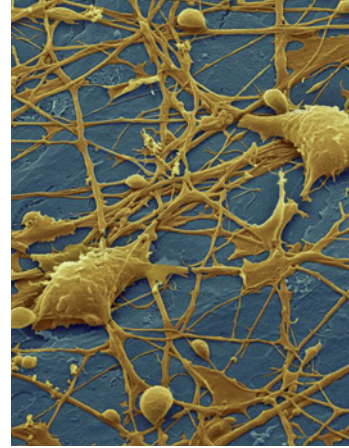
The digital language of the brain

The brain is a giant network of neurons. So far it is still not entirely clear how external stimuli are processed within this network. Matthias Bethge of the Bernstein Center Tübingen and his collaborators from Berlin and London, have now developed a simple model that shows that previously puzzling correlations in neural populations can be explained as a result of common input signals. The model, which was presented in the journal *Physical Review Letters*, can also predict and explain shortcomings of the commonly used Ising Model. By testing specific predictions of these models, the scientists hope to find out how our brain encodes information in the activity of populations of neurons.

The universal language of the brain consists of electrical impulses called spikes. Information is encoded in the exact timing or the number of spikes. Experimental studies have found characteristic statistical dependencies in the activities of many neurons in sensory areas of the brain. However, so far no satisfactory explanation could be provided for this.

To understand these complex relationships and interactions, theoretical neuroscientists use tools from mathematics and physics. Many statistical models, such as the relatively simple Ising model, were originally developed for the description of physical phenomena such as magnetism, but later turned out to be highly useful for the description of the activity of neural populations. Recently, however, researchers reported that experimental measurements can deviate substantially from the predictions of the model. Jakob Macke, Manfred Opper and Matthias Bethge now proposed a simple explanation for these discrepancies.

The researchers assumed that the correlations in the activities of neurons are caused by input signals that reach all cells, a mechanism which is presumed to be present in the visual system.



Highly complex network structures can be very well described with physical models. Using network models, scientists hope to better understand the inner workings of the brain.

© MPI für Entwicklungsbiologie, Jürgen Berger

Their analysis of the model showed that even the smallest differences in the common input signals can lead to complex changes in the neuronal activity, and explain the observed deviations from the Ising model.

“Although our model is quite simple, it explains a number of empirical observations, some of which have previously been regarded as contradictory,” says Jakob Macke, first author of the study. “It not only predicts specific features of neural activity as well as the Ising model does, but also predicts when the Ising model will fail. In addition, it provides quantitative predictions about the behavior of very large neural populations.” Populations of such large sizes cannot be investigated with currently available experimental techniques. “But they are very likely of great importance for computations in the brain,” says Macke.

Thus, the scientists provide a very simple explanation for a number of seemingly contradictory observations. “In addition,” says Matthias Bethge, “this is a nice example of how classical models of physics can become useful again in the context of a new scientific problem.”

Text: BCCN Tübingen, BCOS

[Macke J, Opper M, Bethge M \(2011\): Common input explains higher-order correlations and entropy in a simple model of neural population activity. Phys. Rev. Lett., DOI: 10.1103/PhysRevLett.106.208102](#)



Scientists develop sensitive skin for robots

Our skin is a communicative wonder: The nerves convey temperature, pressure, shear forces and vibrations – from the finest breath of air to touch and pain. At the same time, the skin is the organ by which we set ourselves apart from our environment and distinguish between environment and body. Scientists of the Bernstein Center Munich are now developing at Technische Universität München (TUM) an artificial skin for robots with a similar purpose: It will provide important tactile information to the robot and thus supplement its perception formed by camera eyes, infrared scanners and gripping hands. As with human skin, the way the artificial skin is touched could, for example, lead to a spontaneous retreat (when the robot hits an object) or cause the machine to use its eyes for the first time to search for the source of contact.

Such behavior is especially important for robotic helpers of people traveling in constantly changing environments. According to robot vision, this is just a regular apartment in which things often change position and people and pets move around. “In contrast to the tactile information provided by the skin, the sense of sight is limited because objects can be hidden,” explains Philip

Mittendorfer, a scientist who develops the artificial skin at the Institute of Cognitive Systems at TUM.

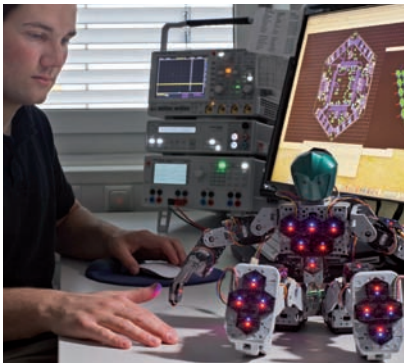
The centerpiece of the new robotic shell is a 5 square centimeter hexagonal plate or circuit board. Each small circuit board contains four infrared sensors that detect anything closer than 1 centimeter. “We thus simulate light touch,” explains Mittendorfer. “This corresponds to our sense of the fine hairs on our skin being gently stroked.” There are also six temperature sensors and an accelerometer. This allows the machine to accurately register the movement of individual limbs, for example, of its arms, and thus to learn what body parts it has just moved. “We try to pack many different sensory modalities into the smallest of spaces,” explains the engineer. “In addition, it is easy to expand the circuit boards to later include other sensors, for example, pressure.”

Only a small piece of skin is currently complete. These 15 sensors, however, at least one on each segment of a long robot arm, already show that the principle works. Just a light pat or blow ensures that the arm reacts. “We will close the skin and generate a prototype which is completely enclosed with these sensors and can interact anew with its environment,” claims Mittendorfer’s supervisor, Gordon Cheng. Cheng expounds that this will be “a machine that notices when you tap it on the back... even in the dark.”

The pioneering aspects of the concept do not end with its sensory accomplishments. Beyond this, these machines will someday be able to incorporate our fundamental neurobiological capabilities and form a self-impression. The robot has moved a step closer to humanity.

Text: modified from Cluster of Excellence CoTeSys

Mittendorfer P, Cheng G (2011): Humanoid multimodal tactile-sensing modules. *IEEE Transactions on Robotics* 27(3): 401-410



The engineer Philip Mittendorfer with the Bioloid Robot with 31 hexagonal sensor modules distributed throughout its body. Similar to human skin, the sensor modules measure temperature, touch and speed.

© Andreas Heddergott, TU München



MEET THE SCIENTIST

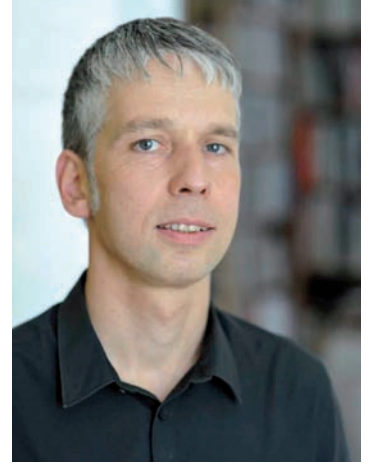
Benjamin Lindner

Half a year has passed since Benjamin Lindner moved into the newly-renovated brick building in the center of the Campus Nord of Humboldt-Universität zu Berlin. In May, Lindner took up a newly established professorship located at the Bernstein Center Berlin and at the Institute of Physics of the Humboldt-Universität. In the coming years, he will both continue his research and teach on the subject of the “Theory of Complex Systems and Neurophysics”.

Benjamin Lindner studied physics at the Humboldt University and did his PhD at the Institute of Physics with Lutz Schimansky-Geier on a topic within the theory of stochastic processes. It was also Schimansky-Geier who brought him into contact with neuronal models. “Neurobiology is an exciting field of application for the physics of nonequilibrium systems and the theory of random processes,” says Lindner.

From the viewpoint of theoretical physics, neuronal systems are composed of many molecules that are kept out of thermodynamic equilibrium by metabolism. This allows them to form structures with complex dynamics. Neuronal excitability and the generation of action potentials in nerve cells are prime examples of complex dynamics. However, the single components of the nervous system (e.g. receptor and nerve cells) are so small that random fluctuations can significantly influence their behavior. How do receptors or neurons process sensory information when complex nonlinear dynamics and neuronal noise interact? This question keeps Lindner and other theorists busy.

Lindner has investigated this question in abstract neuronal models and also in specific sensory systems, for example, in weakly electric fish and in the auditory system of locusts. In this context, he prefers models that take relevant biophysical



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details into account but still permit an analytical approach: “As a physicist, I am interested in the mathematical mechanisms that underlie the experimentally observed properties.” In his view, simplifications of the model that are enforced by the mathematical analysis often contribute significantly to the gain of knowledge. This, of course, does not release him from the obligation of testing predictions of simple models by using computer simulations of more detailed models. “However, it is most satisfying when theoretical predictions are confirmed in the experiment,” explains Lindner.

A recent study by Lindner is devoted to ‘channel noise’. The excitability of neurons, as well as properties like adaptation, rely on the opening and closing of specific ion channels in the cell membrane. At the same time, these channels produce random perturbations (fluctuations). Moreover, the fluctuations stemming from different kinds of channels can have various effects on neuronal firing statistics and signal transmission. Together with his Ph.D. student Tilo Schwalger and Jan Benda’s group at the Bernstein Center Munich, Lindner studies the implications of these findings. The developed mathematical model also allows for answering the reverse question: Which kind of ion channel dominates neural noise? This is highly interesting because, for many neurons, the type and number of channels in the membrane is unknown. The model can thus potentially serve to indirectly estimate unknown parameters of the neuron (e.g. number and



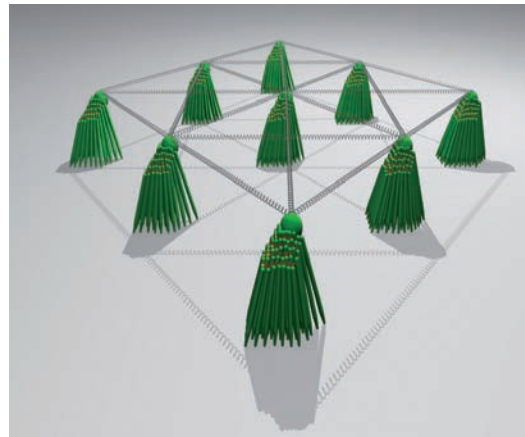
conductance of ion channels). An application of the theory to neuronal data that were measured by Karin Fisch and Jan Benda in Munich in the auditory receptors of locusts, appears promising.

Although Benjamin Lindner has a preference for analytical methods, he believes in the necessity of interdisciplinary collaborations. During his three-year research period at the University of Ottawa (Canada) in the groups of Andre Longtin and John Lewis, he made first contacts to experimentally working scientists. Despite some initial difficulties in communicating across scientific fields, he has learned a lot from this cooperation: “Experimentalists and theoreticians often have very different perspectives on the same phenomena. This makes the exchange sometimes complicated, but often stimulating and fruitful.” At the Bernstein Center Berlin, he seeks new collaborations with the resident experimenters.

After his return from Canada in 2005, Benjamin Lindner did research at the Max Planck Institute for the Physics of Complex Systems (Dresden). There, he worked on the dynamics of sensory hair cells in the inner ear. By means of their ‘hair bundles’, hair cells register and transduce mechanical signals, e.g. sound, into electrical signals. In various hair cells, it has been shown that hair bundles can spontaneously oscillate – even without any external stimulation. This property makes hair cells suitable for the perception and amplification of periodic signals. Experiments on single hair cells, however, show that these oscillations are noisy, which significantly reduces their amplifier characteristics. Lindner, together with his Ph.D. student Kai Dierkes and with Frank Jülicher, Director at the Max Planck Institute in Dresden, could theoretically demonstrate that the mechanical coupling of hair bundles improves the signal gain of the hair cell. Such coupling can be found in the human cochlea. Biological support for the hypothesis came from an inventive hybrid experiment, a collaborative experiment with colleagues in Paris, Jérémie Barral

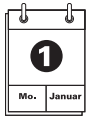
und Pascal Martin. They coupled a biological hair bundle with two computer-simulated “virtual” hair bundles, and this resulted in improvement of the signal gain in the experimentally studied hair cell.

Of course, much of the theoretical results on the complex dynamics of neuronal systems are nowadays achieved in extensive computer simulations. However, new ideas are still developed with paper and pencil or with students and colleagues in front of a blackboard. While his students have asked for modern whiteboards for their new rooms, Lindner prefers the classic style. Besides computer and pencil, his most important tool is the blackboard on the wall of his office.



© MPI für die Physik komplexer Systeme,
Kai Dierkes

Virtually coupled: hair bundle cells in the inner ear possess brush-like elongations, the so-called hair bundles (shown here in green). These are coupled to each other, leading to a better detection of oscillating signals such as sound.



Personalia

Niels Birbaumer (BFNT Freiburg-Tübingen, University of Tübingen) receives a grant from the Koselleck program of the DFG for highly innovative research.

www.idw-online.de/de/news428202 (in German)

Alexander Borst (BCCN Munich, MPI of Neurobiology, Martinsried) was elected new member of the German National Academy of Sciences Leopoldina.

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

Andreas Heinz (BCCN Berlin, BFNL Complex Human Learning, Charité – Universitätsmedizin Berlin) was awarded the „Leibniz Chair“ by the Leibniz Institute for Neurobiology Magdeburg.

www.idw-online.de/de/news426827 (in German)

Sarah Jarvis (Egert lab: Bernstein Center Freiburg, BCF), **Susanne Kunkel** (Morrison lab: BCF), **Eric Reifenstein** and **Frederic Roemschied** (both Schreiber lab: BPCN, BCCN Berlin), **Matthias Schultze-Kraft** (Müller lab: BCCN and BFNT Berlin, BCOL Neurovascular Coupling), **Tilo Schwalger** (Lindner lab: BCCN Berlin), and **Man Yi Yim** (Aertsen lab: BCF) received book awards for their poster presentations at the CNS Conference 2011. **Josef Ladenbauer** (Obermayer lab: BCCN and BFNT Berlin, BFNL Complex Human Learning, BCOL Memory Network, D-USA Collaboration) additionally received a one-year membership in the „Organization for Computational Neurosciences“ (OCNS).

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

www.cnsorg.org/index.shtml

Thorsten Kahnt (BCCN and Charité – Universitätsmedizin Berlin) received an award of the “Berliner Wissenschaftliche Gesellschaft” (Berlin Science Society) for his thesis on the

processing of reward stimuli in the human brain, completed in the group of John-Dylan Haynes (BCCN and BFNT Berlin).

www.idw-online.de/de/news432465 (in German)

Janina Kirsch (BCF and University of Freiburg) received one of three teaching awards of the University of Freiburg.

www.bcf.uni-freiburg.de/news/awards/20110622-teaching-award

David Liebetanz (BCCN and Universitätsmedizin Göttingen) coordinates the new BMBF-funded project TELMYOS that investigates a new approach for human-machine interfaces. The project is also supported by Otto Bock HealthCare (Industry partner of the BCCN and BFNT Göttingen).

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

Henrik Mouritsen (BFNL Sequence Learning, Lichtenberg Professor, University of Oldenburg) was awarded the „Eric Kandel Young Neuroscientists Prize“ of the Hertie Foundation.

www.idw-online.de/de/news426308 (in German)

Visvanathan Ramesh joined the Bernstein Focus: Neurotechnology team at the Goethe-University and Frankfurt Institute of Advanced Studies as W3 professor for Software Engineering with emphasis on Bio-inspired Vision.

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

Eberhart Zrenner (BCCN and University of Tübingen) and his project team received the second prize of the European Society for Retina Specialists (EURETINA) for their work in subretinal implant technology.

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

Bernstein Scientists participate at 1st German-Israeli Forum

On invitation of the German Research Minister Annette Schavan and the Israeli Science Minister Daniel Hershkowitz, the First German-Israeli Forum for Research Cooperation took place in Aachen, Germany, from June 27 - 29, 2011. The objective was to strengthen the ties between the German Federal Ministry of Education and Research and the Israeli Ministry for Science and Technology. One of the topics discussed during the event was Computational Neuroscience. Scientific speakers for this topic were Tamar Flash (Weizmann Institute of Science, Rehovot), Moshe Abeles (Gonda Brain Research Center, Bar-Ilan University), Ad Aertsen (BCF and University of Freiburg) and Michael Brecht (BCCN and Humboldt-Universität zu Berlin, BFNL State Dependencies of Learning). Markus Diesmann (Forschungszentrum Jülich, BCF), Dirk Jancke (BGCN and Ruhr-Universität Bochum), Hermann Wagner (BCOL Temporal Precision, RWTH Aachen University) and Fred Wolf (BCCN and BFNT Göttingen, BFNL Visual Learning, BCOL Action Potential Encoding, MPI for Dynamics and Self-Organization) participated as discussants. The Computational Neuroscience session was chaired by Simone Cardoso de Oliveira (BCOS).

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



Scientists at German - Israeli Forum. From left: Moshe Abeles, Hermann Wagner, Michael Brecht, Fred Wolf, Ad Aertsen.



Bernstein Network at 61st Nobel Laureate Meeting

The Bernstein Network presented its research at this year's Lindau Nobel Laureate Meeting during a cruise on the Lake Constance. Besides a general presentation and videos on the network's research topics, a six-legged walking robot from the lab of Florentin Wörgötter (BCCN and BFNT Göttingen) was presented. More than 20 Nobel Laureates and about 600 hand-picked young scientists attended the meeting.

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

Bernstein Network booth. From left: Winfried Kretschmann (Minister president of Baden-Württemberg), Simone Cardoso de Oliveira (BCOS), Jan-Matthis Braun (PhD student of Florentin Wörgötter, BCCN and BFNT Göttingen).

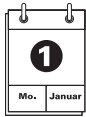


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New Call for German-US American Collaborations in CNS

In June 2011, the second call for applications for German-US American Collaborations in Computational Neuroscience was published. The funding scheme „Germany - USA Collaboration in Computational Neuroscience“ is a transnational initiative for supporting collaborative research between Germany and the United States of America. It is jointly funded by the German Federal Ministry for Education and Research (BMBF), the National Science Foundation (NSF) and the National Institutes of Health (NIH) within the CRCNS program. Next deadline for applications (5 p.m. proposer's local time): November 2, 2011. Additional calls are envisaged.

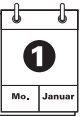
www.nncn.de/nachrichten-en/crcnscalljun2011/



NEWS AND EVENTS

Upcoming Events

| Date | Title | Organizers | URL |
|------------------------------------|---|---|--|
| Sept. 4-6, Boston, USA | 4th INCF Congress of Neuroinformatics | International Neuroinformatics Coordinating Facility (INCF) | www.neuroinformatics2011.org |
| Sept. 4-25, Bochum | First European Campus of Excellence in Neuroscience „The Fate of the Memory Trace: Learning, Remembering and Forgetting from Molecules to Behavior“ | S. Cheng, O. Güntürkün (BFNL Sequence Learning), D. Manahan-Vaughan, R. Menzel (BCCN Berlin, BFNL Memory in Decision Making, BCOL Olfactory Coding), T. Münte, G. Roth | www.euca-excellence.eu/index.php/en/courses-in-europe/bochum.html |
| Sept. 5-9, Lübeck | 2nd Baltic Autumn School: Workshop on Systems Biology | J.C. Claussen, A.M. Mamlouk (Institute for Neuro-/ Bioinformatics, Director T. Martinetz member of D-USA Collaboration, University of Lübeck), K. Dau | www.inb.uni-luebeck.de/~as11/ |
| Sept. 11-16, St. Andrews, UK | Summer School: Advanced Scientific Programming in Python | K. M. Zeiner, M. Spitschan, Z. Jedrzejewscy-Szmek (G-Node), T. Zito (BCCN Berlin, G-Node) | https://python.g-node.org/wiki/ |
| Sept. 19-21, Göttingen | Ribbon Synapses Symposium 2011 | F. Schmitz, H. von Gersdorff, T. Moser (BCCN and BFNT Göttingen), J.S. Rhee, T. Pangrsic, D. Riedel, E. Reisinger, M. Rutherford, C. Wichmann | www.rss2011.uni-goettingen.de |
| Sept. 19-23, Göttingen | 9th Fall Course on Computational Neuroscience | D. Hofmann (Course hosted by BCCN Göttingen) | www.bccn-goettingen.de/events-1/cns-course |
| Sept. 27-30, Freiburg | BMT and DGBMT 45th Annual Meeting | DGBMT within VDE e.V., Department of Microsystems Engineering (IMTEK) of the University of Freiburg (T. Stieglitz and G. A. Urban, BFNT Freiburg-Tübingen, Congress Chairs) | http://conference.vde.com/bmt-2011/ |
| Sept. 28-29, Tübingen | Symposium: Multisensory Perception and Action | Cluster D of the Bernstein Center Tübingen | www.bccn-tuebingen.de/events/bernstein-symposium-series-2011/symposium-d.html |
| Oct. 4-6, Freiburg | Bernstein Conference 2011 | U. Egert, A. Aertsen, F. Dancoisne, G. Grah, G. Jäger, B. Wiebelt (BCF Freiburg), S. Cardoso de Oliveira (BCOS) | www.bc11.de |
| Oct. 14-16, Nuremberg | Symposium: Responsibility - an Illusion? | Gemeinnützige turmdersinne GmbH, (N. Birbaumer, BFNT Freiburg-Tübingen, speaker) | www.turmdersinne.de/index.html?symposium |



Upcoming Events

| Date | Title | Organizers | URL |
|----------------------------------|--|--|--|
| Oct. 16-21, Freiburg | BCF/NWG Course: Analysis and Models in Neurophysiology | S. Rotter, U. Egert, A. Aertsen, J. Kirsch (BCF Freiburg), S. Grün (BCCN Berlin) | www.bcf.uni-freiburg.de/events/conferences/20111016-nwgcourse |
| Oct. 17-18, Berlin | Pathway to more Transparency in Animal Research | M. Hengartner, Stefan Treue (BCCN and BFNT Göttingen) | www.basel-declaration.org/events/berlin-event |
| Oct. 26-28, Bled, Slovenia | Conference: Humanoids 2011 | A. Ude (G. Cheng, BCCN Munich, Awards co-Chair) | www.humanoids2011.org/Welcome.html |
| Nov. 4-5, Heidelberg | 12th EMBO/EMBL Science & Society Conference | A. Bendiscioli, H. Breithaupt, G. Wallon, H. Stefansson (D. Bartsch and A. Meyer-Lindenberg, BCCN Heidelberg-Mannheim, scientific committee) | www.embo.org/policy-and-society/science-society/conferences/2011.html |
| Nov. 12-16, Washington D.C., USA | SfN 2011 with Bernstein Information Booth (#3329) | Society for Neuroscience | www.nncn.de/termine-en/sfn2011/ |
| Feb. 21-23, 2012, Göttingen | Course: Transcranial Magnetic and Electrical Stimulation | A. Antal, W. Paulus (BCCN, BFNT Göttingen, BCOL Transcranial Stimulation) | www.nncn.de/termine-en/kursgoettingen/ |

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Title image: activity map of spatial memory cells of a rat; dark: high activity, bright: low activity (s. article p. 7).

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