Deutsche Forschungsgemeinschaft
Press Release

No. 58 **21 November 2012**

DFG to Fund Eleven New Collaborative Research Centres

Ranging from Insect Timing to Obesity Mechanisms to the Cultural History of Leisure

The Deutsche Forschungsgemeinschaft (DFG, German Research Foundation) will establish eleven Collaborative Research Centres (CRCs) as of 1 January 2013. This was decided by the responsible Grants Committee during its fall session in Bonn. The new CRCs will be funded initially for a period of four years with a total of 101.5 million euros, including a 20% programme allowance for indirect project costs.

The newly established Collaborative Research Centres will explore a variety of complex topics, ranging from the development of pioneering internet-based communication models to new imagery processes in biology to a cultural history of leisure. Other Collaborative Research Centres will more precisely determine the control of immune responses or investigate the role of proper timing in the life of insects. One of the approved centres is a CRC/Transregio, which has multiple locations.

The responsible committee also approved the extension of 25 Collaborative Research Centres for an additional funding period. As a result, the DFG will be funding a total of 232 Collaborative Research Centres as of January 2013.

The new CRCs (in alphabetical order by host university):

In the past, several fundamental principles of protein mechanisms were discovered at the interface of biology, chemistry, and physics. The CRC **"Protonation Dynamics in Protein Function"** follows through on this work and seeks to decode a new functional principle. The researchers define protonation dynamics as the movement of hydrogen ions, which allows the coordination of several different functional locations in complex proteins, for example, and which is the foundation of the conversion of light signals in plants and cyanobacteria. The precise way in which local displacement of protons proceeds in hydrogen bridge networks as well as proton transfer over greater distances will be examined using four selected protein systems. The objective is to understand protonation dynamics as a determining factor in protein function at a fundamental physical/chemical level. This shall be achieved through the combination of new biophysical experiments with molecular simulations and quantum-chemical calculations. Research into the fundamentals of protein function can be of long-term benefit in order to technologically implement novel concepts, such as light-driven water splitting or oxygen reduction (in energy sciences).
(Host University: Free University of Berlin; Spokesperson: Prof. Dr. Holger Dau; Additional Participating Universities: Technical University of Berlin, Humboldt University, Berlin; Additional Participating Institution: Leibniz Institute for Molecular Pharmacology (FMP), Berlin)

Deutsche Forschungsgemeinschaft
Press and Public Relations Kennedyallee 40 · 53175 Bonn
Tel.: + 49 228 885-2443 · Fax: +49 228 885-2180 · E-mail: presse@dfg.de

The CRC **"The Mathematics of Emergent Effects"** will examine how the interaction of many units on a small scale leads to the appearance of new effects on a large scale. For this purpose new rigorous mathematical concepts and methods will be developed and applied to specific examples. In doing so, the CRC will focus on three primary areas: Analysis of the collective behaviour of multiple particle systems in both quantum and classical mechanics, investigation of stochastic systems and continuum limits, as well as systematic observation of such systems from analytical, geometric, algorithmic, and theoretical probability perspectives. By linking analysis, probability theory, and numerics, the CRC intends to lay the groundwork for new, complementary approaches, such as in multiple-particle quantum mechanics.
(Host University: University of Bonn; Spokesperson: Prof. Dr. Stefan Müller)

The CRC **"MAKI - Multi-Mechanism Adaptation for the Internet of the Future"** will take a look into the future of communication systems. In view of the increasingly mobile use of the internet, e.g. via smartphones, the researchers will seek ways to improve mechanisms of exchanging data, so the mechanisms can react with greater flexibility to various conditions without compromising quality. Therefore, the CRC will focus its research on the adaptability, interaction, and continuous improvement of so-called protocols. Such protocols enable and document data transfer and are comprised of a variety of mechanisms that must react flexibly to the flow of traffic or bandwidth of the internet. In ongoing operations, this currently represents a special case. Against this background, the CRC is working on improving interactions between mechanisms within the network that are functionally dependent on each other and enabling automated and coordinated adaptation of the overall system to changing conditions. By developing new design methods and new communication models and processes, the research association will make a large contribution to the future of the internet.
(Host University: Technical University of Darmstadt; Spokesperson: Prof. Dr.-Ing. Ralf Steinmetz; Additional Participating Universities: RWTH Aachen University, University of Illinois at Urbana-Champaign, USA)

Cultural-historical analyses of leisure are the focus of the CRC **"Leisure. Concepts, Spaces, Figures"**. This CRC will investigate from philological, philosophical, sociological, psychological, and ethnological perspectives the question of how times of leisure can be created and justified in a society generally, but also specifically in the largely efficiency-oriented information society of the 21st century. Leisure is thereby defined as free time that provides space for creativity, thought, and experiences. However, in addition to this potential, leisure also contains the risk of destabilizing social orders because it disturbs daily routines. The new research association will explore this source of conflict and clarify with an interdisciplinary approach how cultural orders in leisure initiate the potential for excess and how they simultaneously shield leisure lifestyles from criticism by venerating the concept of unproductive productivity. Special attention will also be paid to demands for "freedom of leisure" in science and the humanities. The theory here is that leisure is an essential component of all forms of science and academia.
(Host University: University of Freiburg; Spokesperson: Prof. Dr. Burkhard Hasebrink)

The common practice of forgoing electronic components in measurement systems in fields such as medicine and aerospace creates the challenge of developing alternative sensor systems. Such optronic systems simultaneously offer the opportunity to capture the properties of their environment across a large area and space-resolved. The CRC/TRR **"Planar Optronic Systems (PlanOS)"** will pursue this task and attempt to further develop novel polymer materials in such a

way that they can be used as large-format, flat films and substrates for fully integrated, distributed sensor networks. The supra-regional research association intends to research the fundamentals of these novel material systems, drive forward the realisation of suitable polymer structures and micro-optical components in optical quality, and successfully assemble the individual components to create sensor systems. These efforts will be backed up by simulations of such systems and the pursuit of resource-conserving and economical production methods.
(Host University: University of Hanover; Spokesperson: Prof. Dr.-Ing. Ludger Overmeyer; Additional Applying University: University of Freiburg; Also Participating: Technical University of Braunschweig, Technical University of Clausthal, Laser Zentrum Hannover e.V.)

Many factors converge to influence obesity: Genetics, behaviour, and lifestyle influence the increase in fat mass through elevated size and quantity of fat cells. Questions remain about precisely how this fetal programming, appetite control, energy consumption, and accessibility of nourishment work in combination. The CRC **"Obesity Mechanisms"** will concentrate on three central complexes: Why do obese people exhibit a positive energy balance? How does over-nourishment lead to improper distribution and inflammation of fat tissue? And which signals from the fat tissue are responsible for obesity accessory symptoms and secondary diseases? Since the mechanisms that may lead to morbid obesity are multifaceted, researchers hope that an interdisciplinary approach will result in fundamental resolution of core questions of pathogenesis and eventually opportunities for prevention.
(Host University: University of Leipzig; Spokesperson: Prof. Dr. Matthias Blüher; Also Participating: Ben Gurion University of the Negev, Israel, Max Planck Institute for Evolutionary Anthropology, Max Planck Institute for Human Cognitive and Brain Sciences, both Leipzig)

One of the most important capabilities of the nervous system is the active maintenance of a balanced and stable internal state (homoeostasis) while at the same time dealing with a continuously changing environment. The permanently ongoing adaptation to changing environmental influences is performed both by general mechanisms of cell functions as well as by locally limited processes within specialized cellular compartments. The CRC **"Molecular and Cellular Mechanisms of Neural Homoeostasis"** will investigate the fundamental processes within nervous systems which establish or maintain a condition of stability throughout the entire lifespan. In pursuit of this, various classes of molecules will be examined, such as those that are important for controlling cell-cell interactions and signal processes. As a result, the importance of homoeostatic mechanisms for organisms and particularly for the diseased human nervous system shall be better understood.
(Host University: University of Mainz, Spokesperson: Prof. Dr. Robert Nitsch; Additional Participating University: Goethe University of Frankfurt a.M.; Additional Participating Institutions: Max Planck Institute of Biophysics, Frankfurt, Max Planck Institute for Brain Research, Frankfurt, Institute for Molecular Biology gGmbH, Mainz)

Virus infections threaten human health and result in healthcare expenditures that strain local financial and healthcare systems around the world. RNA viruses represent a special challenge in this area: Due to the absence of a corrective function in their enzymes, they form so-called quasispecies that, during a change of hosts, result in new virus variations that can again reproduce quickly and continue to adapt. A few families of RNA viruses contain highly infectious pathogens that can cause fever associated with haemorrhaging or acute pulmonary disease. In the CRC **"RNA Viruses: RNA Metabolism, Host Response and Pathogenesis"** researchers intend to

investigate the virus group from several perspectives: This shall provide understanding of the composition and metabolism of viral RNA and discover factors that turn the virus groups into pathogens. In addition, cellular defensive mechanisms against RNA viruses shall be found and suppression thereof through viral factors clarified. This knowledge shall lead to a fundamentally better understanding of the biology of RNA viruses and consequently facilitate preventative care.
(Host University: University of Marburg; Spokesperson: Prof. Dr. Stephan Becker; Additional Applying University: University of Giessen)

T-lymphocytes play a central role in immune defence. However, if the T-cells exhibit elevated or low activity, they may also contribute to immune-mediated diseases such as tumours, chronic infection, or allergies. The causes of this failure of immunological control are largely unknown. The CRC **"Control and Plasticity of Cell-Fate Decisions in the Immune System"** intends to close this gap in research and more closely analyse individual switching elements of the immune system. The focus will be on differentiation pathways and signals that turn precursor cells into efficient, defence-capable T-cells. In particular, the signals that determine the stability and flexibility of the cell differentiation process shall be identified. Since T-cells, in addition to dendritic cells, are primarily responsible for sending the most suitable possible immune-system responses to microbial pathogens, they are of great interest for improved treatment of inflammatory diseases, allergies, auto-immune disease, or cancer. Over the long term, collaboration between immunologists, stem cell researchers, vaccine developers, and others is expected to alter the differentiation of immune cells in such a way that they would be suitable for therapeutic use.
(Host University: LMU Munich; Spokesperson: Prof. Dr. Thomas Brocker; Additional Participating University: Technical University of Munich; Additional Participating Institutions: Helmholtz Zentrum Munich, Max Planck Institute for Biochemistry, Planegg)

Most natural systems are in "non-equilibrium". In physics, this term describes the state of material outside of the thermodynamic balance resulting from a continuous or abrupt outflow or inflow of particles and energy. In the human body, such non-equilibrium processes occur at the molecular, cellular, and tissue levels. These processes involve collaboration between many particles, which is why an understanding of the collective effects plays an important role for a complete understanding of active dynamic processes in living cells. The concept of pattern formation is ubiquitous in biological systems ranging from the microscopic to the macroscopic levels, from intracellular oscillation to tissue formation. The CRC **"Physical Modelling of Non-Equilibrium Processes in Biological Systems"** intends to more closely identify these imbalance phenomena, subject them to quantitative analysis, and develop theoretical models through interaction between researchers from the natural and life sciences.
(Host University: University of Saarbrücken; Spokesperson: Prof. Dr. Heiko Rieger)

It all comes down to timing: Timing determines success or failure in the search for food and a mate as well as the ability to escape from enemies or harmful environmental influences. The CRC **"Insect Timing: Mechanisms, Plasticity and Interactions"** will investigate on selected model organisms such as the fruit fly how the proverbial inner clocks of animals provide the ability to anticipate and adapt to daily and yearly rhythms. Very little is currently known about the functionality and adaptability of these essential timing mechanisms. This will be the researchers' starting point. They wish to examine the complex synchronisation of individual "time calculation" in the interaction with others as well as more precisely determine the importance of the inner clock for the effectiveness of the organism. In doing so, the CRC follows the approach of placing the

various levels of timing into ecological context and to investigate the accuracy of timing within the time periods of one day, the lifecycle of an individual, and across multiple generations. (Host University: University of Würzburg, Spokesperson: Prof. Dr. Charlotte Förster)

Further Information

Further information will be provided by the spokespersons of the Collaborative Research Centres.

DFG programme contact:
Dr. Klaus Wehrberger, Head of Research Centres Division,
Tel. +49 228 885-2355, Klaus.Wehrberger@dfg.de