

BIOVALLEY® News

New Bernstein Center for Computational Neuroscience



Freiburg in Breisgau will be one of four German Centers for Computational Neuroscience.

The German Federal Ministry of Education and Research (BMBF) has started an initiative to create a "National Network for Computational Neuroscience", aimed at achieving major breakthroughs in the understanding of cognitive functions by fostering the young discipline of "Computational Neuroscience". This network seeks to concentrate neuroscientific expertise in Germany and to integrate theoretical approaches to create a common structure for networking neurocomputational findings and transferring them to technological applications. The development of multidisciplinary training programs in Computatio-

nal Neuroscience is an important component of this concept.

Focus on neural dynamics

The central elements of the National Network are four new Bernstein Centers for Computational Neuroscience in Berlin, Freiburg, Göttingen and Munich. These Centers are connected through the exchange of theoretical approaches and models, data analysis tools and data. The Bernstein Center Freiburg focuses on neural dynamics as the hallmark of complex, flexible brain functions.

The BCCN Freiburg represents the collaborative effort of groups from four faculties at Freiburg

University (biology, physics and mathematics, medicine, computer science and microsystems technology), the University Clinic, and two leading companies in neurotechnology: Multi Channel Systems GmbH and Honda Research Institute Europe GmbH. In Freiburg, the BCCN works in close collaboration with the Center for Neurosciences (ZfN), the SFB505, and the Neuroscience Graduiertenkolleg. Regionally, the BCCN forms part of the tri-national neuroscience network Neurex. Collaborations with sister Centers abroad are being established.

continued on page 2

Contents

Editorial	2
Prof. Dr. Philippe Poindron calls for fresh impetus for the BioValley.	
Interview with Dr. Bernd Dallmann	4
	
The president of the BioValley Central Association talks about recent developments in the BioValley.	
MipTec and ILMAC	5
Basel prepares to host the renowned MipTec Conference and ILMAC, a new trade fair, in May.	
Faust Pharmaceuticals	7
A biotech company dedicated to the discovery and development of innovative proprietary drugs for CNS diseases.	

Breaking News

BioValley sponsors Livetec's new wireless application

The German BioValley Committee will support the young company Livetec GmbH, Lörach with EUR 10,000 from the so-called "Start-Up-Labeling Program". Livetec has developed a new wireless application "HF-Modul", which has to be approved by the German technical inspection agency TÜV and will then be put on the market.

www.livetec.de

New "BioValley Report 2005/06"

Take part in the new edition of the "BioValley Report 2005/06", with your own company profile – a yearly BioValley publication including reports and portraits from the BioValley. More information:

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Editorial



Prof. Dr. Philippe Poindron,
President of the Association Alsace BioValley

For a fresh impetus

This is the first issue of our new, modern and short official BioValley Publication called "BioValley News". The "BioValley News" replaces the BioValley Journal and is the format for the near future and suits the trinational structure of BioValley.

All the deliberations that took place within our national associations and at trinational level have led to building the ideal trinational structure, with highly professional standards, semi-private status, a profit-making organisation with the ability to create or welcome biotech companies. Such a trinational structure, with private as well as public shareholders, has to promote the emergence of bi- or trinational projects in close collaboration with all the players in the network.

For such a structure to exist, one has to offer proof of imagination. We should use the concept of extraterritorial eurodistricts where biotech companies could be established in the vicinity of technological platforms. Three eurodistricts could be established: near Strasbourg-Kehl-Offenbourg, Freiburg-Colmar and Basel-Saint-Louis-Mulhouse-Lörrach. It is now up to our politicians to take on the challenge.

Public opinion feels that the era of suicidal competition is over and survival depends on intensifying transnational links between citizens who share the same democratic values.

We live this reality in BioValley. Many examples could illustrate this, one of the most significant being Neurex. Our region has developed much high level research work in neuroscience and researchers in our three countries are working together virtually every day.

Finally, I want to mention Bioethica, a Council of Europe event planned for 2007 in Strasbourg. Mainly dedicated to biotechnologies and ethics, it will be a conference of worldwide repute. In the next issue of BioValley News, an article will be devoted to this project which is in line with the humanist values of the Rhineland, a region where we are glad to live. An opportunity not to be missed!

Philippe Poindron

Towards understanding neural dynamics

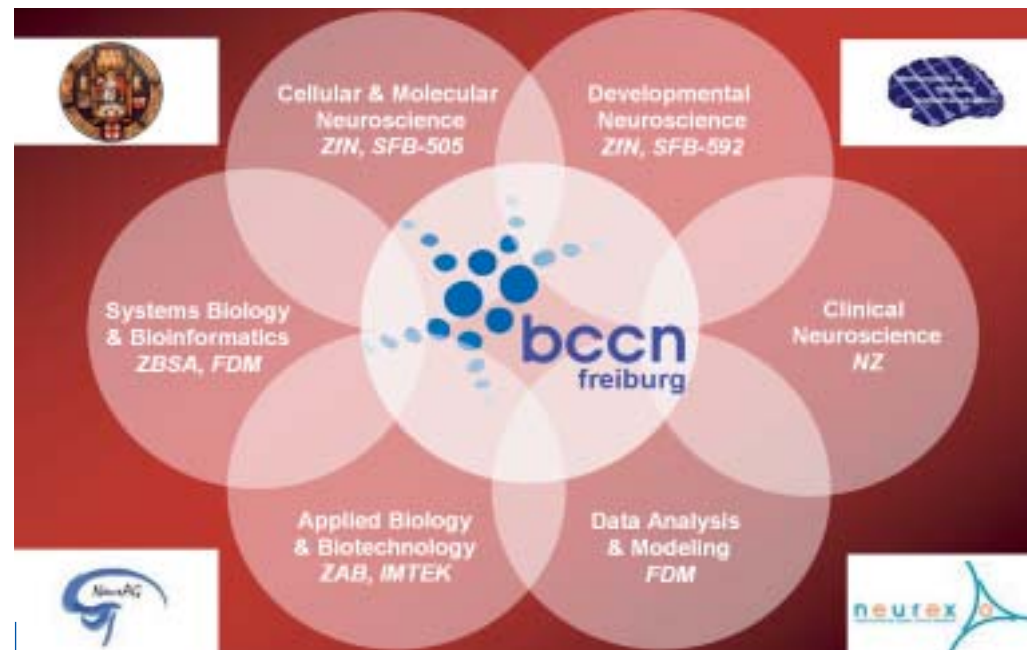
The University of Freiburg was recently awarded close to 8 million euros to establish a Bernstein Center for Computational Neuroscience. Besides many innovative multidisciplinary research projects, this will include the development of new dedicated PhD- and Post-doc-Programs in Computational Neuroscience. This new development brings an exciting new branch of neuroscience to the already rich neuroscience landscape in the Upper Rhine Valley.

The structure and function of the human brain are of unprecedented complexity. Progress in brain research therefore critically depends on the successful interplay between different approaches and methodologies, in particular between experiment and theory. Computational Neuroscience is a new multidisciplinary research paradigm in the neurosciences, operating at this interface between experiment and theory. It aims to identify the computational problems that need to be solved by the brain and to understand the computational strategies and processes used. It pursues this goal by describing structural and functional principles of neuronal systems with formal means, and predicting their properties based on the insights gained.

The methodological focus is on the development and analysis of mathematical and computational models, and the concomitant, model-driven analysis of experimental data, both supported by the use of modern information technology. Basic research in biology and medicine, combined with potential biomedical and technical applications boost the vigorous development of Computational Neuroscience.

Neural dynamics

The brain enables us to actively interact with our environment. Speed, fault-tolerance, adaptivity and creativity characterize brain function, guaranteeing that we successfully master our daily lives. Dynamics are an outstanding feature of the brain at each level of observation:



Networking Bernstein Center for Computational Neuroscience – Freiburg and regional.

- The transient and interactive nature of sensory input and behavioral output confronts the brain with the need of dynamic processing at various time scales. It is an open issue which are the essential determinants and properties of the dynamical system emerging from this loop.
- Neuronal networks of the brain exhibit autonomous dynamics on multiple time scales, conditioned by the properties of the biophysical substrate. For distributed, recurrent networks, no unique direction of signal flow or separable functional modules can be identified. It is an open issue how neuronal representations are formed under these conditions.
- Structural features of the neuronal networks of the brain undergo changes by plasticity and adaptivity on time scales that may in-

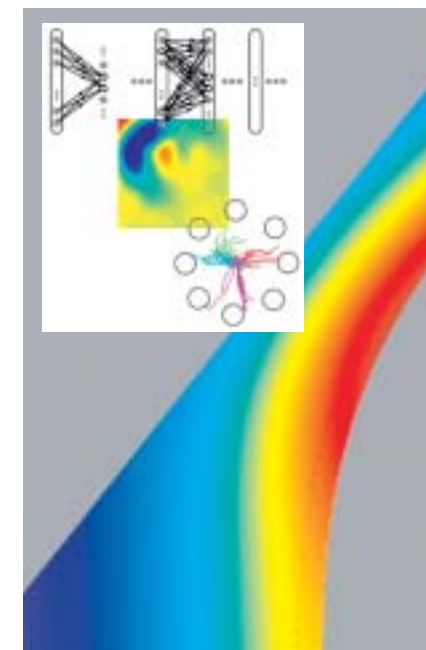
terfere with the time scales of both driven and autonomous dynamics. It is an open issue how stable biological function can be achieved and optimized under these conditions.

The Bernstein Center for Computational Neuroscience Freiburg (BCCN-F) aims to address these issues, to clarify the underlying mechanisms, inter-relations and functional role of neural dynamics, and to explore the application of new insights and techniques to questions in biomedicine and neurotechnology.

Research areas

Research at the BCCN-F focuses on the following areas:

- Process dynamics of neuronal systems: Analysis and modeling of the dynamic processes associated with brain activity, attempting to bridge the multiple levels of single neurons and synapses, local circuits, neuronal networks and architectures.
- Structural constraints and structural dynamics: understand and control the constraints imposed by the biological substrate onto neuronal dynamics; analysis and modeling of functional and structural changes associated with development, learning and adaptation in normal and pathological networks.
- Biological function in a dynamic setting: Measurement of dynamic brain activity at multiple levels and interpretation based



Neural Dynamics – From models and network physiology to neural prostheses.

on neural network models; real-time decoding and controlling of brain dynamics; concepts for adaptive controllers of neural prostheses and humanoid robots.

Research projects are organized into three main categories: Theoretical and Methodological Foundations, Experimental Foundations and Applications to Biomedicine and New Technologies.

Teaching and training

The problems that Computational Neuroscience seeks to solve are multidisciplinary in nature. Accordingly, trained researchers are needed to make significant contributions to the field. To satisfy the increasing demand for such scientists, new teaching and training programs must be developed and installed. The BCCN Freiburg takes up this responsibility by establishing multidisciplinary teaching and training programs in Computational Neuroscience for MSc and PhD students. In addition, a Postdoctoral Program will be established to offer advanced scientific training, and training in qualifying soft skills. Intense communication with colleagues from Germany and abroad is supported by a Visiting Scientist Program that enables internationally renowned researchers to collaborate with the Freiburg team.

Ad Aertsen

In brief

University of Freiburg secures EU research funds for biotech and life sciences projects

The University of Freiburg has been extraordinarily successful in obtaining research funds from the European Union. Income from this source rose from almost EUR 1 million in 1993 to around EUR 4.5 million in 2004. Over the last few years, the bulk of the funds has been used to support projects originating from the medical and biological science departments of the University of Freiburg.

EU funding is provided especially for research projects that promote European scholarship and involve scientists from several member States of the EU. A board of experts in Brussels reviews the projects.

With financial support from governmental sources decreasing, universities now depend more than ever on external funding. The Albert-Ludwig University of Freiburg realised this early on and set up its "Bureau for European Union Affairs" for this purpose. The bureau has been coordinating EU education programmes since 1993.

Guy Morin stresses BioValley's importance as a model region



Guy Morin, member of the Green Party of Basel-Stadt, has been in charge of the canton's external affairs since 2 February 2005, when he joined Basel's government as

the new head of the canton's ministry of justice. In a recent interview with a BioValley representative he underlined the BioValley's importance as one of the main business centers for the Upper Rhine Valley and promised his support.

In addition to purely economic considerations, Morin would like the BioValley to serve as a platform for a more profound discussion of legal and ethical issues in biological and medical research. The BioValley could become a model region in this sense, too, said the newly elected member of government.