

# NEW PARADIGMS FOR UNDERSTANDING LIFE

Unconventional, cutting-edge research at Technische Universität Dresden aims to **SOLVE SOME OF OUR GREATEST SCIENTIFIC CHALLENGES**. Discover how this University of Excellence has evolved into an attractive research hotspot.

**Technische Universität Dresden (TU Dresden) is one of the largest research-focused technical universities and one of the 11 prestigious Universities of Excellence in Germany.** As a dynamic and interdisciplinary university, TU Dresden covers a wide spectrum of research.

Particular areas of focus include biomedicine, bioengineering, materials sciences, information technology, microelectronics, as well as energy and environmental sciences. With its University of Excellence title and three new Clusters of Excellence, TU Dresden takes a leading position in the scientific landscape. Being part of the Excellence Strategy funding programme opens up a myriad of great opportunities and promising prospects for research, teaching and transfer activities.

**“IF YOU WANT NEW ANSWERS, YOU HAVE TO ASK NEW QUESTIONS.”**

JOHANN WOLFGANG GOETHE

The university is considered exemplary in Germany as well as throughout Europe, and has its own way of addressing big questions. 'In Dresden, a

unique, pioneering team spirit prevails that I have rarely felt so profoundly in my international work experience to date,' says Hans Müller-Steinhagen, Rector of TU Dresden. 'It is that spirit and our out-of-the-box way of thinking that attract scholars from around the world to our university. They join our community in order to explore groundbreaking research topics of the future.

## CLUSTERS OF EXCELLENCE – SCIENTIFIC BEACONS

TU Dresden's new Clusters of Excellence are cutting-edge research consortia anchored in three priority areas: health sciences, biomedicine and bioengineering; smart materials and structures; as well as information technology and microelectronics. Each cluster is funded for an initial period of seven years, which began on 1st January 2019. Complementing the expertise on campus, TU Dresden is looking to hire multidisciplinary teams of scientists to work in the new clusters.

## TACTILE INTERNET

The Centre for Tactile Internet with Human-in-the-Loop (CeTI) has an ambitious vision to enable humans to interact in real-time with cyber-physical systems in the real or



Frank Fitzek is the spokesperson for CeTI.

virtual world over intelligent large-scale communication networks. To tackle these challenges, CeTI will conduct unique interdisciplinary research and will address major unexplored research topics in key areas of the complexity of human perception and action in the human-machine loop, sensor and actuator technologies, software and hardware designs, and the communication networks as the basis for numerous novel applications in medicine, industry, and the Internet of Skills.

## QUANTUM MATTER

Novel materials with tailored functionalities are of paramount importance for all modern technologies, from information processing to sustainable energy and health care. In the twenty-first century, condensed matter physicists discovered that topology — previously

understood only as a mathematical concept — is actually fundamental for understanding states of matter. In the Complexity and Topology in Quantum Matter (ct.qmat) Cluster of Excellence — in cooperation with the University of Würzburg — physicists, chemists and materials scientists combine materials design and microscopic control to address topological phenomena in electronics, magnetism and photonics, and to generate a new materials base for tomorrow's technologies.



Matthias Vojta (TU Dresden; top) and Ralph Claessen (JMU Würzburg) are the spokespeople for ct.qmat.

# Excellence and so much more. Be part of it.

As a University of Excellence, we continuously strive to become even better. In research, in teaching, in administration and in all our endeavours. Our vision: a brighter future for all. Do you share our vision? Then join us at TU Dresden!

Photo: Amac Garbe / www.amacgarbe.de



## We are ...

a dynamic, cosmopolitan university with 18 faculties offering 121 degree programmes covering all academic disciplines, and one of the eleven Universities of Excellence in Germany. We are at the heart of a vibrant, colourful city.

We hope to see you in Dresden soon!

## PHYSICS OF LIFE



**Stephan Grill is the spokesperson for PoL.**

The Physics of Life (PoL) Cluster of Excellence is where physics meets biology, to unravel the 'laws of physics' that underlie the organisation of life. PoL aims to understand living systems as physical systems, where

spatiotemporal structures such as molecules, cells and tissues robustly emerge through energy and matter flows. PoL's unique focus is to bring fundamental physics to biology for the purpose of understanding and solving biological questions. For example, the cluster intends to shed light on the mechanisms of self-organisation that determine tissue size and shape, and the principles by which the cellular cytoplasm is compartmentalised. Using this holistic approach, PoL is dedicated to identifying the physical laws that govern the dynamic organisation of

active living matter across multiple scales.

## DRESDEN CALLING

Dresden, in eastern Germany, is located in the Elbe valley surrounded by vineyards, castles and the sandstone formations in the Saxon Switzerland national park. The city is not only a world-renowned cultural capital but also a vibrant science and research hub. Dresden has a high density of research institutions including three Max Planck Institutes, four Leibniz Institutes, the Helmholtz-Zentrum Dresden-Rossendorf and 11 Fraunhofer Institutes.

TU Dresden has bundled this expertise into the DRESDEN-concept research alliance that unifies 28 partners from the world of science and culture to work together to promote the excellence of research in the city and to attract the most promising international students, academics and staff to the university. ■

[www.tu-dresden.de](http://www.tu-dresden.de)