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Bernstein Network Computational Neuroscience

Bernstein Newsletter

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Echolocation—Playing it by ear

As blind people can testify, we humans can hear more than one might think. Blind persons learn to navigate using as guides the echoes of sounds they themselves generate. This enables them to sense the locations of walls and corners. For instance: by tapping the ground with a stick or making clicking sounds with the tongue, and analyzing the echoes reflected from nearby surfaces, a blind person can map the relative positions of objects in the vicinity. Biologists led by Lutz Wiegrebe of the Division of Neurobiology at LMU Munich and the Bernstein Center Munich have now shown that sighted people can also learn to echolocate objects in space.

Wiegrebe and his team have developed a method for training people in the art of echolocation. With the help of a headset consisting of a microphone and a pair of earphones, experimental subjects can generate patterns of echoes that simulate acoustic reflections in a virtual space. The participants emit vocal clicks, which are picked up by the microphone and passed to a processor that calculates the echoes of a virtual space within milliseconds. The resulting echoes are then played back through the earphones. The trick is that the transformation applied to the input depends on the subject's position in virtual space. So the subject can learn to associate the artificial "echoes" with the distribution of sound-reflecting surfaces in the simulated space.

"After several weeks of training, the participants in the experiment were able to locate the sources of echoes pretty well. This shows that anyone can learn to analyze the echoes of acoustic signals to obtain information about the space around him. Sighted people have this ability, too; they simply don't need to use it in everyday situations," says Wiegrebe. "Instead, the auditory system actively suppresses the perception of echoes, allowing us to focus on the primary acoustic signal, independently of how the space alters the signals on its way to the ears." This makes it easier to distinguish between different sound sources, allowing us to concentrate on what someone is saying to us, for example. The new study shows, however, that it is possible to functionally invert this suppression of echoes, and learn to use the information they contain for echolocation instead.

In the absence of visual information, we and most other mammals find navigation difficult. So it is not surprising that evolution has endowed many mammalian species with the ability to "read" reflected sound waves. Bats and toothed whales, which orient themselves in space primarily by means of acoustic signals, are the best known. Wiegrebe and his colleagues will explore in further experiments how well echolocation can function in humans. Currently, they are investigating how the coordination of self-motion and echolocation facilitates sonar-guided orientation and navigation.

Text: LMU Munich (mod.)

Wallmeier L, Geßele N, Wiegrebe L (2013): Echolocation versus echo suppression in humans. Proceedings of the Royal Society B 280(1769),-20131428
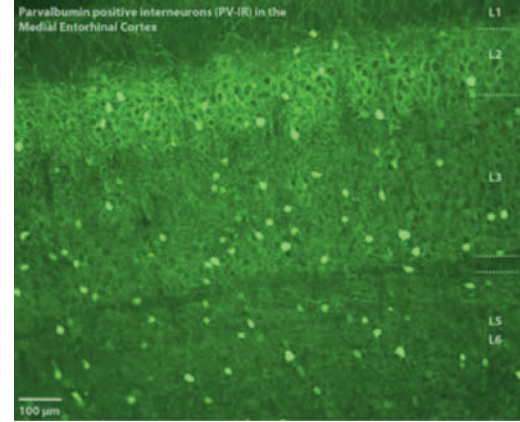
A microscopic view of the entorhinal cortex.
© DZNE/Charité – Universitätsmedizin Berlin, Beed/Schmitz

A brake in the head

Scientists at the Bernstein Center Berlin, the Charité – Universitätsmedizin Berlin and the German Center for Neurodegenerative Diseases (DZNE) have acquired new insights into the functioning of the entorhinal cortex. This region establishes a link between the brain's memory centre, the hippocampus, and other areas of the brain. It is, however, more than an interface that only transfers nerve impulses. The entorhinal cortex also has an independent role in learning and thinking processes. This is particularly applicable for spatial navigation. "We know precious little about how this happens," says Dietmar Schmitz, who headed the research project. "This is why we are investigating in rodents how the nerve cells within the entorhinal cortex are connected with each other."

Signals in the brain are transmitted as electrical impulses from nerve cell to nerve cell. Brain functions critically depend on the fact that the nerve impulses are activated in some situations, and in other cases suppressed. A correct balance between inhibition and excitation is decisive for all brain processes. "Until now, research has mainly concentrated on signal excitation within the entorhinal cortex. This is why we looked into inhibition and detected a gradient in the entorhinal cortex," explains Prateep Beed, first author of the study. "This means that nerve signals are not suppressed equally. The suppression of neural activity is weaker in certain parts of the entorhinal cortex and stronger in others. The inhibition has, so to speak, a spatial profile."

When the brain is actively computing, nerve cells coordinate their activity. In an electroencephalogram (EEG) the synchronous rhythm of the nerve cells manifests as a periodic pattern of the brain's electrical activity. "It is an open question as to how nerve cells synchronize their behavior and how they

bring about such rhythms," says Beed. "But it has been demonstrated that neuronal oscillations accompany learning processes and even happen during sleep. They are a typical feature of the brain's activity," describes the scientist. "In our opinion, the inhibitory gradient, which we detected, plays an important role in creating the synchronous rhythm of the nerve cells and the related oscillations."

In Alzheimer's disease, the entorhinal cortex is among the regions of the brain that are the first to be affected. "In recent times, studies related to this brain structure have accumulated. Here, already in the early stages of Alzheimer's, one finds the protein deposits that are typical of this disease," explains Schmitz. "It is also known that patients affected by Alzheimer's show abnomal EEG patterns. Our studies help us to understand how the nerve cells in the entorhinal cortex operate and how electrical activities might get interrupted in this area of the brain."

Text: DZNE (mod.)

Beed P, Gundlfinger A, Schneiderbauer S, Song J, Böhm C, Burgalossi A, Brecht M, Vida I, Schmitz D (2013): Inhibitory gradient along the dorso-ventral axis in the medial entorhinal cortex. Neuron 79(6), 1197-1207

Natural substance spermidin stops dementia

Age-induced memory impairment can be suppressed by administration of the natural substance spermidin. This was found in a recent study conducted by Stephan Sigrist from the Bernstein Center Berlin, Freie Universität Berlin, and the Neurocure Cluster of Excellence and Frank Madeo from Karl-Franzens-Universität Graz. The biologists showed that the endogenous substance spermidin triggers a cellular cleansing process, which is followed by an improvement in memory performance of older fruit flies to juvenile levels. At the molecular level, memory processes in animal organisms such as fruit flies and mice are similar to those in humans.

Wheat seedlings contain high concentrations of spermidin.
© BCOS

Aggregated proteins are potential candidates for causing age-related dementia. With increasing age, the proteins accumulate in the brains of fruit flies, mice, and humans. In 2009, Madeo's group in Graz already found that the spermidin molecule has an anti-aging effect by setting off autophagy, a cleaning process at the cellular level. Protein aggregates and other cellular waste are delivered to lysosomes, the digestive apparatus in cells, and degraded.

For their study, the researchers fed fruit flies with spermidin and analyzed the insects' memory capacity. This can be measured in behavioral experiments: under classical Pavlovian conditioning, flys can learn to remember certain information and adjust their behavior accordingly. The researchers report that feeding the fruit flies with spermidin significantly increased their memory ability and at the same time decreased the amount of protein aggregates in the brains.

In humans, the ability to remember decreases beginnning around the age of 50. This loss accelerates with increasing age. Due to increasing life expectancy, age-related memory impairment is expected to increase drastically. In contrast, the spermidin concentration decreases with age in flies as well as in humans. If it were possible to delay the onset of age-related dementia by providing spermidin as a food supplement, it would be a great breakthrough for individuals and for society. The work by Sigrist and Madeo has the potential for developing therapeutical substances for treating age-related memory impairment. Patient studies are the next step for the two scientists.

Text: Freie Universität Berlin (mod.)

Gupta VK, Scheunemann L, Eisenberg T, Mertel S, Bhukel A, Koemans TS, Kramer JM, Liu KSY, Schroeder S, Stunnenberg HG, Sinner F, Magnes C, Pieber TR, Dipt S, Fiala A, Schenck A, Schwaerzel M, Madeo F, Sigrist SJ (2013): Restoring polyamines protects from age-induced memory impairment in an autophagy-dependent manner. Nature Neuroscience 16, 1453–1460

Driven by ear muscles

Ear muscles can be selectively activated. But may technical aids—such as wheelchairs or prostheses—be controlled with their help? Scientists from Göttingen, Heidelberg, and Karlsruhe now demonstrate for the first time that this idea works. In a joint study, the researchers have developed a prototype of such a novel human-machine interface. A small chip behind the ear records muscle signals that are then transmitted to a computer via radio. This way, the activity of the ear muscles is coupled to the controller of a particular wheelchair made by Ottobock, a longtime collaborator of the Bernstein Center Göttingen. A first clinical trial of this innovative technology involving ten healthy volunteers shows promising results.

"The results from the first clinical practice test have exceeded our expectations," says David Liebetanz, initiator and leader of the joint project. "We develop this new technology primarily for tetraplegic patients, that means, for patients who cannot move their legs and arms. Unlike existing control interfaces that operate through breathing or eye movements, using ear muscle control, the patients can simultaneously engage in social interactions."

During the experiment, subjects took tours in a virtual course using the control over ear muscles. A: On day 1, the subjects' paths (black lines) deviate significantly from the desired path (green line). B: On day 5 of the training, subjects show significantly fewer changes in direction and less strong deviations from the desired path.
© Universitätsmedizin Göttingen/Liebetanz

The aim of the research group is to return some degree of mobility and quality of life to the patients.

During the study, ten healthy volunteers trained to alternately activate their right and left ear muscles for an hour every day over a period of five days. Their practice was supported by a specifically developed training software. This software is able to adapt to each subject, providing individual feedback on the quality and training potential of the ear muscle signals. On the fifth day of the training, the subjects switched to sit in an electric wheelchair. During each driving test, the wheelchair control was connected to the personal training software.
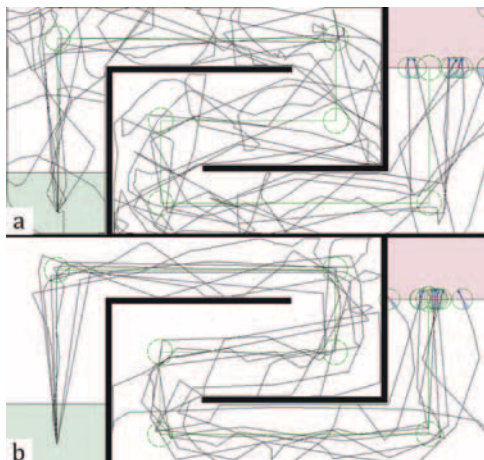
The results of the practical test are impressive: After the training, all ten subjects were able to drive the wheelchair across the test site controlled only by the ear muscles. "The results are amazing. Before the start of the study, half of our subjects had indicated that they were not able to wiggle their ears," says Liebetanz. The research suggests that through exercise, every person can learn to activate his or her ear muscles at will—just like anyone can learn to juggle with three balls through training.

The results obtained with the prototype are now the basis for the development of a fully implantable system, which may then connect wirelessly with different devices, such as a wheelchair, a prosthetic arm, or a computer. The results of this new technology have been presented for the first time to a professional audience at the Annual Meeting of the German Society for Neurorehabilitation in Berlin on December 12 to 14, 2013.

Translation: BCOS

Hermann Cuntz

Numerous delicate branches emerge from a small thickening and extend out to all directions. One of them runs vertically upwards, ramifying into the finest structures. When an ordinary person looks at Hermann Cuntz' images for the first time, he sees widely branched treetops, trunks and roots—similar to a dense forest. A neuroscientist, in turn, recognizes the pictures as microscopy images of neurons. However, both are wrong: Cuntz' display artificially created neurons. Using theoretical models and equations, the biologist generates the neuronal

© Hermann Cuntz

trees using the computer. The long-term goal of Cuntz' research is gaining a basic understanding of the principles of neuronal morphology. In September, Hermann Cuntz received the Bernstein Award 2013 for his work.

"I am interested in the effects of shape and morphology of nerve cells on the structure and function of neuronal circuits," Hermann Cuntz explains. According to which principles do nerve cells form small networks in the brain? Is there a basic connection code?" Hermann Cuntz came in contact with theo-retical neuroscience during his diploma thesis under the supervision of Alexander Borst at the Friedrich Miescher Laboratory of the Max Planck Society in Tübingen. Borst sparked the young biologist's enthusiasm for brain research—and employed him as a doctoral student in his research group. During his

PhD, Cuntz examined the visual system of the fly, also conducting experimental studies. However, for him, the successful modeling of a visual circuit in the fly brain turned out to be more important than intracellular recordings. "Having a theoretical model at the end of the day, that can make accurate predictions about reality, is a great feeling", the neuroscientist says.

Cuntz, who is half German, half French, followed Borst to the University of California at Berkeley (USA), and later to the Max Planck Institute of Neurobiology in Munich during his PhD. In Munich, he received his doctorate in 2004. He then spent two years as a postdoctoral fellow in Igan Segev's laboratory at the Hebrew University in Jerusalem. By means of a Minerva scholarship, Cuntz investigated the morphology of dendrites in Israel. For this, he planned to use the minimum spanning tree algorithm—a method that is often applied to connect points distributed in space with minimum distances. The project had barely begun when he wanted to clear his mind from other projects and started to study the algorithm during a lunch break. He soon realized that it often produced spiral structures, resulting in relatively long path lengths. "These were unrealistically long for dendrites that must transmit the neuronal signals as quickly as possible," the biologist concluded. Cuntz changed this feature of the algorithm and added a constraint to produce short paths in the resulting dendritic tree. He thereby developed a new method that he would later name "morphological modeling" and that constitutes the basis for his ongoing work.

Using morphological modeling, Cuntz can create nerve cells of diverse shapes—or morphology—on the computer. Next to using the shortest feasible path, more parameters are included in the underlying formula, such as the number of contact points with neighboring neurons or the properties of the space that

the dendritic tree innervates. "Interestingly, some of these criteria have already been postulated by the Spanish anatomist Ramón y Cajal in the early 19th Century," Cuntz says. "Nowadays, I use it to form anatomically realistic models of neurons and neuronal networks." His synthetic neurons are so lifelike that even experienced neuroanatomists cannot distinguish the artificially generated cells from natural ones. During another Postdoc stay in Michael Häusser's lab at University College London, Hermann Cuntz extended his model to other types of nerve cells. This way, he may now create synthetic granule, pyramidal, and Purkinje cells next to neurons of the fly. "When I first presented the images of these cells in the lab, even experienced neurophysiologists could not identify them within a set of real neurons—they practically passed the classical Turing test," Cuntz says. The realism of his neurons has also been validated statistically. By now, the computer software developed by Cuntz is used by scientists all over the world to replicate the brain's structure in large-scale projects, such as the Human Brain Project.
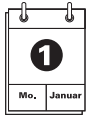
Since 2011, Hermann Cuntz is at the Ernst Strüngmann Institute (ESI) for Neuroscience in collaboration with the Max Planck Society in Frankfurt. His lab will be located there as well as at the Frankfurt Institute for Advanced Studies (FIAS) where he will extend the Bernstein Focus: Neurotechnology. By means of the Bernstein Award, the new father of twin girls plans to examine how nerve cells perfectly combine to small networks based on their shape. In a second approach, he will look at the impact of the circuit's conformation on its own activity and dynamics. In this way, he wants to decipher the relationship between structure and function of neural connections. "For me, neuronal morphology, meaning the shape of nerve cells, is the starting point to derive general rules about neural connections and functions," the neuroscientist explains.
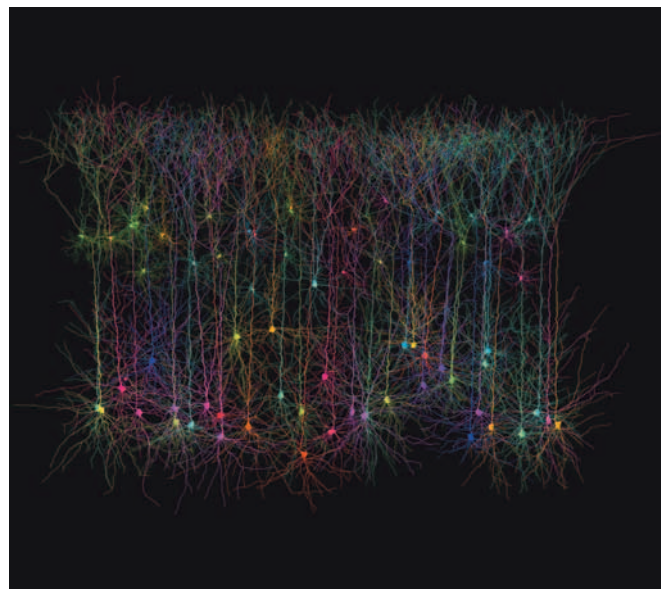
Synthetically generated pyramidel cells by Hermann Cuntz. With this picture, Cuntz won the Wellcome Image Award 2011.

© Hermann Cuntz

In order to pursue the questions about wiring principles in the brain, Hermann Cuntz plans to further deepen his collaborations with experimental and theoretical neuroscientists. This way, he can assess the realism of his network models and their predictions and may constantly develop them further. Next to research, music takes an important role in the life of the scientist. In his spare time he likes to play music with his wife at the piano. At conferences and summer schools, Cuntz has given small concerts together with other scientists. During these occasions, Eli Nelken, a neurobiologist from Jerusalem, typically accompanies him on the piano while Cuntz takes over the singer's part. "Music is an ideal opportunity to meet people. With some fellow neuroscientists I first made contact during these music sessions," Cuntz reports. Next August, he will organize together with Jochen Triesch a summer school on Computational Neuroscience in Frankfurt. He is looking forward to sharing science and music with all attending neuroscientists.

Personalia

Thomas Baden (BCCN and CIN Tübingen, University of Tübingen) received the Attempto Award 2013 of the "Universitätsbund" of the Tübingen University that is annually awarded to two young scientists working in the field of neuroscience.
www.nncn.de/nachrichten-en/attemptopreis2013/

Philipp Berens (BCCN and CIN Tübingen, University of Tübingen, Baylor College of Medicine, Houston, USA) received the Klaus Tschira Award for comprehensible science 2013 for generally understandable insights into his doctoral thesis.
www.nncn.de/nachrichten-en/klaustschiraaward/

Jochen Braun (BGCN and University of Magdeburg) participates in the new Marie Curie Network "Individualized Diagnostics and Rehabilitation of Attention, INDIREA".
www.nncn.de/nachrichten-en/jochenbraunitn/

Julia Fischer (BCCN and German Primate Center Göttingen) received the Grüter Award 2013 that is conferred by the "Grüter-Stiftung" for the promotion of the communication of science.
www.nncn.de/nachrichten-en/grueterpreis/

Giovanni Galizia (BFNL Short Term Memory, BCOL Olfactory Coding, University of Konstanz) is new "Associate Editor" for Insect Neuroscience at the European Journal of Neuroscience (EJN).
www.nncn.de/nachrichten-en/galiziaeditor/

Alireza Gharabaghi (University of Tübingen) is new W3 professor for "Translational Neurosurgery" at the BFNT Freiburg-Tübingen and the University of Tübingen.
www.nncn.de/nachrichten-en/mehringgharabaghi/

Gunnar Grah (University of Freiburg) received the "MTZ®-Förderpeis" for Bioethics for his public relations work at the Bernstein Center Freiburg and the Cluster of Excellence BrainLinks-BrainTools.
www.nncn.de/nachrichten-en/gunnargrah/

Ingeborg Hochmair (BCCN Munich, MED-EL) received the Lasker-DeBakey Clinical Medical Research Award for the development of the modern cochlear implant.
www.nncn.de/nachrichten-en/laskeraward/

Carsten Mehring (Bernstein Center and University of Freiburg) is new W3 professor for "Neurobiology and Neurotechnology" at the BFNT Freiburg-Tübingen and the University of Freiburg.
www.nncn.de/nachrichten-en/mehringgharabaghi/

Alexander Pastukhov, Postdoc with Jochen Braun (BGCN and University of Magdeburg), received the "Best Article Award 2013" of the Psychonomic Society for the best contribution of the year in the prestigious scientific journal "Attention, Perception & Psychophysics".
www.nncn.de/nachrichten-en/bestofyearaward/

Klaus Pawelzik (BFNL Sequence Learning), **Andreas Kreiter**, and **Udo Ernst** (all three BGCN and University of Bremen, BPCN 2010) participate in two newly started projects that aim at helping blind people to get visual impressions.
www.nncn.de/nachrichten-en/sehhilfen/

Hans-Peter Thier (BCCN and CIN Tübingen, University of Tübingen) is spokesman of the new DFG Research Unit "Physiological basis of distributed information processing as basis of higher brain functions in non-human primates".
www.nncn.de/nachrichten-en/forschergruppethier/
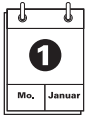
Bernstein Conference 2013

The 9th Bernstein Conference took place in Tübingen from September 24-27, 2013. For the first time, pre-conference workshops took place on September 24 and 25. The conference was organized by the Bernstein Center Tübingen under the direction of Matthias Bethge. More than 500 participants attended the conference. The 225 conference abstracts were published on the server of the German INCF Node (G-Node) under the following link:

http://portal.g-node.org/abstracts/bc13/

Bernstein Award 2013

As in previous years, the prize giving ceremony of the Bernstein Award was a highlight. Dr. Christiane Buchholz (Federal Ministry of Education and Research, BMBF) presented the award to Hermann Cuntz (Ernst Strüngmann Institute (ESI) for Neuroscience in Cooperation with Max Planck Society, Goethe-Universität Frankfurt). With the prize money of up to 1.25 €, he will set up his lab at the Ernst Strüngmann Institute (ESI) for Neuroscience in Cooperation with Max Planck Society and the Frankfurt Institute for Advanced Studies (FIAS) and thereby extend the Bernstein Focus: Neurotechnology in Frankfurt.

Brains for Brains Awards

For the fourth time, the Bernstein Association for Computational Neuroscience awarded Brains for Brains Young Researchers' Computational Neuroscience Awards. This year's awardees were Ralph Bourdoukan (École Normale Supérieure, Paris, France) und Marta Bisio (Fondazione Istituto Italiano di Tecnologia (IIT), Genova, Italy). The awards were made possible by donations by Multi Channel Systems MCS GmbH and Brain Products GmbH.

Travel Fellow from the US-American Sloan-Swartz Centers

Within the exchange program between the Bernstein Network and the Sloan-Swartz Centers for Theoretical Neurobiology, the Bernstein Center Tübingen funded the participation of the American postdoc Marcus Benna (Columbia University, New York) in the Bernstein Conference 2013.

NeuroVision Film Contest

For the third time, a short film competition was held during the Bernstein Conference. Candidate films covered neuroscience themes in a generally understandable form. Winner of the jury award for the film with the greatest informational value was the film "Mein Leben als Kosmonaut" by Katre Haav. The film "The Centrifuge Brain Project" by Till Nowak received the audience award for the most creative handling. The awards—each endowed with 500 Euro—were made posssible by Zeiss Deutschland and the Natural and Medical Sciences Institute (NMI) at the University of Tübingen.

Event for the broad public

Within the framework of the event for the broad public—for the first time—a Science Slam took place on September 25. Six scientists presented their research in short talks and competed for the audience's favor. The films of the Neuro-Vision Film Contest were also shown to the broad public during this event.
www.nncn.de/nachrichten-en/bernsteinconference2013/
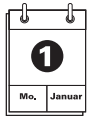
D–J Collaborations in Computational Neuroscience

In 2011, the German Federal Ministry of Education and Research (Bundesministerium für Bildung und Forschung, BMBF), the German Research Foundation (Deutsche Forschungsgemeinschaft, DFG) and the Japan Science and Technology Agency (JST) set up the joint funding measure "Germany–Japan Collaboration in Computational Neuroscience". The funding measure has the objective to establish transnational research projects and aims at deepening already existing collaborations between researchers of these two countries and raising them to a new level. On the German side, D–J Collaborations in Computational Neuroscience are part of the Bernstein Network. The second call for applications was published in 2012. The following projects are granted funding since 2013:

- **Neuronal network mechanisms of reinforcement learning**, Abigail Morrison (Jülich), Kenji Morita (Tokyo), funded by BMBF and JST.
- **Impedance behavior of the human arm during energy exchange: from human experiments over models to robotics**, Alois Knoll (Munich), Ganesh Gowrishankar (Kobe), funded by BMBF and JST.
- **Heterogeneity of the suprachiasmatic nucleus: quantication, simulation, and functional analysis**, Grigory Bordyugov (Berlin), Toru Takumi (Hiroshima), funded by DFG and JST.
- **The influence of feature salience over microsaccades in normal and blindsight humans and monkeys: an experimental and theoretical investigation**, Ziad M. Hafed (Tübingen), Masatoshi Yoshida (Okazaki), funded by DFG and JST.

The first call for applications was published in 2011. The following projects are granted funding since 2012:

- **Robust, adaptive BCIs for nonstationary environments**, Klaus-Robert Müller (Berlin), Shigeyuki Oba (Kyoto), funded by BMBF and JST.
- **Impact of top-down influence on visual processing during free viewing: multi-scale analysis of multi-area massively parallel recording of the visual pathway**, Sonja Grün (Jülich), Hiroshi Tamura (Osaka), funded by BMBF and JST.
- **Neural basis of auditory processing in the honeybee – The role of neuron morphology and development**, Thomas Wachtler-Kulla (Munich), Hiroyuki Ai (Fukuoka), funded by BMBF and JST.
- **The function and role of basal ganglia pathways: from single to multiple loops**, Fred Hamker (Chemnitz), Atsushi Nambu (Okazaki), funded by DFG and JST.
- **Multidisciplinary reconstruction of the pan-network physiome generating spontaneous synchronized neural activity in the mammalian brain**, Swen Hülsmann (Göttingen), Yoshitaka Oku (Nishinomiya), funded by DFG and JST.
- **Haptic learning**, Florentin Wörgötter (Göttingen), Eiichi Naito (Kyoto), funded by DFG and JST.

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

New call for German–US American collaborations in CNS

New proposals for German-US American collaborations are solicited within the funding measure "Germany–USA Collaboration in Computational Neuroscience". The transnational initiative for supporting collaborative research between Germany and USA is jointly funded by the German Federal Ministry of Education and Research (BMBF) and the National Science Foundation (NSF). Next deadline for applications is January 27, 2014.
www.nncn.de/nachrichten-en/dusacollaborationausschreibung

Conference in Central Asia organized by Theo Geisel

From October 7 to 11, 2013, sixty scientists from around the world met for the conference "Complex Nonlinear Systems" in Samarkand, Uzbekistan. Theo Geisel (BCCN and BFNT Göttingen, Max Planck Institute for Dynamics and Self-Organization, and University of Göttingen) and Davron Matrasulov (Politecnico di Torino, Tashkent) organized the conference, which also aimed at laying a foundation for further tighter collaborations between scientists from Central Asia and international colleagues. During the conference, basic properties of complex nonlinear systems as well as applications of such systems were discussed. The conference emphasized applications in neuroscience as well as geoscientific issues that are of particular importance for the seismic prone Central Asia.
www.nncn.de/nachrichten-en/nichtlinearesysteme/

Onur Güntürkün organized Leopoldina's Annual Assembly

Traditionally, the Annual Assembly of the German National Academy of Sciences Leopoldina takes place every two years in Halle. Onur Güntürkün (BFNL sequence learning, Ruhr-Universität Bochum) was responsible for the scientific organization of this year's conference, which took place from September 20 to 22. Speakers working in a vastly diverse range of fields took an interdisciplinary approach to explore a hot topic of great rele-vance to society: "Mind, Brain, Genome, Society. How did we become the person we are?" was the title of the event.

Onur Güntürkün gave his keynote speech on the opening day in the presence of Federal President Joachim Gauck. The title of his speech was "How the brain creates the mind and how the mind shapes the brain".
www.nncn.de/nachrichten-en/leopoldinajahrestagung/
www.leopoldina.org/uploads/tx_leopublication/2013_-03_
Leopoldina_NEWS_ENG.pdf
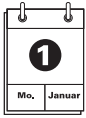
NEWS AND EVENTS

New Book: Neurosciences – From Molecule to Behavior

Giovanni Galizia (BFNL Short Term Memory, BCOL Olfactory Coding, University of Constance) and Pierre-Marie Lledo (Institut Pasteur, Paris) have edited the book „Neurosciences – From Molecule to Behavior: a University Textbook". This new publication covers the neurosciences across the animal kingdom in a comprehensive manner and also includes an entire chapter devoted to computational neuroscience.

The Bernstein Coordination Site wishes you a Merry Christmas and a successful New Year 2014!

Xmas version of nncn logo courtesy of Bernstein Center Freiburg

Galizia, C. Giovanni, Lledo, Pierre-Marie (Eds.):„Neurosciences – From Molecule to Behavior: a university textbook." Springer 2013 ISBN 978-3-642-10769-6

Upcoming Events

Date	Title	Organization	URL
Dec 2-4, 2013, Tutzing near Munich	2nd Bernstein Sparks Workshop „Neuroengineering the Brain: from Neuroscience to Robotics … and back"	J. Conradt, G. Cheng (both BCCN Munich), S. Ehrlich, S. Schneider, Bernstein Koordinationsstelle	http://web.ics.ei.tum.de/~Ehrlich/sparks2013
Feb 17-21, 2014, Berlin	Winter School „Ethics and Neuroscience"	Felix Bermpohl, V. Casagrande, M. Franke, John-Dylan Haynes, Thomas Schmidt, Michael Pauen	www.bcc-berlin.de/ethics
Feb 24-28, 2014, Munich	6th G-Node Winter Course on Neural Data Analysis	O. W. Witte (BFNL Visual Learning), R. Dengler	https://portal.g-node.org/dataanalysis-course-2014/doku.php
Mar 19-23, 2014, Berlin	30th International Congress of Clinical Neurophysiology (ICCN 2014) organized in conjunction with the Annual Meeting of the German Society for Clinical Neurophysiology and Functional Imaging (DGKN)	O. W. Witte (BFNL Visual Learning), R. Dengler	www.iccn2014.de
Aug 3-30, 2014, Frankfurt	Advanced Course in Computational Neuroscience	Lokale Organisatoren: J. Triesch (BFNT Frankfurt), H. Cuntz (BPCN 2013)	http://fias.uni-frankfurt.de/accn

The Bernstein Network

Chairman of the Bernstein Project Comittee: Andreas Herz

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

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