idw - Informationsdienst Wissenschaft
Nachrichten, Termine, Experten

Pressemitteilung

Universität zu Köln
Eva Schissler

31.05.2024
http://idw-online.de/de/news834501

Forschungsprojekte, Wettbewerbe / Auszeichnungen
fachunabhängig
überregional

New Collaborative Research Centre and four extensions for the University of Cologne

The German Research Foundation (DFG) has approved a new Collaborative Research Centre in the field of mRNA research and extended the funding of four existing CRCs / With a total of 16 CRCs as the managing university, the University of Cologne holds the top position in Germany

The DFG will fund a new Collaborative Research Centre (CRC) at the University of Cologne for the next three years and nine months to investigate the effects of defects in the production of mRNA and proteins. Four other existing CRCs from the fields of aridity research, mitochondria, quantum materials and states of matter are entering the third and thus final funding period. In all, the approved CRCs will receive funds totalling approximately 56 million euros in this period, of which 44 million euros will remain at the University of Cologne. The remaining funds go to the collaboration partners.

“The funding approval shows how diverse cutting-edge research in large collaborations is at the University of Cologne. I am delighted that our scholars and scientists developed persuasive proposals and wish them every success in their research work. I would also like to thank everyone involved, especially the speakers, for their commitment,” said Professor Dr Joybrato Mukherjee, Rector of the University of Cologne.

Beginning in October, the University of Cologne will be the managing university for a total of 16 CRCs and Transregios. This places it in the top position in Germany. “This is proof of the excellence of our researchers,” Mukherjee added.

A better understanding of age-related mRNA defects

The new CRC 1678 ‘Systems-level Consequences of Fidelity Changes in mRNA and Protein Biosynthesis’ investigates why more errors occur in the production of mRNAs and proteins with increasing age and how these changes affect cells and the entire organism.

The genome in our cells contains blueprints for the proteins that perform all the essential functions in our body. In order to produce proteins, the genetic information in the cells is first transcribed into mRNA, from which proteins are then built. Although the biosynthesis of mRNAs and proteins has been studied in depth, a comprehensive picture of what happens when these processes no longer function reliably is still lacking. The work of researchers involved in the CRC has already shown that this reduced reliability leads to the development of diseases and age-related physical changes. Thanks to new technologies, the researchers can now investigate the effects of errors in mRNA and protein production more closely. The experts from the fields of molecular and cell biology, systems biology and bioinformatics will combine molecular biological methods with computer-based models to investigate the relationships between the processes.

The aim is to understand how these defects can cause diseases in humans. The funding may also contribute to identifying new therapeutic approaches. A special feature of the CRC is the systematic analysis of interactions between different cellular processes. “This requires an interdisciplinary team of researchers who would otherwise perhaps never

work together in this constellation," said speaker Professor Dr Andreas Beyer from the Institute for Genetics. Beyer is also a principal investigator at the CECAD Cluster of Excellence in Aging Research and at the Center for Molecular Medicine Cologne (CMMC).

Besides the University of Cologne as the managing university, the Universities of Hamburg, Mainz and Göttingen, the Max Planck Institutes for Biology of Ageing and for Molecular Genetics as well as ETH Zurich are involved in the CRC.

How an extremely dry Earth develops

CRC 1211 'Earth – Evolution at the Dry Limit', which is now entering the third funding period, investigates the mutual relationships between biological and landscape evolution in the driest deserts on Earth (Atacama and Namib), where both biological activity and Earth-surface processes are limited by the availability of liquid water. In the first two funding phases, the research team focused on the development of new experimental and numerical methods and on the dynamics of hyper-arid soil-landscape systems and the hyper-arid biosphere. Their results describe the characteristics of biological activity on the basis of the water availability on habitable Earth and characterize the Earth-surface processes that occur in the absence of liquid water. From this, the researchers define threshold values for the possibility of biological life as well as tipping points of the Earth's surface systems.

The designated speaker for the third funding period, Professor Dr Tony Reimann, said: "We originally assumed that there is no higher biological life in the driest parts of the Earth and therefore no influence of the biosphere on the evolution of the Earth's surface, for example with regard to soil formation. We were able to clearly disprove this hypothesis. In the third funding period, we now want to focus on a field that is not well understood: the co-evolution between the hyper-arid biosphere and the respective soil-landscape systems in the context of climate and environmental changes over the last 15 to 20 million years."

In addition to the University of Cologne as the managing university, the Universities of Frankfurt/Main, Bonn, Bochum and Heidelberg as well as RWTH Aachen University and the Helmholtz Centre Potsdam GFZ German Research Centre for Geosciences are involved.

Therapeutic strategies for mitochondrial diseases

CRC 1218 'Mitochondrial Regulation of Cellular Function' is also entering the third funding period. This CRC focuses on the 'powerhouses of cells'. It investigates how mitochondria communicate with cells and how they adapt their function to changing physiological demands. A better understanding of the functional dynamics of mitochondria is an important prerequisite for the targeted investigation of various diseases caused by defects in mitochondria. The findings could serve to develop new therapeutic strategies.

The speaker for CRC 1218 is Professor Dr Elena Rugarli. She is a researcher at the Institute for Genetics and a principal investigator at the CECAD Cluster of Excellence in Aging Research and at the Center for Molecular Medicine Cologne (CMMC). She said: "Over the next few years, Cologne will consolidate its role as a leading centre of mitochondrial research and further reveal the fundamental role of these organelles in regulating a wide range of cellular processes. The CRC brings together a group of researchers from various fields, enabling us to address questions from complementary perspectives and to explore the role of mitochondria in different contexts, from immune response to cancer."

In addition to the University of Cologne as managing university, the Max Planck Institutes for Biology of Ageing, for Metabolism Research and of Biophysics as well as a project at the University of Bonn are involved.

Novel quantum computers and energy-efficient electronics

CRC 1238 'Control and Dynamics of Quantum Materials' brings together researchers from experimental and theoretical physics as well as crystallography. Their vision is to discover, understand and control novel collective phenomena and new functionalities in quantum materials.

Quantum materials are a rapidly developing and internationally highly competitive field of research with high potential for the discovery of new phenomena and concepts. Particularly promising are new materials that meet requirements such as superconductivity, magnetism and exotic topological order. Potential applications range from novel quantum computers to more energy-efficient electronics. Professor Dr Achim Rosch from the Institute for Theoretical Physics and Professor Dr Paul H. M. van Loosdrecht from the Institute of Physics II are the CRC's speakers. "With our project, we can support more than thirty new doctoral students. We are looking forward to surprising new discoveries and findings," said Professor Dr Rosch.

Further partners are the University of Bonn and Forschungszentrum Jülich.

International cooperation for quantum technology

CRC/Transregio 183 'Entangled States of Matter' will also receive additional funding in a third funding period. Complex quantum systems can form entangled states in which the large number of atomic components can protect each other from interference such as radiation, noise or other environmental influences. The aim of CRC/TRR 183 is to use the fundamental laws of quantum mechanics to develop solid-state systems that materialize such macroscopically entangled states in a tangible manner. "Over the past eight years, our international Transregio has made great progress from topological quantum materials to the practical processing of quantum information. In the coming funding period, we will continue with momentum by researching the dynamics of quantum-mechanical entanglement – an important step towards computing on the quantum computers of the future," said speaker Professor Dr Simon Trebst from the Institute for Theoretical Physics.

In addition to the University of Cologne as managing university, Freie Universität Berlin, Heinrich Heine University Düsseldorf, the Weizmann Institute of Science in Rehovot (Israel) and the University of Copenhagen (Denmark) are involved.

wissenschaftliche Ansprechpartner:

Press and Communications Team:
Jan Voelkel
+49 221 470 2356
j.voelkel@verw.uni-koeln.de

URL zur Pressemitteilung: https://www.dfg.de/de/service/presse/pressemitteilungen/2024/pressemitteilung-nr-23