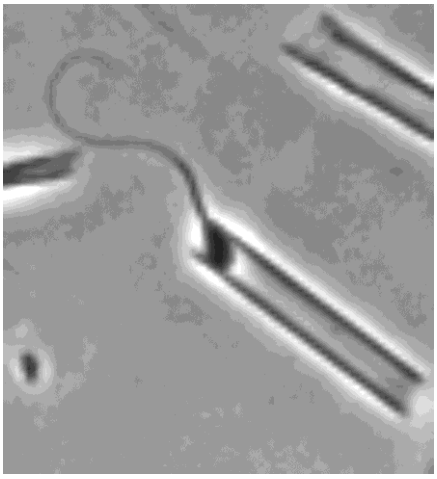
CONTENTS

RESEARCH

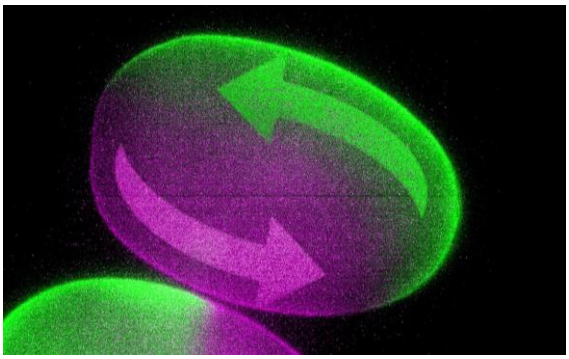
Sperm-micro robots: Dr. Veronika Magdanz explores micro-swimmers as a diagnosis- and therapy tool

Sperm cells not only hold the “miracle of life” – they also have diagnostic and therapeutic potential. Dr. Veronika Magdanz is researching them at the Chair of Applied Zoology of the TU Dresden. Her Open Topic Postdoc Position is titled “Biohybride Sperma-beförderte Mikroschwimmer als Diagnosewerkzeuge” (‘*Biohybrid sperm-driven micro-swimmers as diagnosis tools*’). Within the Open Topic Postdoc Positions programme, the TU Dresden allows postdocs to investigate an independant research project irrespective of their specialisations. Dr. Magdanz is currently one of 17 international young researchers furthering their projects within this Institutional Strategy initiative.



Dr. Veronika Magdanz aims to make sperm cells usable for diagnostic and medical transport purposes in an Open Topic Postdoc Position at the TU Dresden. © Veronika Magdanz

“Spermatozoa can move very fast and are able to transport micro particles or micro tubes whilst doing so”, explains the postdoc who started her micro-swimmer research at the DRESDEN-concept-partner IFW (Leibniz Institute for Solid State and Materials Research Dresden). For their transport task the spermatozoa are to be equipped with hulls made of intelligent materials, able to react to stimulus from their surroundings. “We are programming the materials to certain conditions, which would be normal in the environment that is to be investigated – for example the uterus. If they react in an unusual manner, we could diagnose abnormalities and localise the source of infertility in the womb of a woman.” In the long term, micro-swimmers or “micro motors” could aid in fertilization and cell manipulation and even in cancer therapy. Dr. Magdanz and a team at the IFW investigated in cancer cell-models how spermatozoa could transport antidotes to tumors. Dr. Magdanz appreciates the diverse research landscape Dresden has to offer for her research topic. “Especially in the field of intelligent materials, but also in biomedicine there are a number of competent institutes and experts. I look forward to networking further with them.”



For the first time, researchers succeeded in manipulating motion in living cells and embryos, observing their development.
© Mittasch et al. / MPI-CBG

Cooperation of Mathematics, Biotechnology and MPI-CBG find a fundamentally new way to study cells and embryonic development

For an organism to develop correctly, biomolecules need to move to specific sites inside the embryo. Which meachanisms distribute the molecules remained unanswered for a long time.

Simple motion inside biological cells, such as the streaming of cytoplasm is widely believed to be essential for the development of complex organisms. But due to the lack of suitable tools to move the inside of an embryo without harming it, this intracellular motion could so far not be tested as hypothesized.

Now, a team of researchers from the Max Planck Institute of Molecular Cell Biology and Genetics (MPI-CBG) in cooperation with TU Dresden Faculty of Mathematics and the Biotechnology Center has succeeded to induce and control motion within living cells and early embryos: with their non-invasive lasertechnology called FLUCS (“focused-light-induced-cytoplasmic-streaming”). With this truly revolutionary tool at hand, the researchers were able to probe the function of cytoplasmic motion in the process of embryo polarization, thus validating existing hypothesis. With FLUCS, microscopy of growing embryos becomes truly interactive: with the help of realistic computer simulations, the researchers managed to reverse the

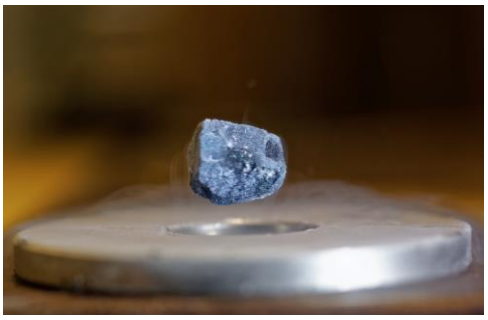
EVENTS

"Write through the Night"
Striving for inspiration and motivation in writing tasks, "Write through the Night" takes place
on 1st March 2018, 6 am –12 pm in the SLUB library (Zellescher Weg 18)
To write on-site is the idea of this event, let yourself get carried away in the fellowship of writing: Don`t let your weaker self get the upper hand! Should you encounter a "writing slump", don't worry, there will be writing consultations, workshops, desk-yoga – or simply enjoy a soup whilst chatting. Please find current information here: http://www.tu-dresden.de/deinstudienerfolg/szd and on our event-app: https://lineupr.com/lnds/lnds2018

Future Lab 2: "Foundations or Applications?"
The second Future Lab will take place
When: 8th March 2018, 9 am – 1 pm
Where: ballroom on Dülferstraße.
"Foundations or application?", how can research and transfer at TU Dresden best be promoted? What kind of support is necessary for the research ideas of prospective and established researchers? How can research results be introduced more widely into business and society? The discussions aim to result in concrete solutions for the further development of the TU Dresden.
The university-wide Future Lab is to gather impetuses for the application for the title of "University of Excellence". All TU Dresden employees and members of DRESDEN-concept institutions are invited to participate in this and in forthcoming Future Labs. More information: https://tu-dresden.de/zukunftslabore

head-to-tail body axis of worm embryos with FLUCS, leading to inverted development. Lead investigator Moritz Kreysing concludes: "The ability to actively move the interior of biological cells will help to understand how these cells move, respond to external signals and divide." These findings were published in the current issue of the journal Nature Cell Biology.

Journey through copper particles: scientific computing explains high-temperature superconductors



A ring magnet floating above a high-temperature superconductor. © Julian Litzel / eigenes Werk, CC BY-SA 3.0. https://commons.wikimedia.org/wiki/File:Levitating_superconductor.jpg

A research group from Stanford University, together with TU Dresden mathematician jun.-Prof. Christian Mendl, have proven the effect of superconductors – by a computational journey through their quantumstructure: copper-based superconductors contain stripes of certain electron charges and -spins, winding through atomic structures of superconductors. Inside them, electrons either line up to negative charged bands, or they align their spins – angular momentum – to create magnetic bands.
These patterns already form in normal state of copper-oxygen-semiconductors, at higher temperatures than at the transition temperature. In normal superconductors, these seldom lie over -250°C. The scientific crux: under the "warmer" conditions, the stripes are so delicate and subtle that they could only be proven numerically, through high precission computer simulations – a great success of scientific computing which Dr. Christian Mendl has been reinforcing since October 2017 at TU Dresden as a Junior-Professor for Applied Mathematics. He worked on this project from mid 2015 until the end of 2016. The future research on superconductors could help design a nearly 100% efficient current flow in the long term.

AWARDS AND FUNDING

Physicist Dr. Martin Körber is awarded the Georg Helm Prize

© Julius Körber

On 27th January Dr. Martin Julius Körber (Faculty of Physics) was awarded the Georg Helm Prize for his dissertation themed "Phase-Space Localization of Chaotic Resonance States due to Partial Transport Barriers". In his thesis rated "summa cum laude", he explains the influence of classic partial transport barriers on the quantum mechanical properties of range and eigenfunction.
His dissertation was accompanied by prominent publications and great commitment in teaching.
His supervisors were Professor Arnd Bäcker and Professor Roland Ketzmerick.
Further award winners were: Dr. Christoph Meißelbach, Faculty of Arts, Humanities and Social Science, dissertation: "Die Evolution der Kohäsion. Anthropologische Grundlagen der Sozialkapitaltheorie" (*'The evolution of cohesion. Anthropological fundamentals of social capital theory'*) and Deborah Yvonne Nagel, Faculty of Business and Economics, Master Thesis: "Linguistische Analyse von Risikoberichten" (*'Linguistic analysis of risk reports'*).

GUESTS

Professor Russell E. Morris of the University of St Andrews networks with DFG's Priority Programme 1708

In the course of his one-week visit to Germany as a Mercator-Fellow, British Chemist Professor Russell Edward Morris visited a number of SPP 1708 (German Research Foundation's (DFG) Priority Programme "Material Synthesis near Room Temperature") sites, including TU Dresden. On 31st January he gave a lecture on ionic fluids, followed by discussions with colleagues and PhD candidates, amongst others about possible future collaborations. Professor Morris studied and wrote his thesis at the University of Oxford. He then took up a post-doc position at the University of California Santa Barbara (USA). Professor Morris has been conducting research and teaching at the University of St Andrews since 1995 and holds a professorship there since 2000. He has received numerous awards for his research in the fields of synthesis, application, and characterization, reflecting in over 200 publications (h-Index 55). The SPP 1708 will greatly profit from Professor Morris' stay of several weeks in Germany, planned for summer 2018.

PROMOTING STUDENTS

The universe of particle physics in classroom-format!

"Netzwerk Teilchenphyik" successfully completed a series of educational materials, finishing the latest volume "Forschungsmethoden", comprising of 4 particle-physics volumes for use in schools. The project partners, chaired by the TU Dresden and in cooperation with the Joachim Herz Foundation, would like to make particle and astrophysics accessible to pupils. Scientists and teachers co-operated for over 4 years and in different workshops, taking into consideration experience as well as needs of teachers to bring about this project. The educational material is designed as a supplement to existing textbooks. "The development process was comprehensive," summarized Netzwerk Teilchenwelt coordinator Anne Rockstroh of the Institute for Nuclear and Particle Physics. The initial question focused on how particle physics can be promoted in schools. "Which phenomena are part of the curriculum and at which point can we integrate? How can we find the right balance to demonstrate fundamental principles of particle physics? Through the integration of our developed materials in teacher training, we received immediate feedback and were able to test feasablility. We learnt that teachers have the wish to integrate our materials as standard." Over one hundred scientists throughout Germany have dedicated themselves "to promote the fascination of this topic in class", emphasised Ms Rockstroh. All volumes can be downloaded for free at: http://www.teilchenwelt.de/tp, or requested as free print version at www.leifiphysik.de/tp.

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