



## Recent Publications

*Estimation behavior – Correlation and causation –  
Brain currents*



## Meet the scientist

Visvanathan Ramesh



## News and Events

*Personalia – Leibniz Prize for Michael Brecht – 2nd round  
of German-US American collaborations in CNS – Bernstein  
members in DFG review boards –  
8th Bernstein Conference in Munich – Events*



### Incorrect estimate is half-way to winning

During estimation processes, we unconsciously make use of recent experiences. Scientists from the Ludwig-Maximilians-Universität (LMU) Munich and the Bernstein Center Munich asked test subjects to estimate distances in a virtual reality environment. The results revealed that estimates tended to approach the mean of all previously experienced distances. For the first time, scientists are able to accurately predict the experimental findings using a mathematical model. The model combines two well-known laws of psychophysics with a theorem from probability theory. The study could be of fundamental relevance to research on perception.

Why do we perceive identical distances as long in one situation and short in another? It all depends on the distances that we have covered in the immediate past. This might seem a trivial conclusion, but it gives an important insight into how the brain processes signals of different intensities or even abstract elements such as numbers. Stefan Glasauer (LMU), project leader at the Bernstein Center Munich, and PhD student Frederike Petzschner have investigated this effect both experimentally and theoretically. Test subjects were first asked to perform certain displacements in virtual reality and then to reproduce these displacements as accurately as possible. As in previous studies, the results showed a bias towards the mean of all previously experienced displacements.

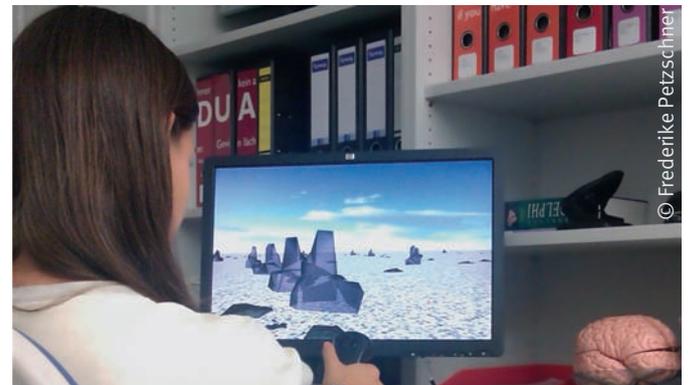
The scientists can now provide a general explanation for this phenomenon. With the help of a mathematical model, they can calculate how previous stimuli affect the current estimate. “The influence of prior experience most probably follows a general principle, and is likely to hold true for the estimation of quantities or sound levels, too,” says Glasauer. Test subjects whose distance

estimates were strongly influenced by prior experience also placed greater weight on prior experience when asked to assess angular displacements. In both cases, they were learning without having received any information about the success or failure of their previous performance. Conventional learning methods, however, presuppose such feedback mechanisms.

Whether or not a fundamental principle determines the perception of stimulus strengths, such as sound levels, brightness, or even distances, has been a controversial issue. Two important laws of psychophysics, the so-called Weber-Fechner law, published 150 years ago, and the 50-year-old Stevens’ power law, seemed to contradict each other. The Munich scientists have now shown that the two laws are in fact compatible, at least for certain cases. By combining the Weber-Fechner law with Bayes’ Theorem (1763), a procedure from probability theory that allows evidence to be weighted, they were able to transform it into Stevens’ power law. Glasauer is therefore confident that “we have helped to solving a problem that perception researchers have been studying for more than 50 years now.” Next, the researchers want to analyze historical data and determine whether the model also applies to different stimulus modalities, such as sound levels and brightness.

[Petzschner F, Glasauer S \(2011\): Iterative Bayesian estimation as an explanation for range and regression effects – A study on human path integration. J Neurosci, 31\(47\): 17220-17229](#)

*A test person walks a certain distance in virtual reality and then has to try to exactly reproduce this distance in the virtual world. Estimation errors can be partly attributed to prior experience.*





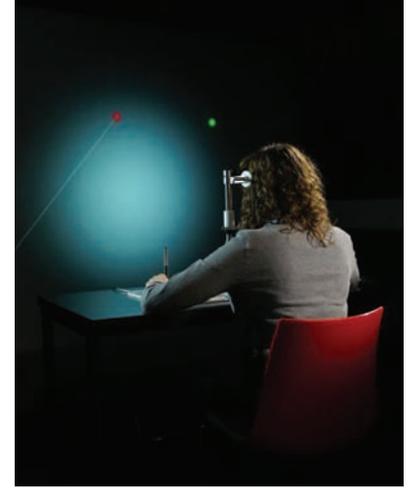
# When correlation implies causation

In order to get a better picture of our surroundings, the brain has to integrate information from different senses. But how does it know which signals to combine? New research involving scientists from the Max Planck Institute for Biological Cybernetics, the Bernstein Center for Computational Neuroscience Tübingen and the Universities of Oxford and Bielefeld has demonstrated that humans exploit the correlation between the temporal structures of signals to decide which of them to combine and which to keep segregated.

Multisensory signals originating from the same event are often similar in nature. Think of fireworks on New Year's Eve, an object falling and bouncing on the floor, or the footsteps of a person walking down the street. The temporal structures of such visual and auditory events are always almost overlapping (i.e., they correlate), and we often effortlessly assume an underlying unity between our visual and auditory experiences. In fact, the similarity of temporal structure of multiple unisensory signals, rather than merely their temporal coincidence, as it had been previously thought, provides a potentially powerful cue for the brain to determine whether or not multiple sensory signals have a common cause.

Cesare Parise from the Max Planck Institute for Biological Cybernetics in Tübingen and the Bernstein Center for Computational Neuroscience Tübingen and his colleagues set out to examine the role of signal correlation in multisensory integration by asking people to localize a stream of beeps and flashes. Participants seated in front of a large screen where sounds (streams of noise bursts) and images (streams of blurred blobs) were presented from different spatial locations. On some trials, only visual or auditory stimuli were presented, while on other trials, visual and auditory stimuli were presented in combination. Critically, on combined audiovisual trials, the temporal structure

*The experimental setup:  
Study participant during  
the experiment.*



of the visual and auditory stimuli could either be correlated or not. Participants were required to report the spatial position of such stimuli by moving a cursor controlled by a graphic tablet. In line with previous studies, participants were more precise when the auditory and visual streams were presented together than when they were presented in isolation. If the stimuli were uncorrelated, precision was only slightly increased. Precision was highest when auditory and visual streams were correlated, and closely approached the theoretical maximum.

These results demonstrate that humans optimally combine multiple sensory signals only when they correlate in time. Previous research has demonstrated that optimal integration only occurs when the brain is sure that the signals have a common underlying cause. These results therefore demonstrate that the brain uses the statistical correlation between the sensory signals to infer whether they have a common physical cause, and, hence, whether they provide redundant information that should be integrated.

Text: modified from MPI for Biological Cybernetics

Parise C V, Spence C, Ernst M O (2012): When correlation implies causation in multisensory integration. *Curr Biol*, 22, 46-49



# How brain currents arise

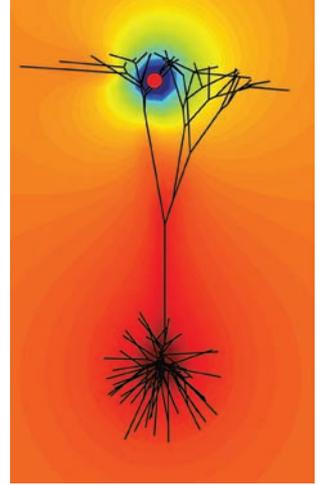
What exactly can measurements of brain currents tell us? Scientists at the Norwegian University of Life Sciences, the Research Center Juelich, and the Bernstein Center Freiburg have developed a model that explains the relations between nerve cell activity and measurable electrical signals. This allows a better analysis of future measurements in order to provide detailed diagnoses of different brain diseases and to select appropriate treatments.

Nerve cells conduct electricity when they are active. Since the beginning of the twentieth century, researchers and physicians have used this fact for electroencephalography (EEG), in which the electrical signals are measured by electrodes on the scalp. In the meantime, these signals have been used to clearly identify different diseases, such as epilepsy. But how they emerge at the microscopic level in the network of brain cells was poorly understood until now.

“Based on methods from the fields of physics, mathematics and computer science as well as using the data processing power of supercomputers, we have developed detailed mathematical models that represent the relationship between nerve cell activity and the electrical signal recorded by an electrode,” says Gaute Einevoll of the University of Life Sciences. A key result of the study: the nerve cell activity itself influences how large the area in the brain is that is detected by one electrode.

“Thus, the range of a measuring electrode is not a constant value,” says Markus Diesmann of the Bernstein Center Freiburg and the Research Center Juelich. “If the nerve cells work independently, each on its own, then the range of an electrode is small: it only receives the signals from nerve cells no more than 0.3 millimeters distant. But if the nerve cells act at the same time – synchronized – then the electrode receives signals from a much

*Electrical potential (color coded, blue: negative, red: positive) generated by a cortical pyramidal neuron (black) in response to a synaptic input (red circle).*  
© Henrik Lindén, Royal Institute of Technology (KTH), Stockholm, Sweden



larger area.” Also, how many nerve cells are in contact with each other, and how intensively they are exchanging information is important for the range of the electrode.

This has consequences. “First, the result gives us a rule of thumb for a minimum distance of measuring electrodes,” says Diesmann. “On the other hand, we now know, that in synchronously operating cells, the signal does not necessarily reflect only the area around the electrode. This could, for example, have an impact on the diagnosis and treatment of epilepsy or Parkinson’s. In both cases, synchronous nerve cell populations are part of the clinical picture.”

For their calculations, the scientists modeled one cubic millimeter of cortical brain tissue. “This is equivalent to approximately 100,000 nerve cells and thus roughly one billion synapses,” says Tom Tetzlaff of the Research Center Juelich. “On this basis, we can make meaningful statements for electrodes directly placed in the brain. To translate our findings to external brain activity measurements such as EEG, we need to model a much larger area. This is challenging, but a step we are aiming at.”

Translation after Research Center Juelich

Lindén H, Tetzlaff T, Potjans T C, Pettersen K H, Grün S, Diesmann M, Einevoll G T (2011): Modeling the spatial reach of the LFP. *Neuron* 72(5), 859-872



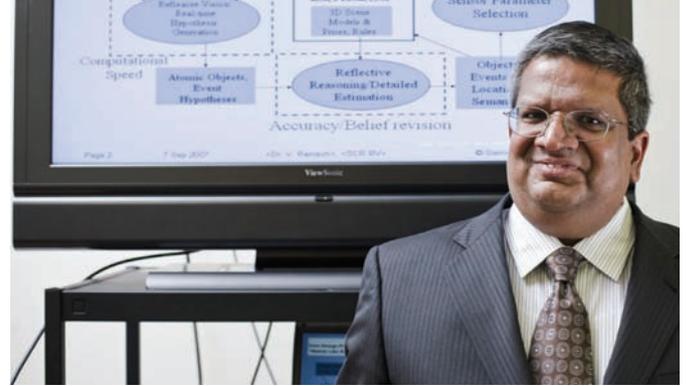
## MEET THE SCIENTIST

# Visvanathan Ramesh

He has collaborated with very different people, from various cultures, separate scientific disciplines and different continents. Visvanathan Ramesh enjoys uniting different perspectives – for his big goal: building machines that can see. Since July 2011, he is professor for Software Engineering with emphasis on Bio-Inspired Vision of the Goethe University Frankfurt and at the Bernstein Focus Neurotechnology (BFNT) Frankfurt. He also is Adjunct Fellow at the Frankfurt Institute for Advanced Studies.

Ramesh grew up in India, where he studied Electronics and Communication Engineering. After his Bachelor's degree during an internship, he found two articles that would influence his whole subsequent life: one about human vision and its impact on machine vision systems and another about medical imaging and diagnosis. "I wanted to explore the unknown," Ramesh says and found it right within these articles: How can we recognize objects in a perpetually changing environment? How do ambient conditions like the lighting affect the visual process? But the engineer always also kept the application in mind: How can these findings contribute to the development of seeing machines?

"What fascinated me was how lessons from biology can be applied to building machines and how building machines can in turn influence understanding of biology," Ramesh states. After the internship, he moved to the United States and studied electrical engineering. In 1995, he received his PhD in the group of his mentor Robert Haralick at the University of Washington, Seattle, on a systematic framework to quantify the performance of vision systems. After his PhD, Siemens offered him to join the Imaging and Visualization Department at its research center in Princeton, New Jersey, USA. The department focused on research on industrial as well as medical imaging tools. After a few years, he became head of the real-time vision and modeling department.



The simultaneous sharp rise of computer power enabled Ramesh and his team to perform more complex real-time vision tasks to detect, track and recognize objects. "The technology has led us to a point where large amounts of data can not only be collected, but processed in real time with machine learning and statistical models," the engineer says excitedly.

During Ramesh's seventeen years at the research center, the vision and imaging technology team almost quadrupled - to over 150 scientists. The development of cheaper and better sensors allowed the engineers to equip even small cameras with high-tech image-recognition systems. These powerful recognition systems operate in a two step fashion: "Indexing" followed by "estimation". During "indexing", filters exploit contextual constraints on scene geometry, appearance, and dynamics of objects to generate quick hypotheses about the present objects. This is followed by a slower "estimation" process that verifies and refines the hypotheses through the use of more detailed probabilistic models. Interestingly, this procedure very much resembles the psychological "dual process theory" of Nobel Prize winner Daniel Kahneman that describes decision-making as a combination of intuitive (fast heuristics) processing followed by deliberative (slower, sequential) processing.

Two facts impressively illustrate Ramesh's success, both in the academic field, as well as in industry. Several of his publications were cited more than a thousand times, the best-cited one was referred to even more than 2200 times. Additionally, in 2008, Ramesh was honored as a Siemens "inventor of the year", with more than 100 inventions and over 40 awarded patents. Today,



## MEET THE SCIENTIST

his visual models are applied in observation cameras for tunnels, at airports and railway stations. But just to develop new models for various environmental conditions is not enough. “Computers have to know by themselves which model to apply in which situation. And they must learn to adapt the models,” says Ramesh. Insights from the most flexible learning device that we know – the brain – may provide valuable hints on how to learn.

Besides building powerful computer models, Ramesh also always tries to build strong teams. “The answers [to our questions] are scattered across the world,” he says. For this reason, in 2008, he reinitiated contact with his former collaborator Christoph von der Malsburg of BFNT Frankfurt, who had a synergistic vision of the future of intelligent vision systems. They discussed new ideas of how neuroscience could fertilize technological vision research. Ramesh is convinced that, besides technological approaches, “brain development, comparative cognition, evolutionary aspects and philosophy may provide very valuable new ideas.” He has already reached out to leading philosophers and experimentalists in artificial intelligence, robotics, neuroscience and consciousness research, both in Germany and the UK, to promote that cross-fertilization.

Increasing computer power and understanding of common design principles for intelligent algorithms also allows tackling another field beyond vision: systems that scale to perform a wide range of intelligence tasks. Therefore, a primary focus of Ramesh’s team’s research is in “intelligent systems engineering”. There, they want to combine classical model-based engineering design along with data-driven learning approaches to produce intelligent systems whose performance and limits are quantifiable.

Currently, Ramesh is teaching a course on systems engineering for computer vision – a “systems thinking” course that attempts to get the students to think about the formal requirements of modeling, analysis and about translation to designs. “The big challenges in society require future generations of engineers and scientists who are holistic systems thinkers and modelers,” Ramesh explains. The course also teaches the link between models and their experimental evaluation to ensure that the students appreciate the entire loop between theory and practice.

Ramesh, in the meantime coordinator of BFNT Frankfurt, appreciates the relatively extensive autonomy that German professors have, compared to scientists in industry. However, he stresses the value of collaborative links between different scientists: “Some fields, such as large-scale systems engineering, depend on the cross-pollination between various disciplines. There, I think a good balance between autonomy and integration is important.” Also for this challenging task, his long experience as a – leading – team player will be very valuable.



*Modern image recognition systems can control the security strip at the train station (left) and identify faces (right).*



### Personalia

**Michael Brecht** (BCCN Berlin, BFNL State Dependencies of Learning, HU Berlin) met EU Research Commissioner Geoghegan-Quinn during her visit to Berlin in October 2011, together with four other top scientists who received an ERC Grant.

[www.nncn.de/nachrichten-en/michaelbrecht/](http://www.nncn.de/nachrichten-en/michaelbrecht/)

**CorTec** is the first start-up company originating from the Bernstein Center Freiburg (BCF). The spin-off from the University of Freiburg develops a neurotechnological platform for long-term measuring and stimulating brain activity.

[www.nncn.de/nachrichten-en/cortec/](http://www.nncn.de/nachrichten-en/cortec/)

**Peter Gass** (BCCN Heidelberg-Mannheim, CIMH Mannheim) and his PhD student Johannes Fuß as well as **Andreas Heinz** (BCCN Berlin, BFNL Complex Human Learning, Charité – Universitätsmedizin Berlin) and his PhD student Anne Beck were awarded the Hans Heimann Prize 2011 for the best dissertations in the field of psychiatry and and psychotherapy.

**Andreas Heinz** is also spokesman of the new DFG Research Unit 1617 “Learning and habitization as predictors of the development and maintenance of alcoholism”.

[www.nncn.de/nachrichten-en/hansheimannpreis2011/](http://www.nncn.de/nachrichten-en/hansheimannpreis2011/)

[www.nncn.de/nachrichten-en/heinzforschergruppe/](http://www.nncn.de/nachrichten-en/heinzforschergruppe/)

**Michael Herbst**, PhD student with Jürgen Hennig (BFNT Freiburg-Tübingen, University Hospital Freiburg) and Jan Korvink (IMTEK, University of Freiburg), received the Fraunhofer Gesellschaft’s award “German High-Tech Champion 2011” for “International Research Marketing”, for the development of a method for motion correction in magnetic resonance imaging.

[www.nncn.de/nachrichten-en/hightechchampion2011/](http://www.nncn.de/nachrichten-en/hightechchampion2011/)

**Dirk Jancke** (BGCN and University of Bochum) and **John-Dylan Haynes** (BCCN and Charité - Universitätsmedizin Berlin) are German project partners within the newly funded German-Israeli Project Cooperation (DIP) “Decoding visual content and perception from neuronal population activity in visual cortex: VSDI, fMRI and computational modelling”.

[www.nncn.de/nachrichten-en/deutschisraelischesprojekt/](http://www.nncn.de/nachrichten-en/deutschisraelischesprojekt/)

**Matthias Kaschube** is new W2 Professor for Computational Neuroscience / Computational Vision at BFNT Frankfurt, FIAS and Goethe University Frankfurt.

[www.nncn.de/nachrichten-en/kaschube/](http://www.nncn.de/nachrichten-en/kaschube/)

**Janina Kirsch** (BCF and University of Freiburg) received the 2011 Teaching Award of the Federal State of Baden - Württemberg for her teaching concept “The Human Brain - A Course in Drawing and Handicraft”.

[www.nncn.de/nachrichten-en/landeslehrpreis/](http://www.nncn.de/nachrichten-en/landeslehrpreis/)

**neuroConn** (BCOL Transcranial Stimulation) collaborates with the New York based company SOTERIX MEDICAL to develop a new device for transcranial direct current stimulation.

[www.nncn.de/nachrichten-en/neuroconnkooperation/](http://www.nncn.de/nachrichten-en/neuroconnkooperation/)

**Andreas Schulze-Bonhage** (BCF, D-USA Collaboration Freiburg-Cambridge, University Hospital Freiburg) made the “European Epilepsy Database”, developed within the (by now completed) EU-project EPILEPSIAE, accessible to other groups.

[www.nncn.de/nachrichten-en/eedatabase/](http://www.nncn.de/nachrichten-en/eedatabase/)

**Stefan Treue** (BCCN and BFNT Göttingen, DPZ Göttingen) was appointed by the state government of Lower Saxony to the Board of Trustees of the Volkswagen Foundation.

[www.nncn.de/nachrichten-en/vwkuratorium/](http://www.nncn.de/nachrichten-en/vwkuratorium/)



### Leibniz Prize for Michael Brecht

Michael Brecht, Humboldt Universität zu Berlin and coordinator of the BCCN Berlin, was selected by the German Research Foundation (Deutsche Forschungsgemeinschaft, DFG) as one of eleven Gottfried Wilhelm Leibniz Prize Winners 2012. He received the prize for his inventive research approaches and innovative techniques, with which he has done pioneering work in neurobiology.



Michael Brecht is particularly interested in the question of how neuronal activity triggers behavior. He achieved his fundamental answers with the “in vivo whole cell technique” that he himself developed and that allows precise measurements in freely moving animals. With this technique, Brecht could show that already the stimulation of one single nerve cell can trigger motor behavior. Brecht’s recordings from the sensory cortex showed that, under certain circumstances, even single stimulated nerve cells can control perception and behavior.

With up to 2.5 million €, the Gottfried Wilhelm Leibniz Prize is the most remunerative German research award.

[www.idw-online.de/de/news455367](http://www.idw-online.de/de/news455367) (in German)

### 2nd round of German-US American collaborations in CNS approved

In 2009, the Federal Ministry of Education and Research (BMBF), the National Science Foundation (NSF) and National Institutes of Health (NIH) set up the joint funding measure “German-USA Collaborations in Computational Neuroscience”. The funding initiative supports transnational collaboration projects. It is part of the program “Collaborative Research in Computational Neuroscience” on the American side, and the Bernstein Network on the German side. So far, three calls were published. In 2010, five projects were approved. At the end of 2011, the following six further projects were selected for funding :

#### **Model-based control of spreading depression**

Markus A. Dahlem (Berlin), Steven J. Schiff (College State)

#### **Generation of computer models of dendritic signal processing and synaptic plasticity mechanisms in hippocampal nerve cells by high-resolution microscopy**

Stefan Remy (Bonn), Nelson Spruston (Ashburn)

#### **Neuronal theory of three-dimensional form perception,**

Roland W. Fleming (Gießen), Steven Zucker (New Haven)

#### **Higher order feature detection in the olfactory bulb**

Andreas Schaefer (Heidelberg), Thomas Cleland (Ithaca)

#### **Development of general high-dimensional models of neuronal representation spaces**

Michael Hanke (Magdeburg), James V. Haxby (Hanover)

#### **How dynamic is neuronal coding? State dependent stimulus sensitivity in thalamo-cortical networks in the vibrissal system of the rat**

Cornelius Schwarz (Tübingen), Garrett B. Stanley (Atlanta)

[www.nncn.de/nachrichten-en/dusacollaborations2011/](http://www.nncn.de/nachrichten-en/dusacollaborations2011/)



## Bernstein members elected into DFG review boards

As published by the German Research Foundation (Deutsche Forschungsgemeinschaft, DFG) on December 8, 2011, the following ten Bernstein Network members were elected into eight neuroscientific DFG review boards, for the period of 2012-2015:

### **Molecular Neuroscience & Neurogenetics (206-01):**

Stephan Sigrist (BCCN Berlin)

### **Cellular Neuroscience (206-02):**

Andreas Draguhn (BCCN Heidelberg-Mannheim, BGCN Heidelberg)

### **System's Neuroscience, Computational Neuroscience, Behavior (206-04):**

Florentin Wörgötter (BCCN Göttingen, BFNT Göttingen)

Peter Thier (BCCN Tübingen)

### **Comparative Neurobiology (206-05):**

Benedikt Grothe (BCCN Munich)

### **Cognitive Neuroscience & Neuroimaging (206-06):**

Niels Birbaumer (BFNT Freiburg-Tübingen)

Christian Büchel (BFNL Complex Human Learning)

### **Clinical Neuroscience I (206-08):**

Cornelius Weiller (BFNT Freiburg-Tübingen)

### **Biological Psychiatry (206-09):**

Andreas Meyer-Lindenberg (BCCN Heidelberg-Mannheim)

### **Clinical Neuroscience III (206-11):**

Eberhard Zrenner (BCCN Tübingen)

[www.nncn.de/nachrichten-en/fachkollegienwahl2011outcome/](http://www.nncn.de/nachrichten-en/fachkollegienwahl2011outcome/)

## 8th Bernstein Conference takes place in Munich

This year's Bernstein Conference will be organized by BCCN Munich. The conference takes place from September 12 to 14, 2012, at the "Klinikum rechts der Isar" of TU Munich, subsequent to the 5th Neuroinformatics Congress (Sept. 10-12, 2012) of the International Neuroinformatics Coordinating Facility (INCF).

Lectures of invited international scientists and two poster sessions offer various opportunities for scientific exchange. The conference will be opened with the presentation of the Bernstein Award. The "Bernstein Bazar" provides journalists with the interesting chance to get informed about current topics in neuroscience.

For the first time, the "Braitenberg Prize" will be awarded during the conference. In addition, short films visualizing neuroscience topics can be submitted already in advance of the meeting to the "Neurovision Film Contest". Winners will be determined during the conference and announced together with the winners of this year's Brains for Brains Awards of the Bernstein Association. In an evening lecture, the general public is invited to learn about new brain research findings.

### **Speakers**

Kwabena Boahen, György Buzsáki, Matteo Carandini, Greg DeAngelis, Shaul Druckmann, Gaute Einevoll, Onur Güntürkün, Moritz Helmstaedter, Quentin Huys, Christof Koch, Gabriel Kreiman, Stefan Leutgeb, Máté Lengyel, Zach Mainen, Maryann Martone, Andreas Nieder, Jeremy Niven, Tomaso Poggio, Alexandre Pouget, Ranulfo Romo, Bernhard Schölkopf, Bernhard Seiber, Ladan Shams, Jochen Triesch

[www.bccn2012.de](http://www.bccn2012.de)



## NEWS AND EVENTS

### Upcoming Events

Date	Title	Organizers	URL
Mar. 5-9, 2012, Munich	4th G-Node Winter Course on Neural Data Analysis	S. Grün (BCCN Berlin), T. Wachtler-Kulla, M. Volk (G-Node, BCCN Munich)	<a href="http://www.g-node.org/dataanalysis-course-2012/">www.g-node.org/dataanalysis-course-2012/</a>
Mar. 9-10, 2012, Heidelberg	R&D Workshop Cellular Electrophysiology	A. Draguhn (BCCN Heidelberg-Mannheim, BGCN Heidelberg), H. R. Polder (npi electronic GmbH, industry partner of BCCN Munich), S. Cardoso de Oliveira (BCOS)	<a href="http://www.nncn.de/termine-en/rudcellularelectrophysiology/">www.nncn.de/termine-en/rudcellularelectrophysiology/</a>
Mar. 19-23, 2012, Tübingen	Spring School: Methods to study the Brain in Action	Graduate Training Centre of Neuroscience, Tübingen	<a href="http://www.neuroschool-tuebingen-cogni.de">www.neuroschool-tuebingen-cogni.de</a>
Apr. 30-May 5, 2012, Lübeck	Workshop: Introduction to GENESIS 3	Graduate School for Computing in Medicine and Life Sciences at the University of Lübeck (with Bernstein Network members)	<a href="http://www.gradschool.uni-luebeck.de/index.php?id=366">http://www.gradschool.uni-luebeck.de/index.php?id=366</a>
Jun. 21-24, 2012, Santorini, Greece	AREADNE Conference 2012	N. Hatsopoulos, J. Pezaris, C. Ojakangas, Y. Poirazi, T. Siapas, A. Tolias (BCCN Tübingen)	<a href="http://www.areadne.org/">www.areadne.org/</a>
Apr. 11-13, 2012, Munich	G-Node Workshop on Neuronal GPU Computing	M. Schmuker (BCCN Berlin), C. Kellner, T. Wachtler-Kulla (G-Node, BCCN Munich)	<a href="http://www.g-node.org/gpu-workshop-2012">www.g-node.org/gpu-workshop-2012</a>
Jul. 10-13, 2012, Reutlingen	8th International Meeting on Substrate-Integrated Microelectrode Arrays	A. Stett (BFNT Freiburg-Tübingen), G. Zeck, I. Digel, N. Gugeler, K. Burgert, Co-Organizer: Bernstein Center Freiburg	<a href="http://www.nmi.de/meameeting2012/">www.nmi.de/meameeting2012/</a>
Jul. 14-18, 2012, Barcelona, Spain	8th FENS Forum of Neuroscience (with Bernstein Network Information Booth)	Federation of European Neurosciences (FENS)	<a href="http://fens2012.neurosciences.asso.fr/">http://fens2012.neurosciences.asso.fr/</a>
Sept. 2-7, 2012, Kiel	Summer School: Advanced Scientific Programming in Python	Z. Jedrzejewski-Szmek (G-Node), T. Zito (BCCN Berlin, G-Node), C. T. Steigies, C. Drews	<a href="https://python.g-node.org/">https://python.g-node.org/</a>
Sept. 6-8, 2012, Heidelberg	2nd Workshop on Computational Properties of Prefrontal Cortex: Prefrontal-Hippocampal Interactions	BCCN Heidelberg-Mannheim	<a href="http://www.nncn.de/termine-en/ws2prefrontalcortex/">www.nncn.de/termine-en/ws2prefrontalcortex/</a>
Sept. 10-12, 2012, Munich	5th INCF Congress of Neuroinformatics	INCF, A. Herz, T. Wachtler-Kulla (both BCCN Munich, G-Node)	<a href="http://www.neuroinformatics2012.org/">www.neuroinformatics2012.org/</a>
Sept. 12-14, 2012, Munich	Bernstein Conference 2012	A. Herz, T. Wachtler-Kulla (both BCCN Munich, G-Node)	<a href="http://www.bccn2012.de/">www.bccn2012.de/</a>



## NEWS AND EVENTS

### Upcoming Events

Date	Title	Organizers	URL
Sept. 16-19, 2012, Jena	BMT 2012: 46th DGBMT Annual Meeting	H. Witte, J. Haueisen (both BGCN Jena), A. Voss	<a href="http://conference.vde.com/bmt-2012/Seiten/Homepage.aspx">http://conference.vde.com/bmt-2012/Seiten/Homepage.aspx</a>
Sept. 20-28, 2012, Berlin	Summer School: Neurotechnology	K.-R. Müller (BFNT Berlin, BCCN Berlin, BCOL Neurovascular Coupling)	Website under construction
Oct. 7-12, 2012, Freiburg	BCF/NWG Course: Analysis and Models in Neurophysiology	S. Rotter, U. Egert, A. Aertsen, J. Kirsch (all Bernstein Center Freiburg), S. Grün (BCCN Berlin)	<a href="http://www.bcf.uni-freiburg.de/events/conferences-workshops/20121007-nwgcourse">www.bcf.uni-freiburg.de/events/conferences-workshops/20121007-nwgcourse</a>
Oct. 29-31, 2012, Berlin	Symposium: Neural Computation: From Perception to Cognitive Function and opening ceremony of the Berlin Center for Advanced Imaging (BCAN)	Research Training Group 1589 "Sensory Computation in Neural Systems" and BCCN Berlin	Website under construction
Aug. 25-29, 2013, Bremen	European Conference on Visual Perception (ECP)	U. Ernst (BPCN 2010, BGCN Bremen), C. Grimsen, D. Wegener	<a href="http://www.nncn.de/termine-en/ecvp2013/">www.nncn.de/termine-en/ecvp2013/</a>

# The Bernstein Network

Chairman of the Bernstein Project Committee: Andreas Herz (Munich)  
Deputy Chairman of the Project Committee: Theo Geisel (Göttingen)

## **Bernstein Centers for Computational Neuroscience** (Coordinator)

Berlin (Michael Brecht)  
Freiburg (Ad Aertsen, Director: Stefan Rotter)  
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*Title image: Also in the virtual reality, we make mistakes during distance estimation.*

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