

PRESS RELEASE

German Research Foundation approves collaborative research center to investigate DNA repair and genome stability

Interdisciplinary research alliance to identify cellular mechanisms involved in protecting and repairing genes

From January 1, 2019, the German Research Foundation (DFG) will be funding the new Collaborative Research Center (CRC) 1361 on Regulation of DNA Repair & Genome Stability. Professor Helle Ulrich of Johannes Gutenberg University Mainz (JGU) will assume the role of spokesperson of the group, which will also include the Institute of Molecular Biology (IMB) in Mainz, the University of Technology Darmstadt, the Ludwig Maximilian University Munich (LMU), and the Goethe University Frankfurt. This interdisciplinary alliance will bring together experts in structural biology, organic chemistry, biochemistry, cell and molecular biology as well as genetic toxicology. Initially, the CRC will receive about € 10 million over the first four-year funding period. Through its research, it will seek to extend our knowledge of how various DNA repair systems ensure the stability of the genome and the information it contains.

On average, the genetic information of every cell in our body is damaged approximately 10,000 times a day, and each of these injuries can, in principle, lead to a modification (mutation) that results in the development of cancer or in premature ageing. To prevent this and to cope with the huge amount of damage, cells can call on an array of repair mechanisms that protect our genes. It is these mechanisms that the newly-funded CRC will be aiming to unravel: how they are regulated and how they interact in order to repair damage.

DNA damage can be caused by exposure to environmental factors such as radiation and particular chemicals. However, it can also be the result of normal cellular metabolism, which continually produces reactive molecules that can be harmful to our DNA. Such damage can prevent genetic information from being stored, copied, and read. However, cells have a wide range of mechanisms that can protect and repair their DNA.

A cell's fate is largely determined by the interaction of these mechanisms, which regulate the balance between cell death and cell survival, and also between error-free damage repair and development of a mutation. DNA repair can, therefore, both contribute to and prevent the development of cancer. It contributes both to the cytotoxic effects of cancer treatment, which kills cells, and at the same time to the unwanted ability of cancer cells to resist treatment. In the broader context, mechanisms of this kind that are supposed to maintain genome stability actually also play a role in evolution, as they in effect increase the genetic diversity on which natural selection is based. In addition, DNA repair not only protects our genes but also helps to regulate gene activity.

The aim of the new Mainz-based CRC is to determine the factors that can cause genomic instability and its biological effects, the signaling pathways that are involved in detecting DNA damage and the mechanisms used by cells to protect themselves against this damage. In addition, the CRC will investigate how the various DNA repair pathways are regulated and how the interactions between them are controlled. Such research will involve the use of state-of-the-art techniques in microscopy, proteomics, and genomics as well as the latest methods that enable recognition and quantification of DNA damage and DNA repair.

Helle Ulrich, Professor at the JGU Faculty of Biology, IMB Executive Director, and the CRC spokesperson, considers the formation of the collaborative research center to be a landmark event for both Mainz and Germany: "With its funding, the German Research Foundation is giving us the opportunity to establish a new research hub in this important biomedical field in Germany. Promotion of both innovative research projects and the structures that support them has provided Mainz with the opportunity to exploit synergies and catch up with the world's leading centers in this field."

The DFG's CRC funding line encourages long-term research partnerships lasting up to twelve years in which scientists cooperate in an interdisciplinary research program. The aim is to develop an institutional focus and structure by pursuing innovative, demanding, extensive, and long-term research projects involving the coordination and consolidation of staff and resources in the host universities.

Professor Helle Ulrich, who is the spokesperson of the CRC, is Executive Director of the Institute of Molecular Biology and a Professor in the Faculty of Biology at Johannes Gutenberg University Mainz. Further information about her research is available at <http://www.imb.de/ulrich>.

About the Institute of Molecular Biology gGmbH

The Institute of Molecular Biology gGmbH (IMB) is a centre of excellence in the life sciences that was established in 2011 on the campus of Johannes Gutenberg University Mainz (JGU). Research at IMB focuses on three cutting-edge areas: epigenetics, developmental biology, and genome stability. The Institute is a prime example of successful collaboration between a private foundation and government: The Boehringer Ingelheim Foundation has committed 154 million euros to be disbursed from 2009 until 2027 to cover the operating costs of research at IMB. The State of Rhineland-Palatinate has provided approximately 50 million euros for the construction of a state-of-the-art building and will give further 52 million in core funding from 2020 until 2027. For more information about IMB, please visit: www.imb.de.

About Johannes Gutenberg University Mainz

Johannes Gutenberg University Mainz (JGU) is a globally recognized research-driven university with around 31,500 students. Its main core research areas are in particle and hadron physics, the materials sciences, and translational medicine, while its most outstanding research achievements in the humanities have been attained in the fields of American Studies and Historical Cultural Studies. JGU's academic excellence is reflected in its success in the Excellence Initiative of the German federal and state governments: In 2012, the university's Precision Physics, Fundamental Interactions and Structure of Matter (PRISMA) Cluster of Excellence was approved and the funding of its Materials Science in Mainz (MAINZ) Graduate School of Excellence was extended. Moreover, excellent placings in national and international rankings, as well as numerous other honors and awards, demonstrate just how successful Mainz-based researchers and academics are. Further information at www.uni-mainz.de/eng.

Boehringer Ingelheim Foundation

The Boehringer Ingelheim Foundation is an independent, non-profit organization committed to the promotion of the medical, biological, chemical, and pharmaceutical sciences. It was established in 1977 by Hubertus Liebrecht (1931–1991), a member of the shareholder family of the company Boehringer Ingelheim. With the Perspectives Programme "Plus 3" and the Exploration Grants, the foundation supports independent junior group leaders. It also endows the internationally renowned Heinrich Wieland Prize as well as awards for up-and-coming scientists. In addition, the Foundation is donating a total of 154 million euros from 2009 to 2027 to the University of Mainz for the Institute of Molecular Biology (IMB). Since 2013, the Foundation has been providing a further 50 million euros for the development of the life sciences at the University of Mainz. www.bistiftung.de

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