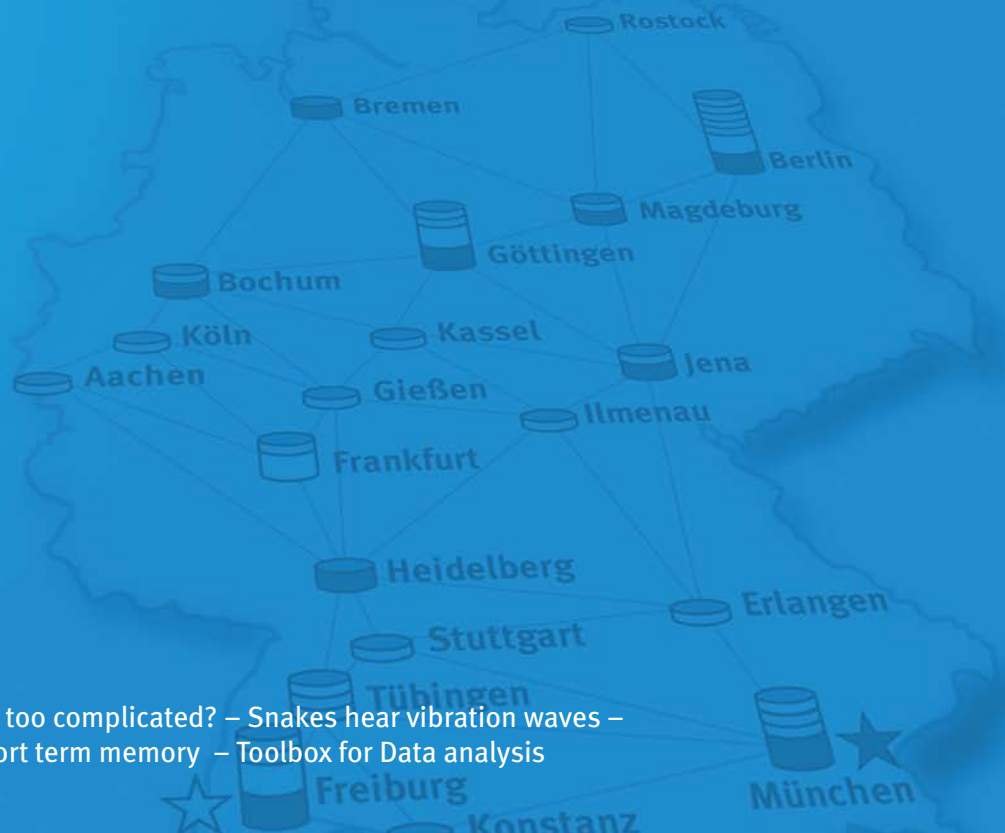


Bernstein Network for Computational Neuroscience

Bernstein Newsletter



Recent Publications

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Unconscious decisions – Short term memory – Toolbox for Data analysis



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Putting ideas into practice

A new procedure for neuroprosthetics

Every movement we execute has its origin in the brain. The goal of Carsten Mehring and his research group at the BCCN and the University of Freiburg is to use the brain signals for controlling prostheses for severely paralyzed patients or for using a computer. Together with colleagues from the University Hospital in Freiburg, the scientists showed that with the help of electrodes placed onto the brain, continuous arm movements can be predicted.

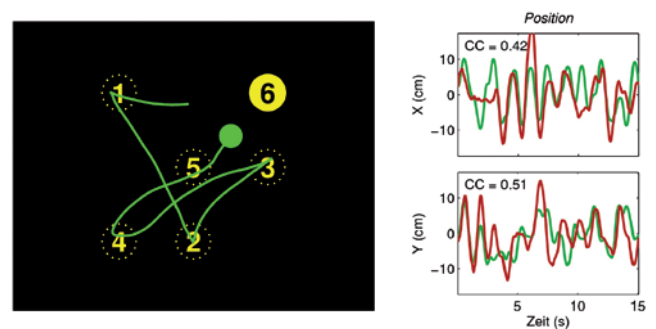
The scientists used a so-called ‘semi-invasive’ approach known as the electrocorticogram (ECoG) for measuring electrical brain signals. ‘We are looking for an optimal compromise between fully invasive and non-invasive methods,’ says Mehring. In non-invasive methods, such as the EEG, electrodes are applied onto the scalp. The neural signal is measured through the skull and has a correspondingly low spatial resolution. In fully invasive methods, electrodes are inserted a few millimeters into the brain, so that the activity of individual neurons or groups of neurons can be registered. The signal is much more accurate and allows controlling complex movements. After first clinical studies with severely paralyzed patients, it is still hard to judge whether the brain can be damaged by the implanted electrodes and how stable the measured signals are over longer periods of time.

With ECoG, the electrodes are placed directly onto the brain surface. They measure voltage changes that arise from large groups of neurons. This method is less invasive, and the measured signals are presumably stable over a long time. ‘We want to check whether this method is suitable for the control of movements, and thus constitutes a possible alternative to fully invasive methods,’ says Mehring.

Mehring conducted his investigations in epilepsy patients who got electrodes implanted in preparation for a brain surgery. Their brain activity was recorded while they were using a handle to control a cursor on a monitor. Using mathematical algorithms, the scientists succeeded in extracting brain signals that correlated with the cursor movements and by which a continuous reconstruction of the movement was possible.

In a next step, Mehring and his colleagues want to investigate how well this strategy can be used to control a cursor on the screen without the subject moving its arm. ‘Previous studies show that in this way, movement reconstruction from brain signals can still be improved, because the subject can learn to adapt its brain activity to the cursor’s movement,’ says Mehring. ‘There is hope that, based on such methods, new prosthetic devices or communication tools for severely paralyzed patients can be developed in the future’.

[Pistohl, T., Ball, T., Schulze-Bonhage, A., Aertsen, A. & Mehring, C. \(2008\). Prediction of arm movement trajectories from ECoG-recordings in humans. J. Neurosci. Methods, 167 \(1\): 105-114.](#)



Left: Experiment - Subjects trace a number of target points (yellow) with a cursor (green). Right: cursor movement along the X- and the Y-axis; experiment (green), reconstruction from the brain activity (red).

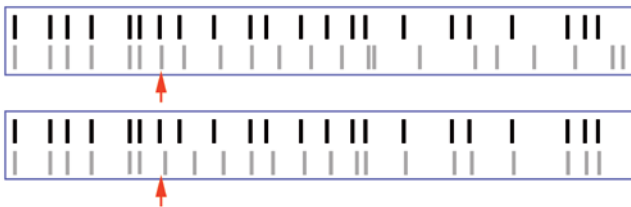


Thinking too complicated?

Neuronal activity is far more predictable than has until now been assumed.

How sensitive are neuronal networks to external interference? To what extent are neuronal network processes including the thinking patterns of the brain predefined? These questions have been investigated by Sven Jahnke, Raoul-Martin Memmesheimer and Marc Timme at the BCCN Göttingen and the Max Planck Institute for Dynamics and Self-Organisation. They have found out that, under certain conditions, neuronal networks are more predictable than was previously assumed.

The brain consists of more than 100 billion neurons that communicate with one another through a widely branched network via electrical impulses. Each cell computes the signals of the presynaptic cells. The point in time when it generates an impulse itself, depends on the result of this calculation. Marc Timme and collaborators have now mathematically analyzed such a system of neuronal signal transmission and have verified their theory by means of computer simulations. As in the brain, the dynamics of neuronal signal transmission in the model does not follow a recognizable order; the way in which neuronal impulses are transmitted appears to be unforeseeable.



Top: 'Chaotic' network dynamics: small disturbances in the impulse sequence (arrow) grow into larger discrepancies. Bottom: 'Stable' behavior: slightly different impulse sequences become more similar.

Researchers call a system “chaotic” if slight differences in the initial states lead to very different outcomes after long times. The behavior of chaotic systems thus cannot be predicted in the long-term. ‘The beat of a butterfly’s wing in the Amazon Jungle can cause a hurricane in Europe,’ as the mathematician and meteorologist Edward N. Lorenz visualized this effect in the 1960s. In 1996 researchers of the Hebrew University in Israel demonstrated in a theoretical study that the observed irregular neuronal activity of the brain may be explained by chaotic behavior. Thus, the network would develop a very different dynamics, even if only a single neuron transmitted a signal a fraction of a second earlier or later. In the last ten years many neuroscientists assumed that such chaotic behavior generally accounts for the observed irregularities.

As Timme and colleagues have now uncovered, chaotic activity only arises under certain conditions. ‘A combination of various new methods has made it possible for us to consider every single impulse of a neuron in a network,’ Jahnke explains. The researchers could show that, under certain conditions, a neuronal network is astonishingly insensitive to small temporal shifts of neuronal impulses. ‘If patterns of neuronal activity are similar enough, they do not develop an entirely different dynamics, as would be expected from a chaotic system. Quite in contrast, they conform to one another in the long-term,’ Memmesheimer explains. In the brain this could contribute to the highly precise emergence of temporal activity patterns, so that information in such networks can be processed. Although the network appears to be highly irregular according to statistical measures, this is not necessarily an indication of a chaotic system. Rather, it can be predictable over a longer period of time.

Source: Jahnke, S., Memmesheimer, R.-M. & Timme, M. (2007). Stable irregular dynamics in complex neural networks. *Phys. Rev. Lett.*, 100: e048102.



Snakes locate prey through vibration waves

Biophysicists show that snakes “hear” vibrations.

It is often believed that snakes cannot hear – they lack an outer ear and scientific evidence of snakes responding to sound is scarce. Snakes do, however, possess an inner ear with a functional cochlea. J. Leo van Hemmen and Paul Friedel from TU München and the BCCN together with their colleague Bruce Young from the Washburn University at Topeka (USA) could present evidence that snakes use this structure to detect minute vibrations of the sand surface caused by prey moving. Their ears are sensitive enough to not only ‘hear’ the prey approaching, but also to allow the brain, i.e., the auditory system, to localize the direction it is coming from.

Any disturbance at a sandy surface leads to vibration waves that radiate away from the source. The amplitude of the sand waves may be as small as a couple of thousands of a millimeter. If a snake rests its head on the ground, the two sides of the lower jaw are brought into vibration by these waves. The vibrations are then transmitted directly into the inner ear by means of a chain of bones attached to the lower jaw – comparable to the transmission of auditory signals by the ossicles in the human middle ear. The snake thus literally hears surface vibrations.

Mammals and birds localize a sound source by comparing the arrival times of sounds that arrive at the right and left ear through air. For sound coming from the right, the right ear will respond a

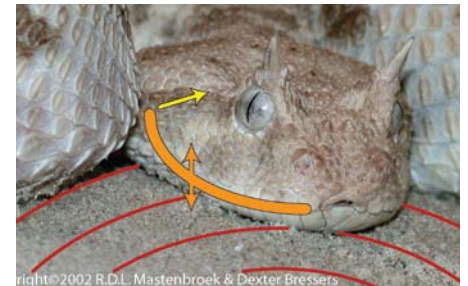
Source: Friedel, P., Young, B. A. & van Hemmen, J. L. (2008). Auditory localization of ground-borne vibrations in snakes. *Phys. Rev. Lett.*, 100: e048701 .

fraction of a second earlier than the left ear and vice versa. From this time-of-arrival difference, the brain computes the direction the sound comes from.

Combining biomechanics, naval engineering and modeling of neuronal circuits, Friedel and his colleagues have shown that the snake uses its ears to perform the same trick for sound arriving through sand. The left and right side of the lower jaw of a snake are not rigidly coupled. They are connected by flexible ligaments. Both sides of the jaw can move independently, like two boats floating on a sea of sand, and thereby allow stereo hearing.

A sand wave originating from the right will stimulate the right side of the lower jaw slightly earlier than the left side, and vice versa. Using a mathematical model, the scientists calculated the vibration response of the jaw to an incoming surface wave. They could show that the small difference in the arrival time of the wave at the right and the left ear is sufficient for the snake’s brain to calculate the direction of the sound source.

The extraordinary flexibility of the lower jaw has evolved because being able to swallow very large prey is a big advantage if food is in short supply and competition fierce. Moreover, the separation of the sides of the lower jaw allowed this very interesting form of hearing to develop.



The horned desert viper rests its head on the sand to locate prey.

right©2002 R.D.L. Mastenbroek & Dexter Bressers



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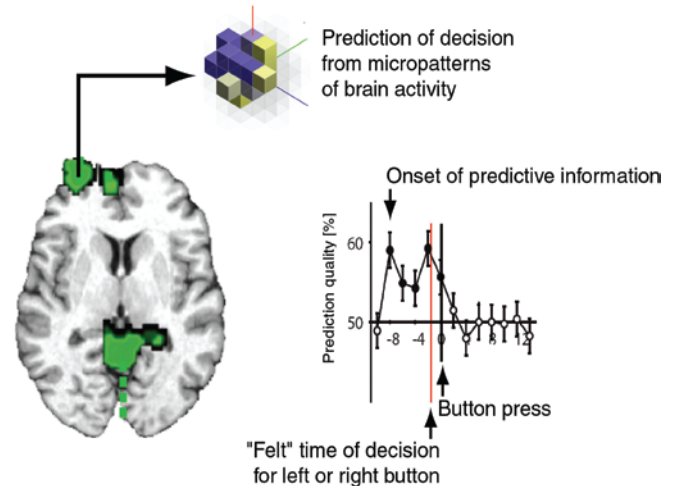
Unconscious decisions in the brain

Scientists unravel how the brain unconsciously prepares our decisions

Already several seconds before we consciously make a decision its outcome can be predicted from unconscious activity in the brain. This is shown by a study of scientists from the Max Planck Institute for Human Cognitive and Brain Sciences in Leipzig, the Charité University Hospital and the BCCN Berlin. The researchers around John-Dylan Haynes used a brain scanner to investigate what happens in the human brain just before a decision is made. 'Many processes in the brain occur automatically and without involvement of our consciousness. This prevents our mind from being overloaded by simple routine tasks. But when it comes to decisions we tend to assume they are made by our conscious mind. This is questioned by our current findings.'

In the study, participants could freely decide if they wanted to press a button with their left or right hand. They were free to make this decision whenever they wanted, but had to remember at which time they felt they had made up their mind. The aim was to find out what happens in the brain in the period just before the person felt the decision was made. The researchers found that it was possible to predict from brain signals which option participants would take already seven seconds before they consciously made their decision. Normally researchers look what happens when the decision is made, but not what happens several seconds before. The fact that decisions can be predicted so long before they are made is a striking finding.

Micropatterns of activity in frontopolar cortex analyzed by sophisticated computer programs were predictive of the choices even before participants knew which option they were going to choose. The decision could not be predicted perfectly,



Brain regions (green) from which the outcome of a participant's decision can be predicted before it is made. Computer-based pattern classifiers can be trained to recognize micropatterns that typically occur just before either left or right decisions.

but prediction was clearly above chance. This suggests that the decision is unconsciously prepared ahead of time but the final decision might still be reversible. 'Most researchers investigate what happens when people have to decide immediately, typically as a rapid response to an event in our environment. Here we were focusing on the more interesting decisions that are made in a more natural, self-paced manner', Haynes explains.

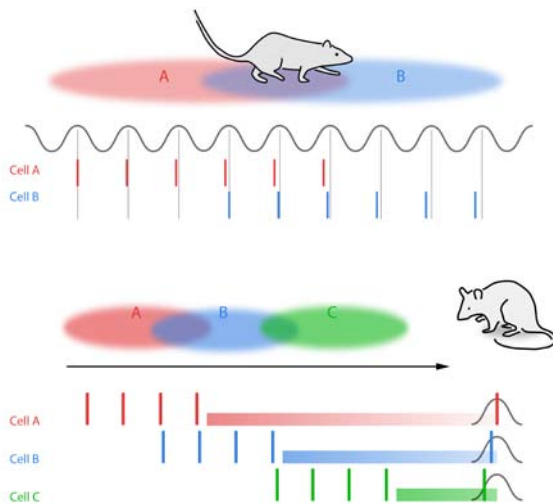
That parts of our decisions are prepared unconsciously does not automatically urge us to act as our brain proposes. 'Our study shows that decisions are unconsciously prepared much longer than previously thought. But we do not know yet where the final decision is made. Especially we still need to investigate whether a decision prepared by these brain areas can still be reversed.'

Source: Soon, C.S., Brass, M., Heinze, H.-J. & Haynes, J.-D. (2008). Unconscious determinants of free decisions in the human brain. *Nature Neuroscience*, 05/2008.

The neural code for short term memory

Scientists from Berlin and Munich have discovered how to read out information from cellular short term memory.

When the brain processes information, neurons emit a quick succession of electrical impulses forming a spatial and temporal pattern. This neuronal information transmission happens within a few milliseconds, but nevertheless represents information that has been gathered and experienced over a longer period of time.



While the rat strives through its territory, the timing of the place cells misaligns cumulatively with respect to the theta oscillations. Thereby the heading direction of the rat is coded within each oscillation cycle.

When the rat rests, memories from the recent seconds that are saved in the synapses are read out. The place cells of the most recently visited places are activated in reverse sequence.

Christian Leibold, Richard Kempfer, Dietmar Schmitz (Bernstein Centers Munich and Berlin) and their colleagues have now shown which cellular mechanisms can form the basis of this compression of event series, using electrophysiological experiments and theoretical modeling.

The cellular mechanism that is assumed to underlie short term memory is the so-called ‘synaptic facilitation’. Repeated transmission of a signal from one neuron to another increases the efficiency of the synapse linking the two cells. Even if this strengthening of the synapse is not permanent, it persists for several seconds – the synapse ‘memorizes’ the event. ‘Memories that are saved in the synapse in this way must also be read out by the rest of the brain’, explains Leibold. Leibold and his colleagues discuss this issue using the example of spatial navigation in rats.

A rat that is familiar with its territory has established so-called ‘place cells’ that are active when the rat visits a particular area. If, for example, place cells of two areas A and B are active at the same time, the rat is located at the intersection of both areas. As long as the rat is moving, the place cells in the hippocampus produce a joint oscillation. They preferentially emit signals in the so-called ‘theta rhythm’ – comparable to an audience applauding rhythmically after a concert. This rhythm serves a reference to measure the exact moment of neuronal discharges. The longer the rat remains in one location, the more the rhythm of the respective place cells differs from the theta rhythm. Thus, the rat ‘knows’ at any moment not only where it is located, but also for how long it has already been in this area.

This phase shift can be explained by ‘synaptic facilitation’ as the scientists from Berlin and Munich could prove. When the rat passes an area, the respective cell in the hippocampus



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repeatedly receives signals from an upstream brain region. The transmission efficiency of the synapse increases with each signal and the strength of the signals increases. Due to the augmented signal strength, the hippocampus cell fires its neural impulses more rapidly than before and thereby gets out of rhythm.

If the rat rests after its walk or feeds, it recapitulates – unconsciously – the passed trail. During these rest periods, the places visited are replayed in reverse sequence. Possibly, also this ‘reverse replay’ is based on synaptic facilitation. Several seconds after the rat has passed the trail from A via B to C, the synapses still contain traces of this ‘memory’ – the synapses of the place cell C are strongest, while the ones of place cell A have nearly decayed to the normal level. When the rat rests, the place cells are stimulated and reveal this ‘memory’. They forward signals with corresponding differences in signal strength. Once again, the signal strength has an impact on the exact moment of the next signal.

The conversion of signal strength into a temporal code is supported by neural oscillations. However, in resting periods, no theta rhythm exists, but fast field potential changes, so-called ‘sharp wave ripples’. For a long time, sharp wave ripples have been assumed to play an important role in the process of memory consolidation. How events can be recalled from short term memory during these sharp waves is now shown by the scientists’ work.

[Source / Quelle: Leibold, C., Gundlfinger, A., Schmidt, R., Thurley, K., Schmitz, D. & Kempter, R. \(2008\). Temporal compression mediated by short-term synaptic plasticity. Proc Natl Acad Sci USA. 105\(11\):4417-22.](#)

[Thurley, K., Leibold, C., Gundlfinger, A., Schmitz, D. & Kempter, R. \(2008\). Phase precession through synaptic facilitation. Neural Comput. 20\(5\):1285-1324.](#)

Finding information in neural data

Analysis toolbox for electrophysiological recordings

The complexity of neurophysiology data has increased tremendously over the last years, especially due to the widespread availability of multi-channel recording techniques. With adequate computing power the current limit for computational neuroscience is the effort and time it takes for scientists to translate their ideas into working code. Advanced analysis methods are complex and often lack reproducibility on the basis of published descriptions.

To overcome this limitation scientists around Ralph Meier, Ad Aertsen and Ulrich Egert from the Bernstein Center Freiburg have developed ‘FIND’ (Finding Information in Neural Data) as a

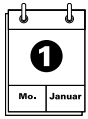
platform-independent, open source framework for the analysis of neuronal activity data based on MATLAB (MathWorks).

The FIND toolbox offers a unified data import from various proprietary formats, simplifying standardized interfacing with tools for analysis and simulation. The toolbox FIND covers a wide range of a steadily increasing number of tools. Analysis tools address various types of neural activity data, including discrete series of spike events, continuous time series and imaging data. Additionally, the toolbox provides solutions for the simulation of parallel stochastic point processes to model multi-channel spiking activity.

[Release: May 1st 2008](#)

[Contact: Ad Aertsen \(aertsen@bcf.uni-freiburg.de\)](mailto:aertsen@bcf.uni-freiburg.de)

[Further information: http://find.bccn.uni-freiburg.de](http://find.bccn.uni-freiburg.de)



The Bernstein Network keeps growing

An overview over recent developments

Since its establishment in 2004 the National Bernstein Network Computational Neuroscience has increased in size by a factor of three. Today, it encompasses close to 200 research groups at 20 different locations and is funded with about 100 Million Euro. This development reflects the enormous potential of the research field.

The Bernstein Network was founded in 2004 with four “Bernstein Centers for Computational Neuroscience” and was then complemented by further funding measures in the following years. In 2006, the highly endowed ‘Bernstein Award’ was established to offer young scientists the opportunity to start their own research group. With the initiative ‘Bernstein Partners’ in 2007, further neuroscientists joined the network. The most recent funding initiative, the ‘Bernstein Focus: Neurotechnology’ aims at bridging the gap to technological and clinical applications. With this funding measure, the Research Ministry will support research groups in the regions of Berlin, Frankfurt, Freiburg/Tübingen and Göttingen with 34 Million Euros over the coming five years.

Further information about the structure of the network:
www.nncn.de/MitgliederNNCN-en
or in our information material which can be
downloaded from: www.nncn.de

Research conducted at the **Bernstein Focus Berlin** will lead to the improvement of a direct dialogue between brain and computer. The scientists concentrate on so called ‘non-invasive’ brain computer interfaces (BCIs), i.e. methods like

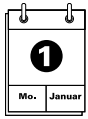
electroencephalography and magnetic resonance tomography that allow the measurement of brain activity “from outside” without having to intrude into the brain tissue. On the one hand, BCIs allow to contribute to a better understanding of the mechanisms and dynamics of thought. On the other hand, they give rise to future visions of, for example, devices which check the state of wakefulness of drivers or pilots. For such applications, it is important that the devices are easy to handle and that they can adapt to the wearer.

Coordination: [Klaus-Robert Müller \(krm@cs.tu-berlin.de\)](mailto:krm@cs.tu-berlin.de)

The goal of the **Bernstein Focus Frankfurt** is to develop a fully functional artificial visual system. To be able to see and perceive, visual information captured on the retina needs to be processed and interpreted correctly. The brain achieves this by a number of different neuronal computations – like estimating distances, recognizing objects from different perspectives or following objects with the eyes. A major challenge in science is to transfer these capabilities of the brain to a machine. Research at the Bernstein Focus Frankfurt aims at bringing together these different aspects of vision to a functioning whole based on neuronal organization principles.

Coordination: [Christoph von der Malsburg \(malsburg@fias.uni-frankfurt.de\)](mailto:malsburg@fias.uni-frankfurt.de), [Jochen Triesch \(triesch@fias.uni-frankfurt.de\)](mailto:triesch@fias.uni-frankfurt.de)

Every movement that we carry out originates in the brain. Measuring the corresponding brain activity and using it to control artificial limbs or computers is one of the goals of researchers at the **Bernstein Focus Freiburg / Tübingen**. They do this by means of non-invasive as well as invasive methods. The development of prostheses that can carry out complex grasping movements can only be achieved with the application of implants. The treatment of some cases of pathological neuronal activity dynamics by patterned electrical or magnetic stimulation is another area



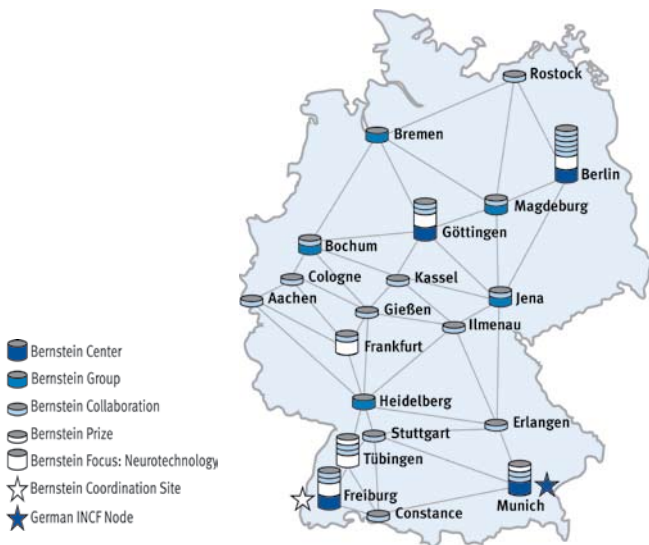
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of research of the Bernstein Focus Freiburg/Tübingen. This technology involves the electrical stimulation of defined brain areas to influence pathological brain function.

Coordination: [Ulrich Egert \(egert@imtek.uni-freiburg.de\)](mailto:egert@imtek.uni-freiburg.de)

The goal of the **Bernstein Focus Göttingen** is the development of so called 'Neuro-Bionic Systems', i.e. systems in which biological and technical components are coupled. Scientists investigate the information transfer at the interface between nervous system and technical device. How can information be derived from brain signals? How can neurons be selectively stimulated and what effect would that have on the whole network? This research approach will result in for example walking prostheses that react to neuronal signals and send a feedback signal back to the brain. It will also find applications in neurostimulation and adaptive steering of machines.

Coordination: [Florentin Wörgötter \(worgott@bccn-goettingen.de\)](mailto:worgott@bccn-goettingen.de)



Central coordination and support of the Bernstein Network

Since 2008, the Coordinators of all network members collectively form the Project Committee as a central steering organ for the network. The chairman of the project committee represents the network to the outside.

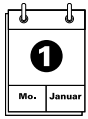
Chairman: [Ad Aertsen \(aertsen@bcf.uni-freiburg.de\)](mailto:aertsen@bcf.uni-freiburg.de)

Deputy Chairman: [Theo Geisel \(geisel@nld.ds.mpg.de\)](mailto:geisel@nld.ds.mpg.de)

The scientists of the Bernstein Network are strongly connected through numerous cooperations, exchange programs and joint conferences. Since beginning of this year, collaboration between the scientists is supported by a central coordination facility, the "Bernstein Coordination Site" (BCOS). Among its tasks are:

- Press and Public Relations
- National and international representation of the Bernstein Network (e.g. by means of information booths at conferences)
- Support with the organization of events, e.g. symposia and workshops
- Advancement and maintenance of industrial contacts
- Lobbying for the field of Computational Neuroscience and finding new funding options
- Supporting the NNCF in the promotion of young researchers (e.g. by organizing central courses, collecting and distributing teaching material, supporting recruitment of students and post docs)
- Central contact for the Bernstein Network, the project management agency DLR and the Federal Ministry of Research and Education

Head of BCOS: [Simone Cardoso de Oliveira \(cardoso@bcos.uni-freiburg.de\)](mailto:cardoso@bcos.uni-freiburg.de)



Personalia

Laurenz Wiskott and **Michael Brecht** have taken over the coordination of the Bernstein Center Berlin, with Laurenz Wiskott representing the Center towards the Federal Ministry of Education and Research (BMBF).

Andreas V. M. Herz has accepted the appointment to the new professorship ‘Computational Neuroscience’ at the Ludwigs-Maximilians-Universität Munich and has taken over the coordination of the Bernstein Center Munich on March 1, 2008.

Ulrich Ebert has been appointed to the professorship ‘Bio-microtechnology’ at the Department of Microsystems Engineering at the Albert Ludwigs University Freiburg. Ebert’s research combines microsystems technology and neurosciences.

Stefan Rotter has accepted the appointment to the professorship ‘Computational Neuroscience’ at the Albert Ludwigs University Freiburg as of April 1, 2008. As new director of the Bernstein Center Freiburg he has taken over its management together with Ad Aertsen (coordinator).

Gabriel Wittum (BGCN Heidelberg) has accepted the appointment to the professorship ‘Modelling and Simulation’ at the ‘Goethe-Zentrum für Hochleistungsrechnen’ of the University of Frankfurt.

Randolf Menzel has been awarded the International Prize of the Fondation Fyssen for his research on the cognitive abilities of the honey bee. The Fondation Fyssen supports research projects on the neural basis of cognitive mechanisms like thinking, learning and feeling.

Tim Gollisch, head of the new junior research group ‘Visual Coding’ at the MPI for Neurobiology in Munich, and **Harald Luksch**, professor for zoology at the TU Munich since September 1, 2007, have been affiliated to the BCCN Munich. Gollisch studies sensory coding and information processing in the early stages of the visual system. Luksch’s research concentrates on neuronal processing of visual and auditory information in the midbrain of various vertebrates, especially of birds.

Martin-Paul Nawrot has accepted a Junior-Professorship at the Free University Berlin.

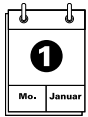
Babette Dellen is ‘Bernstein Fellow’ at the BCCN Göttingen. She works on neuronal models of the visual system and their application in automatic image processing and robotics.

Raoul Memmesheimer, scientist in the Network Dynamics Group at the MPI for Dynamics and Self-Organization, has been awarded the Otto Hahn Medal of the Max Planck Society.

Christian Machens has taken up a tenured position at the Ecole Normale Supérieure in Paris in November 2007 and left the BCCN Munich.

Ad Aertsen (BCCN Freiburg) and **Theo Geisel** (BCCN Göttingen) have been elected chairman and deputy chairman of the Project Committee of the National Bernstein Network.

Dagmar Bergmann-Erb has started her work as coordination assistant at the Bernstein Center Munich succeeding Isolde von Bülow. She is assisted by **Maj-Catherine Bothroyd**. **Janina Kirsch** has followed Simone Cardoso as teaching and training coordinator at the BCCN Freiburg.



Events

The **fourth Bernstein Symposium** will take place from **October 08-10, 2008** in Munich. During this annual event, scientists of the Bernstein Network present their research in talks and posters and use the opportunity for intensive discussions.

Contact: Dagmar Bergmann-Erb, bergmann.erb@bio.lmu.de

The **'CNS*2009 - Eighteenth Annual Computational Neuroscience Meeting'** of the Organization for Computational Neurosciences, Inc. will take place in Berlin from **July 18-23, 2009** under the local organization of Udo Ernst (BGCN Bremen), John-Dylan Haynes (BCCN Berlin) and Andreas Herz (BCCN Munich). The main meeting will be held at the Hotel Hilton from July 19-21, 2009. It will be followed by two days of workshops in the Berlin-Brandenburg Academy. A core element of the workshop is a symposium on neuroinformatics sponsored by the International Neuroinformatics Coordinating Facility (INCF).

Further information (as from end of July): <http://www.cnsorg.org>

The **'Growing Connections in Computational Neuroscience: A German-US Collaborative Symposium'** took place from June 8-12, 2008 in Munich. The aim of the symposium was to foster German-American collaboration in the field of Computational Neuroscience and to identify optimal conditions for cooperation measures. Apart from scientists from Germany and the US, representatives of several funding agencies took part in the symposium. From the American side, delegates from the National Science Foundation (NSF) and the National Institute of Health (NIH) attended the meeting. On the German side, the Federal Ministry of Education and Research (BMBF), the German Research Foundation (DFG), the German Academic Exchange Service (DAAD), the Alexander von Humboldt Foundation (AvH) and the Project Management Agency at the DLR (PT-DLR) were represented.

Information material on the Bernstein Network

Where does robotics lead us? How do we understand the images we see? How do animals perceive their surroundings? The information booklet 'Computational Neuroscience' gives a graspable insight into the manifold research activities of the Bernstein Network. The booklet and the new flyer of the Bernstein Network can be ordered at the Bernstein Coordination Site.

<http://www.nncn.de>

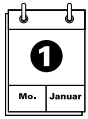


Call for Proposals

Within the framework of the National Bernstein Network Computational Neuroscience the BMBF announced a call for proposals for the new funding initiative **'Bernstein Focus: Neuronal Basis of Learning'**. Research should be relevant for application-oriented topics, such as information technology or biomedical research. Proposals should be submitted to the Funding Management Agency PT-DLR until Sept. 30, 2008.

Further information: <http://www.bmbf.de/foerderungen/12434.php>

The Federal Ministry of Education and Research and the Alexander von Humboldt Foundation are granting the **Alexander von Humboldt Professorship**, the most highly endowed research award in Germany. The award is valued at up to five million Euros and allows highly qualified researchers to pursue research at universities and research institutions in Germany for five years. Nominations must reach the Alexander von Humboldt Founda-



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tion by October 2nd, 2008.

Furthermore, the Alexander von Humboldt Foundation offers a broad spectrum of funding measures for excellent foreign and German researchers from all fields. Each year up to 800 research fellowships and more than 100 research awards are allocated.

Further information: <http://www.humboldt-foundation.de>

New EU-Project 'BIOTACT'

Researchers around Michael Brecht (BCCN Berlin) are participating in the newly funded EU project "Biotact". The goal of the project is to develop robots with sophisticated touch technology. Technologies inspired by insights about the use of touch in the animal kingdom could in the future allow developing robots or mine-clearing machines that are able to sense objects in the dark.

Further information: <http://www.biotact.org>



Long Night of Science in Berlin: Visitors of the Bernstein Center in a perception experiment.

Distinguished Guest in Berlin

On May 21st, 2008, Michael Thielen, State Secretary in the Federal Ministry of Education and Research, visited the Humboldt University in Berlin. On this occasion, he informed himself about the research of the Bernstein Center for Computational Neuroscience Berlin. The BCCN holds as an example of a successful research institution that acts beyond the borders of institutes and joins several universities. Thielen showed great interest in the research of Michael Brecht and John-Dylan Haynes, the two groups he visited in the BCCN building. "Therefore the presentation, which was scheduled to 30 minutes eventually extended to a full hour", says Laurenz Wiskott, who coordinates the BCCN Berlin jointly with Michael Brecht.

Long Night of Science in Berlin

The 'Lange Nacht der Wissenschaft' (Long Night of Science), also called 'the smartest night of the year' took place on June 14, 2008 in Berlin. With experiments, presentations and lectures scientists of the Bernstein Center Berlin participated in this major event for the public.

In a presentation called 'Understanding Perception – the Brain and Informatics' Felix Wichmann explained how it is possible that we recognize people, sometimes even after decades, despite new hairstyles or glasses. In a behavioral experiment, visitors in the lab of John-Dylan Haynes were addressing the question how intensions and decisions arise in the brain. How the Etruscan shrew, the smallest mammal of the world, relies on its sense of touch when hunting relatively large prey was explained in the laboratory of Michael Brecht. 368 visitors were counted in the building of the BCCN alone, where part of the presentations took place.

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