TECHNISCHE UNIVERSITÄT DRESDEN

DRESDEN concept

EXCELLENCE NEWSLETTER

10TH JULY 2020

TUD 2028 – SYNERGY AND BEYOND

EXCELLENCE AND RESEARCH CLUSTERS

Dear Readers,

thanks to the steadily declining number of corona infections over the past few weeks, a certain normality is slowly returning to our university. Many employees are gradually resuming their work on the premises of TU Dresden. The refectories are open. Selected on-site teaching can take place. But the following continues to apply: All teaching events and all exams that can be held online, will continue to be held online. TU Dresden's degree programmes in the 2020/21 winter semester will be prepared for online teaching in accordance with the continuation of the regulations in force at the end of the 2020 summer semester.

Nonetheless, this issue of our Excellence Newsletter once again features many exciting contributions from our university and the Clusters of Excellence and Research.

There is more news: Starting with this issue, our newsletter has a new, barrier-free design! We hope you enjoy reading and we bid farewell for the summer break. You can look forward to a new issue in September 2020.

The editorial team of the Excellence Newsletter can still be contacted by email: exzellenz@tu-dresden.de. We look forward to your questions, suggestions and comments. You are also welcome to recommend our Excellence Newsletter, which can be subscribed to with just a few clicks.

TUD 2028 – SYNERGY AND BEYOND

Pass on excellence, create synergies: new mentoring programme

As part of the new Junior Professorship and Tenure Track Programme, a mentoring programme has been established. Committed professors from all DRESDEN-concept partners are being sought after as mentors for our new colleagues.

The mentoring is based on the idea of forming tandems of experienced lecturers and new members of staff. Mentors can draw on their wide-ranging experience and share important tips on how to deal with various challenges in everyday working life in the organisation. The aim of the mentoring partnership is to motivate, advise and qualify the mentee during the planning and development of their academic career, and to impart knowledge about structures, processes and principles of everyday academic life. As a result, new colleagues feel at home at our university more quickly.

Additional information regarding the programme and the application is available online on the YOU PROF programme pages. You may also contact Maria Elena Zegada. ↗ More

Administrative workshops online

The new administrative workshops for recently appointed chairs, first held in February 2020, already have an eventful history. Unfortunately, due to COVID-19, parts II and III had to be cancelled or postponed. The newly appointed chairs were not to suffer further delays. On 11th June 2020, as scheduled, Part IV was the first online event in this series to be presented on the participants' screens. The next workshop on 15th July 2020, focusing on Student Affairs and Continuing Education as well as Property Management, Technology and Security will probably also be held online. Participants are given sufficient time for individual questions and comments via a chat function and during the question period. The new date for the topics IT and Personnel has been scheduled for October 2020. ↗ More

GET TU KNOW – New programme for active recruitment

GET TU KNOW is designed to be used as a strategic tool by the faculties and the Central Academic Units with the right of appointment. The aim of the programme is to foster the public presentation both of TU Dresden and the advantages of the DRESDEN-concept research network. Thanks to a positive welcome strategy, any prejudices against the location of Dresden shall be overcome in the run-up to calls for chairs as well as during ongoing appointment procedures. GET TU KNOW offers a unique opportunity to present TU Dresden as attractive employer and the city of Dresden both as an outstanding science hub and a domicile with a high quality of life. ↗ More

The contact person for applications as well as for financial and organisational support is Sebastian Strecker, Active Recruitment Advisor in the appointment team.

Promotion of internationalisation

Developing and strengthening international cooperation in research, studies and administration even in these exceptional times is an important focus of TU Dresden, fostered specifically by the Internationalisation funding programme. The programme also supports ideas for the internationalisation of the campus or of teaching. As part of the flexible funding programme, applications can be submitted for internationalisation projects that take into account a variety of specialist interests or backgrounds. Moreover, the cooperation with TU Dresden's Strategic Partners (TU Delft, Science regions Wrocław and Prague) will be intensified. Kathrin Tittel and Daniela Mohrich will be happy to advise you on your projects. The application deadline is on the 25th of each month. ↗ More

For joint projects with King's College London, TUD researchers can submit applications to Maike Heber until 15th July 2020. Maximum funding: 15,000 EUR. ↗ More

The deadline for applications for the Internationalisation Award, which this year will honour a special commitment to making new students and staff feel at home, is the 15th of July 2020. All members of the university whose initiatives and activities contribute to a cosmopolitan and international environment at TU Dresden are invited to submit an application. ↗ More

6th Doctoral Council of the Graduate Academy elected

The GA Doctoral Council (DDocs) represents the doctoral students of the Graduate Academy (GA) and aims to both foster networking among its students and represent the doctoral students' interests across disciplines. It is elected each year.

Due to the restrictions imposed by COVID-19 and in compliance with all data protection and IT security requirements, the election successfully took place online for the first time this year. At present, the Doctoral Council consists of seven doctoral GA members from different faculties. ↗ More

Laureates of the 2020 GA supervisor award

In order to raise the awareness of the importance of good doctoral supervision, the Graduate Academy (GA) advertised for the fourth time the award for excellence in doctoral supervision - Promotionsbetreuung Ausgezeichnet. Despite the restrictions due to COVID-19, the response from the doctoral students and postdocs was once again very positive. 27 proposals were submitted. The number of nominations as well as the very personal laudations of the doctoral students and postdocs show that TUD performs extremely well in the supervision of doctoral students. Since in times of crisis the promotion of early-career researchers is particularly important, the Executive Committee decided to confer two awards this year. The two laureates, Prof. Dr. Florian Siems (Chair of Business Management, esp Marketing) and Prof. Dr. Bärbel Fürstenau (Chair of Business Education and Management Training, will each receive a 3,000 EUR prize. ↗ More

Two new TUD Young Investigators

On 16th July 2020, the University Executive Board appointed Dr. Martina Artmann (Faculty of Environmental Sciences/IOER) and Dr. Mareike Albert (Faculty of Biology/CRTD) as TUD Young Investigators.

The status of TUD Young Investigator strengthens the position of excellent, independent young research group leaders in Dresden as a science hub by integrating them more closely into the faculties and offering a range of qualifications specifically tailored to their needs. ↗ More

EXCELLENCE AND RESEARCH CLUSTERS

Metamaterial confirms physical theory

Researchers of the Cluster of Excellence Complexity and Topology in Quantum Matter (ct.qmat) use topological metamaterials to investigate extraordinary effects. Instead of using natural materials, the components of a metamaterial are artificially arranged into a regular structure - element by element. The aim of this approach is the generation of special properties. Optical metamaterials may e.g. have a variable refractive index, which can be used to build optical cloaking devices.

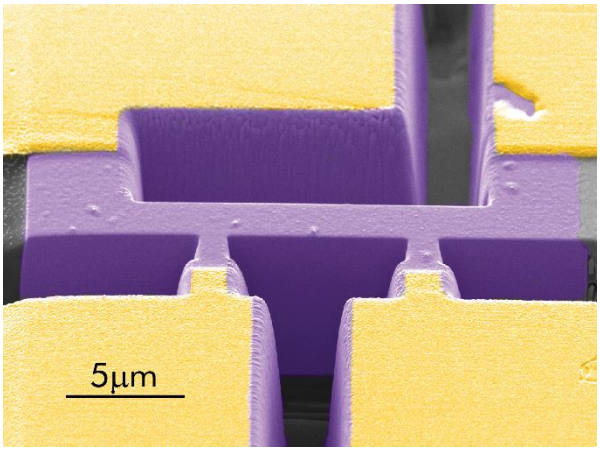
Researchers now presented their latest results on electrical metamaterials in the scientific journal Nature Physics. At low temperatures, topological insulators conduct electrical current on their surface without loss.

ct.qmat
Complexity and Topology in Quantum Matter

This phenomenon is the subject of intensive worldwide research and will possibly lead to advances in semiconductor technology. Researchers have now succeeded for the first time in proving the energy exchange of topological insulators with their environment, thus experimentally confirming the theory of the non-Hermitian skin effect. For this to be successful, the researchers had to structure a topological insulator made of metamaterial. ↗ More

Wow research: Quantum physics in ultrapure metals observed

For the first time, researchers of the Cluster of Excellence Complexity and Topology in Quantum Matter (ct.qmat) have demonstrated phenomena of quantum physics in ultrapure metals at the macroscopic level. So far, most quantum effects could only be observed at the microscopic level in the world of atoms and electrons. By examining samples of the ultrapure metals palladium cobalt oxide and platinum cobalt oxide, the researchers were able to experimentally prove that the special laws of quantum physics also apply in metals on a larger level. The periodic superposition of electron waves was measured over an astonishing length of 20,000 inter-atomic distances, previously ten to 100 atoms had been common. 20,000 inter-atomic distances correspond to about 0.01 millimetres, which can almost be observed with the eye.



"What the colleagues observed in their experiment is a spectacular discovery for solid state physics. The observation of macroscopic quantum coherence in a metal opens up new fields of research for physicists

from all over the world", comments the Spokesperson of the Dresden Cluster, Prof. Matthias Vojta.

These research results were published in the journal Science. ↗ More

International network of female researchers in quantum matter physics

They come from Brazil, Germany, the Netherlands, Norway, Sweden, Switzerland and the USA and share the same professional passion – condensed matter physics. There are more than 20 women, all of them are early-career researchers or experienced professors who explore and design quantum materials with unusual electrical, magnetic, or optical properties. Whether cold computer chips, quantum sensors, or quantum computers – the future information and medical technology of the 21st century is inconceivable without these materials.

On 14th July 2020, the first event of the Grete Hermann Network takes place. The first international network of female scientists in the field of quantum matter physics with a focus on quantum materials, initiated by the Cluster of Excellence Complexity and Topology in Quantum Matter (ct.qmat). Registration is possible until 13th July 2020 by e-mail. ↗ More

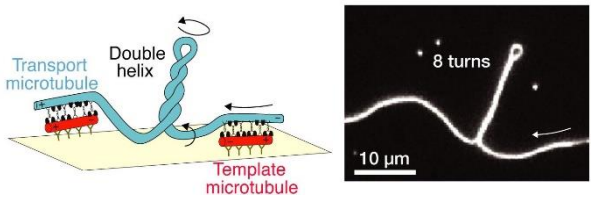
PoL welcomes Dr. Natalie Dye as new research group leader

The Excellence Cluster Physics of Life (PoL) congratulates Dr. Natalie Dye on winning a fellowship of the Mildred Scheel Early Career Center Dresden (MSNZ). With this funding, Dr. Dye will establish her own group at PoL, starting in January 2021. Dr. Dye and her team will study the biophysics of epithelial morphogenesis in development and cancer.

Using human patient-derived tumour organoids, her group will investigate the physical mechanisms underlying individual variability in gastrointestinal tumourogenesis and cancer progression. Dr. Dye is currently leading a research group at the Max Planck Institute of Molecular Cell Biology and Genetics (MPI-CBG) and she is a member of the Dresden International Graduate School for Biomedicine and Bioengineering" (DIGS-BB). ↗ More

Twist and torque in the cellular nanocosmos

One of the key questions researchers at the Cluster of Excellence Physics of Life (PoL) focus on is the kind of biophysical forces that act in the mitotic spindle during cell division. The genetic material needs to be divided in a coordinated manner. Cytoskeletal motor proteins play a decisive role in this process. Until now, these motors have been considered linear force generators, i.e. exerting forces exclusively in parallel to the cytoskeletal filaments. The Diez Lab at the Center for Molecular Bioengineering (B CUBE) has now shown that some of the motors can also generate rotational forces, leading to twist and torque of the spindle.



The study also addresses the phenomenon of chirality, which classifies structures that cannot be brought into alignment with their mirror image. This feature is regarded a hallmark of symmetry breaking during cellular development. However, so far little is known about its origin. Based on their results, the biophysicists believe that chirality can be explained by the rotational forces of motor proteins. ↗ More

Intestinal health: Vital enzyme in stem cells identified

The intestinal epithelium is the inner layer of the intestinal wall, which separates host tissue from the intestinal microbiota. This layer of cells plays a crucial role in water, electrolyte and nutrient absorption, while limiting the entry of bacteria, viruses, fungi, toxins and antigens into host tissue to ensure intestinal homeostasis.

Epithelial differentiation is largely controlled by the tissue-specific activity of transcription factors. Access to DNA is provided by accessible chromatin (euchromatin), while compacted heterochromatin limits access of transcription factors to DNA. The team headed by Prof. Sebastian Zeißig at the TUD Center for Regenerative Therapies Dresden (CRTD) has now investigated the significance of the regulation of heterochromatin formation in the intestinal epithelium. Their findings were published in the renowned international scientific journal Gut. ↗ More

Huge proteins - huge differences

International cancer genome sequencing projects discovered that the sister genes MLL3 and MLL4 are frequently mutated in almost all types of cancer. Despite their remarkably prominent association with malignant diseases, the essential roles of these genes in mammalian development has not been determined until now. The proteins encoded by MLL3 and MLL4 are epigenetic regulators and responsible for the activation of genes. MLL3 and MLL4 are among the largest proteins found in the mammalian nucleus.

The team headed by Dr. Andrea Kranz and Prof. Francis Stewart at the Biotechnology Center (BIOTEC) reports that both proteins play very different and very specific essential roles in mouse development. The results of the study were published in the scientific journal Development. ↗ More

What can maritime shipping learn from brain network science?

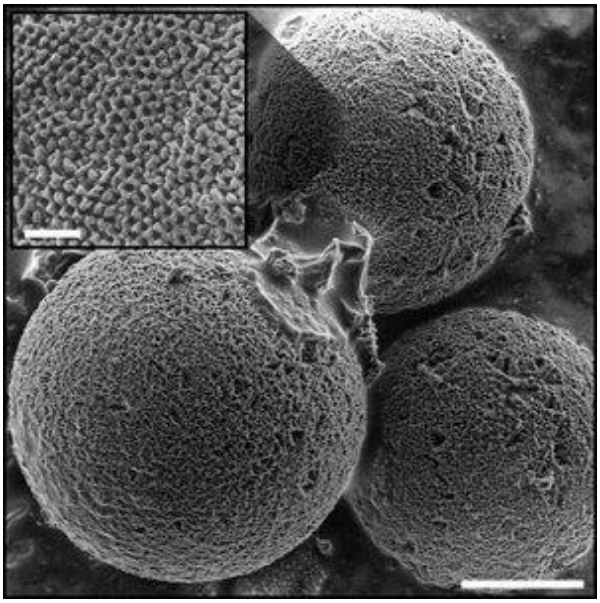
Dr. Carlo Vittorio Cannistraci from TU Dresden's Biotechnology Center (BIOTEC) is focusing his research on network science applied to biological systems and neuroscience.

At the Biomedical Cybernetics lab, he is conducting an interdisciplinary study, showing how network science computational theories effective for brain analysis can help to understand global shipping networks and their impact on world economy. The study was conducted in conjunction with maritime economy scientists from China, and has now been published in the scientific journal Nature Communications. ↗ More

DinoLight: Unicellular algae transform into novel nanomaterials

In the last decade, metal-halide perovskites emerged as a promising group of materials for next generation technological applications. In the DinoLight research project, TU Dresden scientists want to develop state-of-the-art strategies for the preparation of perovskite nanostructures. Teams of the Center for Molecular Bioengineering (B CUBE) and the Faculty of Chemistry and Food Chemistry are joining forces in this project.

"Nature provides beautiful, nanostructured mineral architectures. These include some unicellular algae species, which produce highly regular nanostructured mineralised cell walls that are great templates for us", reported Dr. Anne Jantschke, expert in microalgae cultivation and characterisation at the Faculty of Chemistry and Food Chemistry.



"In this project, we want to convert these mineral shells into highly ordered nano-porous lead-halide single-crystalline perovskite nanostructures", added Dr. Igor Zlotnikov, research group leader at B CUBE. ↗ More

cfaed acquires one of three new DFG Collaborative Research Centres

Prof. Xinliang Feng, Chair of Molecular Functional Materials at the Center for Advancing Electronics Dresden (cfaed), and his team have successfully acquired one of three new large funding programmes for Collaborative Research Centres (CRC) at TU Dresden, as the German Research Foundation (DFG) announced in May 2020.

CRC 1415

Feng and his team will receive about 7.7 million EUR of funding and will collaborate with the Helmholtz-Zentrum Dresden-Rossendorf, the Leibniz Institute of Polymer Research Dresden, the Leibniz Institute for Solid State and Materials Research Dresden and Ulm University.

The CRC 1415 "Chemistry of Synthetic Two-Dimensional Materials" will aim at the controlled bottom-up synthesis and the development of novel classes of synthetic 2DMs with high structural definition. ↗ More

New ESF junior research group "Re-Learning" launched at cfaed

Artificial neural networks are still a long way from their biological models, especially in terms of their energy efficiency.

The new cfaed junior research group "Re-Learning" of the European Social Fund (ESF) at the Center for Advancing Electronics Dresden (cfaed) investigates novel hardware-based approaches to machine learning and has now started its kick-off event in June.

During the two-year duration of the project, ten doctoral students from nine different chairs are working under the direction of Dr. André Heinzig on the topics of reconfigurable nanowire transistors, organic electronics and adaptive system design.

Instead of the conventionally used software-based algorithms on static hardware, approaches are to be investigated in which the circuit reversibly configures itself when learning the function, thus being more energy efficient. This path from component development to a self-learning system requires expertise in materials science, physics, electrical engineering, chemistry and computer science. By supporting the cooperation of scientists from different faculties to develop a cross-thematic overall concept, the core idea of cfaed is lived and intensified in the research group.

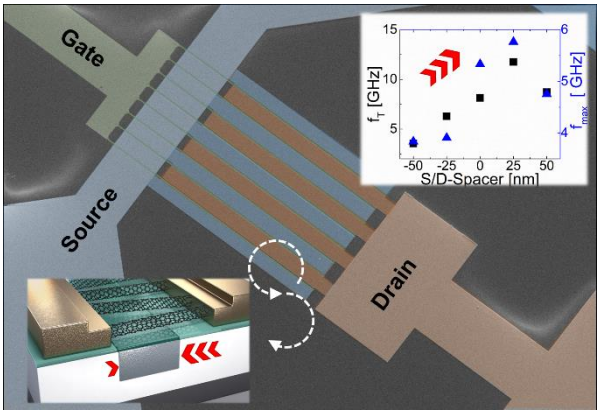
The junior research groups funding programme aims at training outstanding experts and managers as well as strengthening regional development in key technologies. ↗ More

Fast nanodevices - Impact of the architecture of high frequency transistors

The Carbon Nano Devices group headed by Dr. Sascha Hermann (TU Chemnitz, Fraunhofer ENAS) at the Center for Advancing Electronics Dresden (cfaed) discovered that field-effect transistors based on carbon nanotubes (CNT) experience a significant performance increase with special device structures.

These developments confirm the great potential of this new technology for future radio frequency (RF) transceiver electronics.

While most studies have concentrated on symmetrical top-gate transistors up until now, Hermann's team reports on asymmetrical bottom-gate transistors. These developments were facilitated by the 200 mm nanotechnology platform for advanced nanomaterial integration in Chemnitz and the Faculty of Electrical Engineering (Work group Prof. Michael Schröter) at TU Dresden.



The analyses showed that an increase in transistor speed of up to 18 percent can be achieved, at the same time improving amplifier linearity. In this study, transition frequencies of up to 14 GHz were achieved. Since this technology allows for alternative component concepts, these properties are interesting for a wide range of applications in advanced electronics even today. ↗ More

EMBO Workshop in June 2021

The EMBO Workshop "Physics of living systems: From molecules to tissues" will take place from 7th to 11th June 2021. The workshop will provide a new perspective on dynamic biological processes as self-organising dynamical systems on different levels – from molecules and cells to tissues. Interdisciplinary research presented and discussed will include Active Forces in Biological Systems, Self-Organisation of Living Systems, Compartmentalisation of the Cytoplasm, Nuclear Organisation, Tissue Mechanics, and Tissue Morphogenesis.

The event had originally been scheduled to take place in June of this year. Due to the corona pandemic, planned EMBO courses and workshops had to be postponed or held as online meetings. The organisers of the Cluster of Excellence Physics of Life (PoL) have been able to secure the venue at the Center for Regenerative Therapies Dresden (CRTD) for 2021, so that next year an impressive range of speakers will be welcomed in Dresden. ↗ More

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