

Growing Connections in Computational Neuroscience

A German-USA Collaborative Symposium, Munich, June 8-11, 2008

Recent years have seen a variety of advances to promote the field of Computational Neuroscience, culminating in several sponsoring initiatives in the USA and in Germany. Inspired by these developments, the present symposium aims to help strengthen scientific collaboration between the two countries.

In the USA, NSF and NIH have joined forces by establishing a funding structure through the CRCNS (Collaborative Research in Computational Neuroscience) program in 2002. Notable private organizations in Computational Neuroscience are the Sloan Foundation, which started supporting the field in 1994 through the *Sloan Centers for Theoretical Neurobiology*. The Swartz Foundation joined later, which led to the establishment of the *Sloan-Swartz Centers for Theoretical Neurobiology*. In addition, there is an educational component in the form of the summer course “Methods in Computational Neuroscience” offered by the Marine Biological Laboratory in Woods Hole since 1992.

In 2004/05 the German Education and Science Ministry (BMBF) established four *Bernstein Centers for Computational Neuroscience*, located in Berlin, Freiburg, Göttingen, and München. This was followed in 2006/07 by additional funding for “Bernstein Groups”, “Bernstein Collaborations”, the “Bernstein Prize”, and in 2008, the “Bernstein Focus: Neurotechnology” and the “Bernstein-Focus: Neural Basis of Learning”. In addition, several other organizations in Germany, such as the Deutsche Forschungsgemeinschaft, Deutscher Akademischer Austausch Dienst, Alexander von Humboldt Foundation and Volkswagen Foundation, are actively supporting Computational Neuroscience.

It seems timely, therefore, to explore the possibilities of tighter collaboration among scientists of both countries. In this spirit, the symposium brings together researchers and funding agency representatives from the USA and Germany, with a shared interest in Computational Neuroscience. The aim is to discuss scientific advances, to explore possibilities of future collaboration, and to discuss strategies for streamlining the exchange of people, educational opportunities, and scientific ideas between the two countries. The meeting therefore has sessions of two different flavors. One type is devoted to scientific exchange, and we hope that it may inspire participants to think about concrete topics for scientific collaboration. The other aims at assessing the potential for US-German collaborations, deepening the understanding of the interests of funding agencies in both countries, and identifying factors that may enable, or hamper, international collaboration. Other important topics of discussion are the education of students and the training of young investigators in a more international setting. Special emphasis will be given to developing ideas for increasing the participation of underrepresented groups in international exchange.

It is our great pleasure to thank all persons and organizations who made this meeting possible – in particular BMBF and NSF – as well as Maj Catherine Botheroyd for her organizational support.

Rob de Ruyter van Steveninck, J.Leo van Hemmen, Andreas V.M. Herz

Growing Connections in Computational Neuroscience

A German-US Collaborative Symposium

Munich, June 8-11, 2008

Sunday, June 8 Location [on Sunday only]: "Seehaus" in the Englischer Garten

6:00 PM Word of welcome

Christiane Buchholz (BMBF), *Ken Whang* (NSF), *Yuan Liu* (NIH/NINDS)

6:20 PM *Simone Cardoso de Oliveira*: National Bernstein Network for Computational Neuroscience

7:00 PM Dinner

Monday, June 9 Location: Kardinal-Wendel Haus, Mandlstraße 23, 80802 Munich

Chair: Andreas Herz

8:45AM Connecting Neuroscience in Germany and the US – Status quo and expectations:
Presentations by representatives of US and German Funding Agencies

Ken Whang (National Science Foundation)

Yuan Liu (National Institute of Neurological Disorders and Stroke)

Jan Kunze (Deutsche Forschungsgemeinschaft)

Thomas Hesse (Alexander von Humboldt-Stiftung)

Martin Diestel (for Deutscher Akademischer Austausch Dienst)

Henrike Hartmann (Volkswagen-Stiftung)

Olaf Krüger (BMBF/Projekträger DLR)

10:30 AM Coffee Break

Chair: Rob de Ruyter van Steveninck

10:50AM AUDITORY PROCESSING – FROM LISTENING TO SINGING

Martin Göpfert: From transducer dynamics to sensory system behavior –
identifying the molecular mechanisms that shape the performance of ears

Richard D. Mooney: Neural mechanisms for imitative communication

11:50 AM Short Break

12:00 AM OLFACTION AS A COMPUTATIONAL PROBLEM

Christiane Linster: Computational and behavioral evidence for normalization in
the olfactory system

12:30 PM Lunch

Chair: Leo van Hemmen

2:00 PM COMPUTATIONAL APPROACHES TO SINGLE-NEURON DYNAMICS:

Dieter Jaeger: Combining dynamic clamp experiments and single neuron modeling to determine synaptic coding properties of deep cerebellar nucleus neurons

Gabriel Wittum: Detailed simulation of neuronal signal processing

3:00 PM Short Break

3:10 PM BRAIN STRUCTURE AND FUNCTION

Dmitry B. Chklovskii: From neuronal circuit reconstructions to principles of brain design

Claus C. Hilgetag: Paradoxical lesion effects in cat, human and modeled brains

4:10 PM Coffee Break

Chair: Simone Cardoso de Oliveira

4:30 PM HOW DO SENSORS AND MOTORS INTERACT IN THE CORTEX?

Carlos Brody: Flexible sensorimotor mapping: the ProAnti task in rats

Alexander Gail: Planning of visually guided arm movements in the sensorimotor cortex

5:30 PM Short Break

5:40 PM FROM LARGE-SCALE ACTIVITY TO BRAIN-COMPUTER INTERFACES

Miguel Nicolelis: Computing with neural ensembles

Klaus-Robert Müller: Towards brain computer interfacing

6:40 PM “Digestion” – Time for questions that go beyond a single talk

7:00 PM Dinner

8:30 PM Break-Out Sessions on German-US Collaboration

Tuesday, June 10

Chair: Ernst Niebur

9:00AM VISUAL CORTEX AND THE NATURAL WORLD

Dirk Jancke: From luminance changes to natural scenes: Voltage-sensitive dye imaging in primary visual brain areas

David Fitzpatrick: Imaging experience-dependent emergence of functional circuits in visual cortex

Fred Wolf: A symmetry of the visual world in the design of the visual cortex

10:30 AM Coffee Break

11:00 AM FROM SENSORY INTEGRATION TO PATHOLOGY

Dora Angelaki: Multisensory integration for heading perception in macaque visual cortex

Carsten Mehring: Adaptive optimal control approaches to sensorimotor learning

Stefan Glasauer: Modelling the influence of medical treatment on pathological eye movements

12:30 PM Lunch

Chair: Benedikt Grothe

2:00 PM THE NEURAL BASIS OF ATTENTION AND PERCEPTION

Nava Rubin: A hierarchy of temporal receptive windows in human cortex

Jochen Braun: On the causes of multi-stable perception

Peter König: Feature integration in overt attention

3:30 PM Coffee Break

4:00 PM COMPLEXITY OF SIGNAL PROCESSING IN VISUAL CORTEX

Yang Dan: Analysis of visual cortical receptive field in anesthetized and awake animals

Mriganka Sur: Dynamics of neuron and astrocyte networks in visual cortex

5:00 PM Break-Out Sessions on German-US Collaboration

6:00 PM Excursion

Wednesday, June 11

Chair: Theo Geisel

9:00 AM COMPUTATIONAL VISION:

Alexander Borst: Optic flow processing in the cockpit of the fly

Laurenz Wiskott: Learning where- and what-information for visual objects under translation, rotation and zoom

10:00 AM Coffee Break

10:20 AM AUDITORY TUNING AND PLASTICITY

Laurel H. Carney: Computational models for the tuning of inferior colliculus neurons to periodicities in amplitude modulated tones, noise and click trains

Catherine Carr: Short term synaptic plasticity in the auditory system

11:20 AM Short Break

11:30 AM PLASTICITY AND HOMEOSTASIS IN HIPPOCAMPUS AND CORTEX

Mayank Mehta: Place cell plasticity, synaptic plasticity and cortico-hippocampal interaction

Michael P. Stryker: Mechanisms of activity-dependent competition in neocortex

12:30 PM Lunch

Chair: Henry Abarbanel

2:00 PM DYNAMICS OF LARGE SCALE NEURAL NETWORKS:

Stefan Rotter: Relating structure and dynamics of neocortical networks

Kenneth. D. Miller: Inhibition-stabilized recurrent networks and selective amplification of neural activity patterns

Sara Solla: Patterns of neural activity in networks with complex connectivity

3:30 PM Coffee Break

4:00 PM CORTICAL SYNCHRONIZATION

Herbert Witte: Model-related analysis of time-variant interrelations and synchronization of activated brain areas

Klaus Pawelzik: Decoding stimuli and attention from the power of cortical synchronization

AN OUTLOOK

Konrad Körding: Normative models in Neuroscience

5:30 PM Coffee Break

Chairs: Andreas Herz and Rob de Ruyter van Steveninck

6:00 PM Connecting Computational Neuroscience in Germany and the US – New ideas and future perspectives: Presentations by the rapporteurs of the break-out sessions

7:30 PM Farewell Banquet at “Café Reitstall”

Thursday, June 12

9:00 AM Wrap-up session for the organizers and representatives of BMBF, NSF, NIH, and other interested funding agencies.