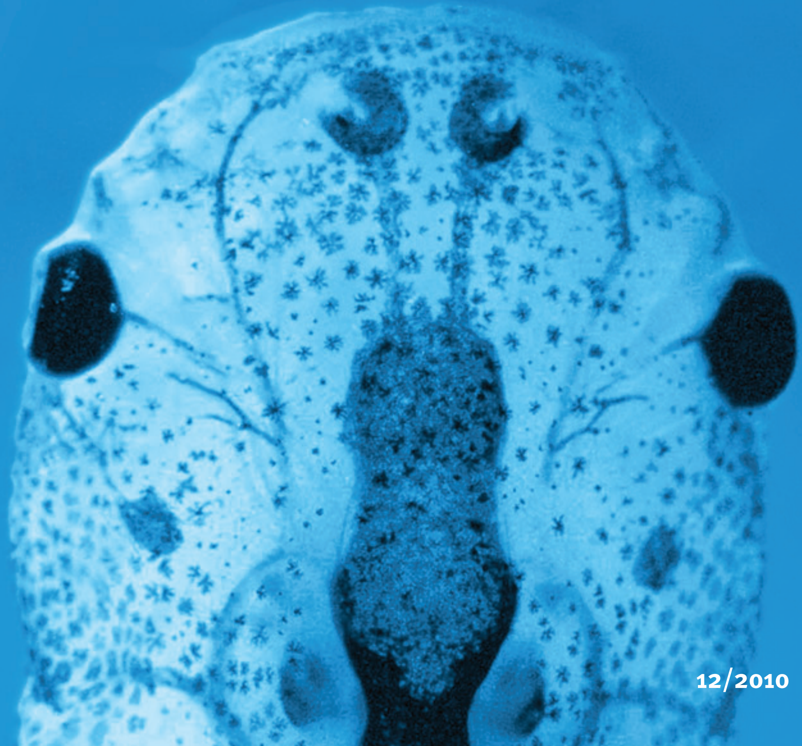
Bernstein Network for Computational Neuroscience

Bernstein Newsletter



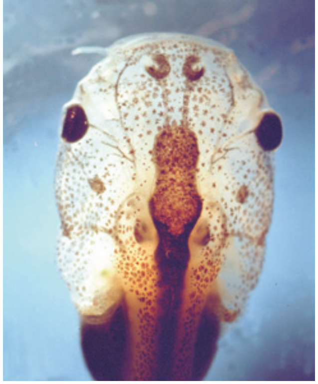
Recent Publications
Fast code for odors – Neurons are smart number crunchers – Perception of motion – Self-organization instead of environment and genes – Invisible signals teach us to see – Unravelling the code of the brain

Meet the Scientist
Udo Ernst

News and Events
Bernstein Conference 2010 – News from the training programs

12/2010

Fast code for odors



Overview of the front part of the brain and the nose of the larva (tadpole) of the African clawed frog Xenopus laevis.

Sensory perception is a fast process. One glance is enough to capture a complex visual scene, and without the ability of the ear to process signals at an enormous temporal resolution, an understanding of language or music would not be possible. But not only hearing and vision are characterized by fast reactions. Recent studies indicate that humans and animals can also recognize odors in less than a second.

Scientists from the University Medicine Göttingen have now discovered the neural mechanism underlying the brain's fast reaction to odors. They could show that the information about an odor is already contained in the temporal sequence of the first neuronal impulse each nerve cell in a neuronal population would generate. Stephan Junek obtained the results in the framework of his doctoral thesis in the laboratory of Detlev Schild, Director of the Department of Neurophysiology and Cellular Biophysics, University Medicine Göttingen. Both scientists are also part of the Bernstein Center Göttingen and the DFG Research Center for Molecular Physiology of the Brain (CMPB).

To be able to perceive our environment, every sensation is translated into neural activity of the brain. The Göttingen scientists have addressed how information about odor is contained in the spatio-temporal patterns of neural impulses. Is the crucial factor the number of neuronal signals that each cell transmits, or is it the exact timing of individual impulses? The Göttingen researchers examined the neuronal processes in tadpoles of the African clawed frog in more detail. They investigated neural activity in the olfactory bulb, the brain region responsible for processing olfactory information. In their experiments, they focused on the earliest information sent out by each neuron, namely the time of the first neural impulse after administration of an odor, called first-spike latency.

The scientists presented the olfactory system with a variety of stimuli and analyzed the time it takes for the neuron to "fire" for the first time (the first-spike latencies) in dozens of nerve cells simultaneously using high-resolution optical measurements. They found that different odors each evoked a characteristic latency pattern. In the next step, the researchers were able to show that it is also possible to infer the odor solely on the basis of its measured pattern. They conclude that latency patterns are essential for the rapid detection of odors.

"Until now, it was generally assumed among the vast majority of neuroscientists that other aspects of neuronal activity — not the first-spike latencies — represent the code in the brain," says Prof. Detlev Schild. "Our results show that odor information is contained in the latencies of neurons in the olfactory bulb. This insight has raised a set of new questions. Above all, it will now be important to find out how downstream brain regions read and understand the latency code."

Junek S, Kludt E, Wolf F, Schild D. (2019): Olfactory coding with patterns of response latencies. Neuron 67, 5: 872-884.

Neurons are smart number crunchers

The brain processes information in form of electrical impulses. Each neuron receives impulses from thousands of upstream cells, each of which causes a small deflection of the voltage across the neural membrane. If the voltage reaches a threshold, the neuron itself emits an impulse and the process starts anew.

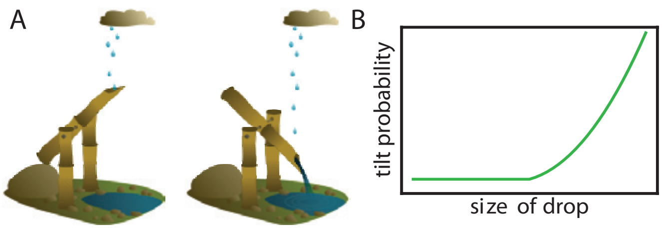
Scientists around Stefan Rotter at the Bernstein Center Freiburg and Markus Diesmann at the RIKEN Brain Science Institute now found out how neurons may benefit from this impulse-like language: Communication is faster than previously thought. Even a single cell is able to perform complex operations, and neurons are optimally prepared to process many signals at the same time.

Why did the prevailing theory miss these features? As a neuron receives ten thousands of small impulses each second, previous theories made the simplifying assumption that every impulse has a vanishingly small effect, like a raindrop in the ocean. In the life of a neuron, however, there are situations in which a single impulse can be decisive. As an analogy, the scientists around Diesmann refer to the "shishi odoshi" – the Japanese deer scarer – in the rain. As soon as the water level in the bamboo tube reaches a critical level, the bamboo tilts and drains, like the discharge of a neuron during an action potential. The single last drop of water causes the shishi odoshi to tilt, corresponding to an instantaneous response of a neuron to the last incoming impulse. The novel theory takes this "last drop" into account, resolving the contradictions between simulation results and the traditional theory. Verification of the new theory was enabled by developing highly precise simulation algorithms.

Taking into account a further property of nerve cells, the new theory also explains why a neuron can do more than just add up its inputs. A small leak current, corresponding to a tiny hole at the bottom of the shishi odoshi, leads to continuous discharging of the cell. Hit simultaneously by two drops of water, the shishi odoshi tilts with more than the twofold probability; the neuronal response is "non-linear". This non-linearity is the basis for complex operations like multiplications. Moreover, the theory helps to understand how neurons can process the barrage of impinging inpulses in a meaningful way. It illustrates that a neuron only works optimally if it receives enough inputs at a given time. The reason is the same as in the shishi odoshi: A single raindrop will never tilt an empty shishi odoshi. It can only have a decisive effect if it is accompanied by many others.

Which effects does this fast, non-linear response of a nerve cell have on the function of the network as a whole? How do these features affect learning in large networks? These are the questions Diesmann's group is now able to address.

Helias et al. (2010): PLoS Comput Biol 6(9): e1000929.
Hanuschkin et al. (2010): Front. Neuroinform. 4:113.
www.nest-initiative.org



A: Shishi odoshi as analogy to neuronal activity. Raindrops correspond to incoming impulses, tilting to impulse emission and a small hole to a leak current. B: Tilting probability increases disproportionately with increasing drop size – the shishi odoshi works non-linearly.
Image: Susanne Kunkel, Idea: Johanna Derix

Perception of motion

The appearance of a spot of light on the retina causes sudden activation of millions of neurons in the brain within tenths of milliseconds. At the first cortical processing stage, the primary visual cortex, each neuron thereby receives thousands of inputs from both close neighbors and further distant neurons, and also sends out an equal amount of outputs to others. Scientists from the Ruhr University Bochum and the Bernstein Group for Computational Neuroscience have now described the complex interplay between individual cells in a computer model that is based on far reaching interactions between cortical neurons. The model explains how neurons can be preactivated by their neighbors, so that stimuli can be processed more rapidly.

The starting point of the study was a phenomenon called "line motion illusion" in psychology: if an observer looks at a square followed in fast succession by an elongated bar, he will perceive a gradual movement, as if the bar is drawn out from the location of the previously flashed square. This illusion arises because the presentation of the square leads to an initially local brain activation that spreads quickly as a travelling wave. At first, this wave remains subthreshold and hence cannot be perceived consciously. If shortly after, however, a second, horizontal bar-shaped stimulus appears, the activity can become supra-threshold.

Scientists around Dirk Jancke have now successfully implemented these complex interaction dynamics in a computational model. A so-called neural field was used in which the impact of each model neuron is defined by its distance-dependent interaction radius: close neighbors are strongly coupled, and neurons that are farther apart are gradually less interacting. Two layers, one excitatory and one inhibitory, are recurrently connected such that a local input leads to transient, focal activity that propagates quickly and then gradually fades out. In such a model, the long-range interactions lead to a pre-activation of distant nerve cells.

Such pre-activation may play an important role during the processing of moving objects. Given that neuronal processing takes time, the brain always receives information about the external world with a certain delay. In order to counterbalance such delays, pre-activation may serve a "forewarning" of neurons that represent locations ahead of an object trajectory and thus, may enable a more rapid crossing of firing thresholds to save important processing time.

The model offers a mathematical framework of how the brain operates beyond a simple passive mapping of external events and how it conducts "interactive" information processing, leading, in limit cases, to what we call illusions. The future challenge will be to implement neural fields for more complex visual stimulus scenarios. Here, it may be an important advantage that this model class allows abstraction from single neuron activity and provides a mathematically handable description in terms of interactive cortical network function.

Text: Dirk Jancke / Press office RUB

Markounikau V, Igel C, Grinvald A, Jancke D (2010): PLoS Comput Biol 6, e1000919.

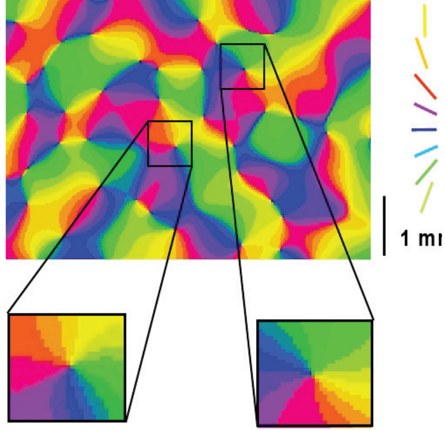
The "line-motion" illusion. If subjects are presented with a square and a bar in short sequence (left), they perceive an illusionary motion (right).

Self-organization instead of environment and genes

Besides environmental and genetic factors, self-organization plays a crucial role in brain development. This is the conclusion that an international team around Fred Wolf and Siegrid Löwel (Bernstein Center and Bernstein Focus Neurotechnology Göttingen, Bernstein Collaboration, Bernstein Focus Learning) draws from their research. The scientists discovered an astonishing similarity in the brains of ferrets, tree shrews and bush babies: The arrangement of nerve cells in their visual cortices follows exactly the same design. Neither environmental nor genetic factors could explain this finding. Using a mathematical model describing how neural circuits in the brain develop through self-organization, however, the researchers could accurately predict the observed brain architecture.

Nerve cells in the visual cortex respond to certain image elements such as edges and contours. Every cell has a so-called orientation preference: it is specialized on specific edge orientations, such as horizontal or oblique lines. By coloring cells of the same orientation preference in the same color, a map of orientation preference arises. The fundamental structural element that is repeated over and over in these maps in the visual cortex is called a "pinwheel", since the areas of different orientation preferences touch each other at a central point, like the wings of a toy pinwheel.

Earlier work had suggested that the distributions of pinwheels should be different in different species. In their study, however, the researchers found that the distributions in ferrets, tree shrews and bush babies were amazingly similar. This finding could not be due to a common, inherited genetic blueprint. The inheritance trees of these species were separated 65 million years ago, and there are clearly more closely related mammals that have differently structured visual cortices. Nor can similar experiences during brain development provide an explanation, since the animals live under completely different environmental conditions.



False-color orientation map in the visual cortex of a ferret with two enlarged pinwheels. @ MPI für Dynamik und Selbstorganisation.

The similarity in structure is best explained by self-organization processes by which orientation preference maps gradually develop after birth. The mathematical analysis of neural self-organization showed that a few conditions suffice to produce the observed "quasi-periodic" pattern of pinwheels. The existence of direct connections between distant neurons, through which they can interact during brain development, is one of these decisive conditions.

Popular examples of self-organization processes are waves in soccer stadiums or stop-and-go waves in traffic flow. They do not obey a hidden "conductor", or "script" that controls all system elements (the individual football fans or cars). The movements rather result from interactions between the individual elements. The new results now show that such interaction processes in self-organization can explain not only the concerted behavior of soccer fans or cars, but also the formation of maps in their brains.

Text after Birgit Krummheuer, Fred Wolf (shortened).

Kaschube et al. (2010): DOI: 10.1126/science.1194869.

Invisible signals teach us to see

Adjustments of perception to variations in the sensory input occur in all our senses. Massimiliano Di Luca and Marc Ernst from the Bernstein Center Tübingen and the Max Planck Institute for Biological Cybernetics, together with their colleague Benjamin Backus from the State University of New York, discovered that perception does not only adjust gradually, but that completely new associations between previously unrelated signals can be learned and that this form of learning occurs automatically. “Otherwise it could not be explained why even associations with invisible signals can change our viewing behavior,” says Marc Ernst, head of the group for multisensory perception at the Max Planck Institute. “To perceive the world as it is, babies repeatedly undergo this process in which they learn to integrate known sensory impressions with new, at first not perceivable, signals.”

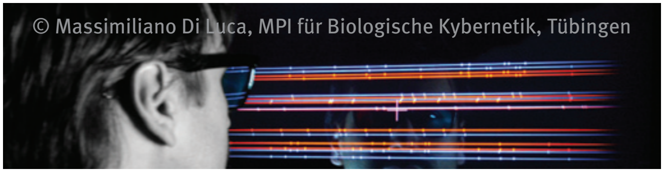
When new sensory stimuli correspond to other known stimuli, our brain learns this new contingency and integrates the signals to shape novel perceptions. This is advantageous for the brain because such redundancies in signals will render perception more robust. If, for example, one signal is missing at times, the brain can still maintain a stable percept by relying on the other redundant signal. Using a trick and combining an invisible visual signal with an already established signal, Massimiliano Di Luca and colleagues have now found that such new associations occur continuously and automatically, without cognitive influences such as awareness or attention.

But what is an invisible visual signal? We perceive depth by combining the signals supplied by the images in both eyes. Those images are normally slightly different. For example, the size of the image is larger in the eye that is closer to the object. We are not consciously aware of this difference – it is invisible. Massimiliano Di Luca and colleagues used this size difference and combined it with the direction of rotation of a cylinder constituted by lines (figure). Depending on which eye had the larger image, the cylinder was either rotating upwards or downwards. To test whether this association was learned, the scientists used a version of the cylinder in which the direction of rotation was ambiguous. “Combined with the newly learned invisible signal, however, the rotation of the cylinder changed depending on which eye had the larger image,” says Massimiliano Di Luca. “This proved that the new, invisible signal had gained an influence on visual perception,” says Benjamin Backus.

This study highlights the brain‘s plasticity and may thus also provide important hints for rehabilitation. “Our study may also help to better understand when and under what conditions failures of brain parts – for example, after a stroke – can be compensated by learning such new associations,” says Ernst.

Text: Marc Ernst

Di Luca M, Ernst MO, Backus BT (2010): Current Biology 20 (20): 1860-1863



A cylinder made up of horizontal lines: Special glasses provide the right eye with the blue lines and the left eye with the red lines.

Unravelling the code of the brain

For more than fifty years, the neuroscience community is engaged in an intensive debate on how information is coded in the brain and transmitted reliably from one brain region to the next. Mutually exclusive coding systems have been proposed and are being energetically supported. Scientists from the University of Freiburg were now able to demonstrate that earlier studies were based on rather extreme propositions. Instead, it is possible that, under certain conditions, both proposed codes can be simultaneously employed within the brain.

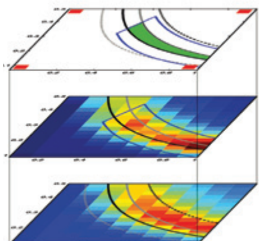
One of the unsolved puzzles of the brain is the question of which code is being used when nerve cells communicate with each other. It has been known for more than a century that the basic unit of communication within the nervous system is the pulse-like fluctuation in voltage at the membrane of neurons. But there is still a hot ongoing debate on how these so-called action potentials are combined to form a code for the actual processing and transmission of information. Two forms of coding are popular candidates: one is based on the rate of action potentials (rate coding) and the other relies on the timing of their occurrences (temporal coding).

So far, the nature of the neural code has remained largely elusive to experimental brain research. Even the brains of insects are too complex for today's scientists to determine which code they use. Theoretical approaches, simulating brain processes by means of computer models, therefore play an important role within modern neuroscience and can address these and other questions.

Models presented in earlier studies suggested that only one of the two proposed codes could be employed at any time in neuronal networks. Depending on the way how neurons contact each other, either pulse rate or timings could be transmitted reliably. Arvind Kumar, Stefan Rotter and Ad Aertsen from the Bernstein Center Freiburg now propose that under certain conditions, both forms of coding can in fact be employed simultaneously. The scientists argue that earlier studies did not recognise the possible coexistence of both codes, because they represent two extremes of a continuum of biologically plausible conditions. Now, their studies demonstrate that earlier findings can be reconciled into a larger conceptual framework of neural coding and transmission. In addition, their analysis of the required conditions shows that it is actually possible to use both codes simultaneously in one neuronal network. Thus, for the first time, conditions for this coexistence of different neural codes have been identified. This provides valuable clues as to what to analyze in future experiments when trying to identify the codes that are used by "real" brains.

Text: Gunnar Grah, Bernstein Center Freiburg

Kumar A, Rotter S, Aertsen A (2010): Nat Rev Neurosci 11: 615-27.



Neuronal networks with different combinations of number and strength of neuronal connections can be displayed as a plane, with each rectangle representing a certain combination of features. The region in which asynchronous (bottom) or synchronous (middle) signals can be propagated overlaps (top, marked in green). Networks in this region can use both rate coding and temporal coding.

Udo Ernst explaining the "visual typewriter" during his talk at the Bernstein Award ceremony.

Bild: Ulrich Dahl, TU Berlin

Udo Ernst

How we see the world

"Not too abstract" he wanted the topic of his diploma thesis to be, "something that bears a relation to everyday life," says Udo Ernst, now scientist at the University of Bremen and winner of the Bernstein Award 2010. And this is how the theoretical physicist got into brain research. He did his diploma thesis with Theo Geisel and stayed on for his doctoral thesis – first at the University of Frankfurt and later at the Max Planck Institute for Dynamics and Self-Organization in Göttingen. The Geisel group deals with nonlinear dynamics, i.e. with complex systems whose behavior can not be predicted easily. The nervous system, Udo Ernst's research focus, belongs exactly to this class of systems. He has remained faithful to the neurosciences up until today, and also to the collaborators of his diploma and PhD work. In Bremen, he conducts his research in the laboratory of Klaus Pawelzik, with whom he had teamed up already in Theo Geisel's lab in Göttingen.

Today, Udo Ernst investigates the visual system. From a philosophical point of view, how we see the world depends very much upon ourselves – and this insight also applies to the sensory processing in the brain. To enable us to see, the brain represents our visual environment in the form of electrical activity of nerve cells. However, it does not create an exact copy of the environment. Rather, it optimizes its representation to the given context. When we are looking for something specific, for example, we blank out other objects. Also prior knowledge is integrated into the vision process – shapes that are familiar to us are recognized much faster, and we automatically complete any missing information. But how exactly are prior knowledge and context integrated into visual processing? This is the question that Udo Ernst wants to investigate with his Bernstein Award.

His research focuses on the question of how we integrate local features of a scene into more complex shapes and objects – e.g., how we combine colinearly aligned edges into a contour. "When we observe, for example, a bus driving along behind a tree, its contour is interrupted," says Ernst. "Yet, our mind very quickly re-assembles the image and we perceive interrupted edges as a unit." This process is influenced by what we expect on a picture or which aspects we focus on. If we are looking for horizontal lines, we are less good at perceiving vertical ones. By combining experimental and theoretical research approaches that cross-fertilize each other, Ernst investigates how the ability to integrate contours depends on what we focus our attention on.

In a first approach, subjects are shown images that contain many short edge elements. Their task is to discover simple shapes that consist of longer contours. Ernst then changes individual parameters in the images, such as the orientation of the edges relative to the contour or their distance from another. He then examines which rules are used to integrate the image segments, and how this integration process changes when the subject is asked to focus on certain aspects.

In a second approach, macaques are confronted with very similar tasks, in which they also have to recognize simple shapes. At the same time, the activity of nerve cells in the visual cortex is measured. In a certain cortical region, called "V1", the cells react to edges of a particular orientation. These cells are interconnected in several layers such that in another region, "V4", more complex forms are recognized. In cooperation with the research group of Andreas Kreiter, neural activity in V1 and

V4 will be measured, allowing to investigate how edges are integrated into shapes and how this process is influenced by task demands and attention.

Ernst's hypothesis is that factors such as attention and stimulus context affect neuronal activity simultaneously on all levels of image processing. What is the nature of such an influence? Does it require a continuous neuronal signal, or is a short impulse sufficient to move the network from one state into another and thus specifically select a particular processing mode? Ernst will analyze these questions by using computer-based models of neural networks that include the results derived from the experimental studies.

Ernst envisages several possible applications for his research. Already today, paralyzed patients who can only move their eyes communicate via a visual typewriter: they move their eyes from letter to letter. This process could be accelerated significantly by directly reading out the attended letters from the patients' brain activities. Ernst's research will deliver a significant contribution to this effort.

Another – technically very challenging – application is a novel cortical visual prosthesis. In previous approaches to restore visual function, a neural prosthesis is inserted into the retina in order to replace neuronal functions there. If the optic nerve is damaged, however, such prostheses are no help. The research focus 'Neurotechnology' of the University of Bremen, therefore, explores the possibility of implanting a neural prosthesis directly into the visual cortex of the brain. The prosthesis would analyze image data and would stimulate the cells in the visual cortex accordingly, such that a particular visual sensation is elicited. This requires, however, a better understanding of the functioning of nerve cells within the visual cortex, which is the main objective of the Bernstein Award winner.

"I always wanted to understand something that not many scientists have yet touched upon," says Udo Ernst. This requires freedom to explore new avenues and to develop your own thoughts – and this is what he always received in the groups of Theo Geisel and Klaus Pawelzik. "They have always optimally supported me, have mediated contacts and, whenever I needed a research stay abroad in order to pursue a new idea, they have made it possible." One of these trips took him to Sophie Denève in Paris at the École Normale Supérieure. In the group of Theo Geisel, Ernst had applied what one could call a "bottom-up approach", which starts out from the networks components and their properties in order to understand its dynamics and possible functions. The Denève lab, in contrast, applies a "top-down approach", which looks at the abilities of the brain and asks which connectivities and collective mechanisms could underly them. It is the combination of both approaches that specifically characterizes Udo Ernst's current research.

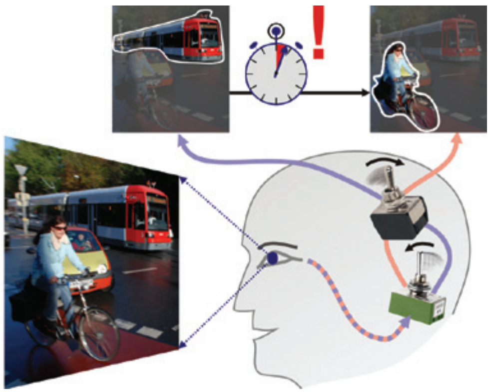


Bild: Udo Ernst

Our brain is capable of rapidly switching between different processing strategies: Within milliseconds, it switches from the task of recognizing the correct streetcar line to the task of initiating an evasive movements in response to an approaching bike.

Bernstein Conference 2010

From September 27 to October 1, 2010, the 6th Bernstein Conference on Computational Neuroscience took place in Berlin. This year's Bernstein Conference was organized by the Bernstein Focus Neurotechnology Berlin under the direction of Klaus-Robert Müller. The approximately 270 attendees comprised, besides 205 members of the Bernstein Network, another 41 attendees from Germany and 26 international participants from other parts of Europe, Israel, the USA and Australia. The conference abstracts were published in Frontiers in Computational Neuroscience. http://frontiersin.org/events/Bernstein_Conference_on_Comput_1/1213/All%20Events

Dr. Udo Ernst (left) Dr. Georg Schütte (right)

Bernstein Award 2010 for Udo Ernst

As kick-off and first highlight of the conference, Dr. Georg Schütte , State Secretary at the Federal Ministry of Education and Research (BMBF), presented the Bernstein Award 2010 to Dr. Udo Ernst (University Bremen). Aim of the Bernstein Award is to offer outstanding young scientists "the best possible conditions for their scientific career and to attract them to Germany", Schütte said. The Bernstein Award is endowed with up to 1.25 Mio.€, constituting one of the best remunerated young scientists' award (s. also p. 15).

Source: www.bmbf.de/press/2951.php (in German)

Brains for Brains Awards 2010

Within the framework of the Bernstein Conference, the Bernstein Computational Neuroscience Association conferred for the first time three "Brains for Brains" Awards to students who, before starting their doctoral studies, contributed to a peer-reviewed publication or as first author to a peer-reviewed conference abstract. The awardees are: Ritwik Kumar Niyogi (India, currently Gatsby Computational Neuroscience Unit, UK), Costas Lagogiannis (Greece, currently University of Southampton, UK), Ramon Martinez Cancino (Cuba, Cuban National Bioinformatics Center). The prizes (500 € award money, additionally a travel scholarship for attending the Bernstein Conference and three German research institutions) were made possible by generous donations by the companies Brain Products GmbH, Multi Channel Systems MCS GmbH, Thomas Recording GmbH and Circular Informationssysteme GmbH.

Fellows of the Sloan Swartz Centers

Within the framework of the German - US-American exchange program between the Bernstein Network and the Sloan Swartz Centers for Theoretical Neurobiology, the Bernstein Focus Neurotechnology Berlin supported the participation of three PhD students/postdocs in the Bernstein Conference 2010: Jonathan Caplan (Brandeis University), Daniel Marti (NYU) and Kris Chaisanguathum (UCSF) .

Opening Ceremony of new BCCN Berlin Research Training Group

Subsequent to the Bernstein Conference, the Research Training Group (RTG) "Sensory Computation in Neural Systems" was officially inaugurated in an Opening Ceremony. After greetings by Prof. Jörg Steinbach (President, TU Berlin), Dr. Hans-Georg Husung (State Secretary at the Senate Department for Education, Science and Research, Berlin) and Prof. Klaus Obermayer (RTG spokesman, Bernstein Center Berlin), three internationally renowned speakers (Alain Destexhe, Gif-sur-Yvette; Maneesh Sahani, London; Jan Koenderink, Delft) presented their research, bearing great relevance for the newly established Research Training Group.

www.nncn.de/nachrichten-en/bernsteinkonferenz2010/

Personalia

Dario Farina (formerly Aalborg University, Denmark) accepted the appointment for the tenure track professorship “Biomedical Neuroinformatics and -stimulation“ at the Georg August University Göttingen and the Bernstein Focus Neurotechnology Göttin-gen.
Source: www.uni-goettingen.de/de/191742.html (in German)
s. also: http://person.hst.aau.dk/df/

Felix Franke was awarded a Chorafas Prize for his PhD thesis “Real Time Analysis of Neural Signals”, completed in the research group of Klaus Obermayer (Bernstein Center Berlin and TU Berlin).
Source:
http://idw-online.de/pages/de/news393376 (in German)

Tim Gollisch moves from the Max Planck Institute of Neurobiology in Munich-Martinsried and the Bernstein Center Munich to the Georg August University Göttingen, where he takes over the tenure track professorship “Sensory Processing in the Retina”.
Source: www.uni-goettingen.de/de/191742.html

Rüdiger Krahe (McGill University, Montreal, Canada) joined the Bernstein Center Munich in August 2010 to spend a one-year sabbatical leave in the group of Bernstein Awardee Jan Benda. He will work with Jan Benda and Jörg Henninger to develop a system for quantifying the statistics of natural sensory scenes as experienced by weakly electric fish in their natural habitats in South American rainforest streams. The resulting data, together with accompanying *in vivo* electrophysiology and modeling, will provide new insights into how these fish navi-gate and communicate based on their electrosensory system.
Source:
www.bccn-munich.de/people/scientists-2/rudiger-krahe

Siegrid Löwel (formerly Friedrich Schiller University Jena) accepted the appointment for the professorship “Systemic Neurobiology“ at the Georg August University Göttingen and the Bernstein Focus Neurotechnologiy Göttingen. Löwel already coordinates the Bernstein Collaboration “Action Potential Encoding” as well as the project “Visual Learning” within the Bernstein Focus Learning.
www.uni-goettingen.de/en/190976.html

Marianne Maertens will be awarded the Junior Research Award of the Governing Mayor of Berlin in 2010. She is postdoc in the research group of Felix Wichmann at the Bernstein Center Berlin and the Technical University Berlin and receives the award for her outstanding achievements in the psychophysical ana-lysis of human perception.
Source: http://idw-online.de/pages/de/news391707
(in German)

Roland Memisevic (ETH Zürich, Switzerland) has accepted the Junior Professorship (W1) for Computer Vision and Machine Learning at the Goethe University Frankfurt. The position is part of the Bernstein Focus Neurotechnology Frankfurt.
www.nncn.de/nachrichten-en/juniorprofessor/
www.cs.toronto.edu/~rfm/

New Master/Doctoral program at Bernstein Center Tübingen

The “Graduate School of Neural Information Processing” is scheduled to start in winter term 2011/2012. It provides research-oriented training in a wide spectrum of computational neuroscience topics, such as coding principles in sensory periphery and their clinical application, population coding in the early sensory cortex, perceptual inference mechanisms, and multisensory integration processes. Other fields of research include brain computer interfaces, neuroprosthetics, rehabilitation robotics, magnetoencephalography, and functional magnetic resonance imaging. Application deadline: Spring 2011.
www.neuroschool-tuebingen-comput.de

Prix Bartholdi for “Joint Master in Neuroscience” program

The trinational master program “Joint Master in Neuroscience”, created at the suggestion of members of the trinational research network NEUREX at the universities of Strasbourg, Basel, and Freiburg, was awarded the Prix Bartholdi on November 5, 2010, recognizing its unique transnational teaching offer. In Freiburg, the study program is provided by members of the Bernstein Center Freiburg.
Source (in German):
www.prixbartholdi.com/D_prixequipepedagogique.html

NWG course with new impetus

From October 10 to 15, the course “Analysis and Models in Neurophysiology” took place at the Bernstein Center Freiburg, supported by the German Neuroscience Society (NWG). The established program was complemented by open discussions between participants and faculty, in which concrete problems and questions could be discussed in smaller groups.
Source: www.bcf.uni-freiburg.de/events/conferences/101010-nwgcourse

DAAD funding for PhD program at Bernstein Center Freiburg (BCF)

Within the framework of the DAAD funding program “International doctorates in Germany”, the BCF receives a four year funding for its PhD program “International PhD in Computational Neuroscience and Neurotechnology”. The program further promotes the internationalization of BCF‘s PhD student training.

Events

Event	Title	Organization	URL
March 7 - 11, 2011, Munich	3rd G-Node Winter Course: Neural Data Analysis	M. Nawrot (BCCN Berlin), T. Wachtler (G-Node)	www.g-node.org/dataanalysis-course-2011
March 23 - 27, 2011, Göttingen	9th Göttingen Meeting of the German Neuroscience Society (with Bernstein booth and symposia organized by Bernstein members)	S. Korsching, M. Bähr, U. Heinemann, I. Zerr	www.nwg-goettingen.de/2011/
March 30 - April 2nd, 2011, Delmenhorst	Workshop: Computational Aspects of Learning	K. Pawelzik (BGCN Bremen, BFNL Sequenzlernen), U. Ernst (BGCN Bremen, BPCN 2010)	www.nncn.de/termine-en/workshopdelmenhorst
June 19 - 24, 2011, Bertinoro, Italy	FENS-IBRO SfN School: Causal Neuroscience: Interacting with Neural Circuits (with Bernstein members M. Brecht, H. Monyer)	G. Buszaki, M. Haeusser	www.nncn.de/termine-en/causalneuroscience
October 4 - 6, 2011, Freiburg	Bernstein Conference 2011	U. Egert, A. Aertsen, F. Dancoisne, G. Grah, G. Jaeger, B. Wiebelt (BCCN /BFNT Freiburg), S. Cardoso (BCOS)	www.bc11.de

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Title image: Overview over the front part of the brain and nose of the larva (tadpole) of the African clawed frog Xenopus laevis (s. article p. 3).

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