

Healthcare industry BW

One hundred percent success

Two Clusters of Excellence for the University of Freiburg: Biological Signalling Studies and Bioinspired Materials Research. It is a major boost to cutting-edge research in Freiburg: in the current Excellence Strategy competition, scientists at the University of Freiburg have been granted two Clusters of Excellence, CIBSS – Centre for Integrative Biological Signalling Studies, and livMatS – Living, Adaptive and Energy-autonomous Materials Systems.

With these successful full proposals, up to 100 million euros will, over the next seven years, go towards Biological Signalling Studies and Bioinspired Materials Research, which are two of the University of Freiburg's profile fields. Funding for the new Clusters of Excellence will begin on January 1, 2019.

"I am delighted by this announcement, and I congratulate our outstanding researchers, whose extraordinary dedication over the past few months has made our new Clusters possible," says Prof. Dr. Hans-Jochen Schiewer, Rector of the University of Freiburg. "I would also like to thank all the staff in the university administration who have provided such great support to our Cluster Teams. This success is due to all of you, and true to our motto 'Connecting Creative Minds' proves what is possible when we transcend the borders between scientific disciplines and work together to develop new ideas. I am confident that in the coming years the two Clusters – with their creativity and passion – will bring their promising research programs to fruition and produce groundbreaking insights and innovations."

With this result, Freiburg has fulfilled the requirement to apply for the second funding line of the competition as a University of Excellence. The application must be submitted by December 10, 2018. The decision on the future Universities of Excellence will be announced on July 19, 2019. "Our new Clusters have delivered and have thereby bestowed the University of Freiburg with a 100 percent success in the first funding line. We are delighted about this ideal result, which also spurs us to take on the next step. We are confident that we are also well-positioned in the competition for the title of University of Excellence," says Schiewer. Rankings such as the Funding Atlas of the German Research Foundation (DFG) that was published in July 2018 document the outstanding research performance of the University of Freiburg: they show that in relation to the number of professors and range of subjects it offers, the University of Freiburg is by far the most successfully funded university in Germany.

Statements on the Cluster decision

Prof. Dr. **Wilfried Weber**, CIBSS – Centre for Integrative Biological Signalling Studies:

"We are elated that we now have the opportunity to put our creativity into effect. With the granting of CIBSS, we are reaping the fruits of long-term strategic planning on the part of the University and the Max Planck Institute of Immunobiology and Epigenetics. Through the appointment of colleagues in complementary, forward-looking research fields and through the systematic development of an outstanding research infrastructure, we have been afforded perfect starting conditions to obtain a comprehensive, integrative understanding of biological communication processes. We are full of enthusiasm to enter this new frontier together and to develop innovative solutions for pressing challenges in medicine and in the sustainable production of crops."

Prof. Dr. **Jürgen Rühle**, Living, Adaptive and Energy-autonomous Materials Systems (livMatS):

"We are delighted that our concept livMatS was chosen as a Cluster of Excellence and that we can now realize our vision of entirely novel materials systems. Now it's full steam ahead with work on developing materials systems that can adapt their characteristics to their environment like living beings and also use clean energy, which they harvest from their environment. Our team will combine natural and engineering sciences and the humanities in transformative research, and further develop Freiburg's strong position in materials research."

Prof. Dr. **Gunther Neuhaus**, Vice-President for Research:

"The success of our Clusters of Excellence is further evidence that Biological Signalling Studies and Bioinspired Materials Research at the University of Freiburg are gaining an outstanding position both nationally and internationally. My thanks go to both Cluster teams and the administrative staff who support them. We have all worked intensively in the past few months. I am extremely delighted that we have now achieved our shared goal – it's a great day for all those involved and for the entire university."

CIBSS – Centre for Integrative Biological Signalling Studies

Biological signalling research examines the biological communication processes that are fundamental to life and health. It explores how cells sense and react to diverse conditions and cues, and how they communicate with one another to form and maintain a functioning organism – whether it be human, animal or plant. While knowledge about individual signalling processes has expanded greatly in recent years, it is still unclear how the plethora of signals are coordinated and how they are intertwined with other fundamental biological processes such as metabolism.

It is the goal of the Excellence Cluster CIBSS – the Centre for Integrative Biological Signalling Studies to gain a comprehensive understanding of signalling processes. CIBSS will study the integration of different signalling processes across scales – from individual molecules and cells, to tissues and entire organisms. An important element for such a comprehensive understanding of signalling is how signalling processes and metabolism influence each other. CIBSS aims to take on a pioneering role in this emerging research field, termed Metabolic Signalling.

Based on this knowledge, CIBSS will use methods from synthetic and chemical biology to develop tailor-made molecular tools to precisely control signalling processes. This will not only accelerate research but will also enable CIBSS to develop innovative strategies to address key challenges – from the treatment of cancer with new immunotherapies to the development of strategies for the sustainable and resource-preserving growth of crops.

The success of CIBSS is founded on the University of Freiburg's strong tradition of excellence in biological signalling research, which is currently funded in several Collaborative Research Centres and the BLOSS Excellence Cluster. Building on this collaborative research, Freiburg's modern research infrastructure, and an innovative research program, CIBSS aims to establish Freiburg as an international hub for integrative signalling research.

Looking into the future, CIBSS is implementing new strategies to empower the next generation of signalling scientists and to promote cross-border scientific collaborations. International collaborations will be supported within the framework of a new trinational network, as well as the Freiburg Research Collaboration (FRESCO) program. CIBSS will also be a core member of the Freiburg Network on Ethical, Legal and Social Aspects of Science and Technology (FELSA), which is a new university-wide platform for interdisciplinary research and open dialogue on the far-reaching implications of science and technology.

Scientists from the University, the University Medical Center and the Max Planck Institute of Immunobiology and Epigenetics jointly developed the CIBSS Research Proposal. The interdisciplinary team of spokespersons includes Prof. Dr. Wilfried Weber (Faculty of Biology, Synthetic Biology), Prof. Dr. Carola Hunte (Faculty of Medicine, Biochemistry and Structural Biology), and Prof. Dr. Wolfgang Driever (Faculty of Biology, Developmental Biology).

Living, Adaptive and Energy-autonomous Materials Systems (livMatS)

The Cluster Living, Adaptive and Energy-autonomous Materials Systems (livMatS) develops bioinspired materials systems that autonomously adapt to different environments and harvest clean energy from their environment.

Present-day materials have characteristics that are imprinted on them during the production process and that do not change over time. For instance, they have a specific strength, hardness, transparency or conductivity that – apart from inevitable aging – hardly changes during the lifespan of the material. This enables the use of such materials for everyday purposes, but also under extreme conditions that are hostile for living beings, e.g. in the deep sea, in the desert and even in outer space. In contrast, all living beings ranging from single-cells to multicellular organisms are never static, and constantly adapt to the environment. The key to the survival of all living beings is the maximum degree of adaptability to an indifferent, sometimes hostile environment. However, the ability to adapt to changed environmental conditions comes at a price: adapting to the environment costs energy, which must be obtained from food or sunlight.

The vision of livMatS is to combine the best of both worlds: the world of nature and the world of technology. The materials systems developed by the livMatS Cluster adapt their characteristics to changes in the environment and ‘harvest’ the necessary energy from this environment. Life-like characteristics such as these are not generated by a single ‘miracle material’, but can only be realized as complex systems.

Even though livMatS is mainly focused on fundamental research, there are numerous potential applications for these systems. Examples include helmets, back protectors or prostheses that can adapt to the wearer automatically and without batteries – for instance by using body heat, packaging materials that automatically strengthen under a load, or building facades that compensate for temperature differences and prevent overheating, for instance.

In order to make this vision a reality, livMatS has brought together scientists from six faculties in an interdisciplinary team. This team builds on the established research foci of the University of Freiburg in the fields of energy research, polymer science, biomimetics and microsystems engineering, and combines them with sustainability research, behavioral sciences and philosophy. The livMatS Cluster is based in the Freiburg Center for Interactive Materials and Bioinspired Technologies (FIT) and reinforces the strategic alliance of the University with the Freiburg Fraunhofer Association institutions. The Cluster is represented by an interdisciplinary team of speakers, consisting of Prof. Dr. Jürgen Rühle (Faculty of Engineering, spokesperson), Prof. Dr. Anna Fischer (Faculty of Chemistry and Pharmacy, vice spokesperson), and Prof. Dr. Thomas Speck (Faculty of Biology, vice spokesperson).