The junior research group “Biological Algorithms” headed by Benjamin Friedrich within the Cluster of Excellence ‘Center for Advancing Electronics Dresden’ (cfaed) offers a

Research Associate / PhD or Postdoc position in Theoretical Biophysics
(subject to personal qualification employees are remunerated according to salary group E 13 TV-L)

Research area: Muscle building in silico: Mathematical modeling of myofibrillogenesis

cfaed Investigators: PD Dr. Benjamin Friedrich

cfaed research path: Biological Systems Path

Terms: PhD: 65% of the fulltime weekly hours, fixed-term until 06/2021. Prolongation possible depending on the likely no-cost extension of the HFSP grant beyond the scheduled termination date. Postdocs: 100%, fixed-term for about 2 years. The position starts as soon as possible. The period of employment is governed by the Fixed-Term Research Contracts Act (Wissenschaftszeitvertragsgesetz - WissZeitVG). The position offers the chance to obtain further academic qualification (e.g. PhD or habilitation thesis).

About the “Biological Algorithms group”
The mission of our “Biological Algorithms group” is to understand physical principles of self-assembly and self-organization in biological cells and tissues, and their robustness to noise and perturbations. Topics include cellular motility control and pattern formation of the cytoskeleton. We pursue a Quantitative Biological Physics approach that combines nonlinear dynamics, statistical physics, computational physics and state-of-the-art image/data analysis. More information on current research can be found at https://cfaed.tu-dresden.de/friedrich-home.

About the project

We are hiring a research associate for a project on mathematical modeling of myofibrillogenesis, to understand how microscopic force-generating units in our muscles self-assemble during development.

Human muscle fibers are centimeter-long cells, packed with long linear myofibrils that span throughout the fiber. Every myofibril is built by a chain of sarcomeres, which produce active muscle forces. Each sarcomere is composed of actin filaments and myosin molecular motors, linked together by gigantic titin springs. The sarcomeres are strikingly regular, constituting an example of a dynamic biological crystal. How the myofibrils assemble during development is poorly understood. Previously, we suggested a mathematical model of how actin and myosin filaments self-assemble into regular sarcomeric patterns by a combination of active forces and passive crosslinking (Friedrich et al. PLoS Computational Biology, 2012). Based on this, we propose agent-based simulations of a bundle of actin, myosin, and titin, in order to understand the role of active tension in sarcomere self-assembly. You will formulate and implement alternative physical mechanisms and compare predictions to quantitative experimental data.
This position will constitute the theory part of a theory-experiment collaboration with the laboratories of Frank Schorrer (IBDM, Marseilles) and Olivier Pourquie (HMSB, Boston). The experimental partners will provide high-resolution time-lapse fluorescence microscopy data from the fruit fly and stem-cell derived human muscle cells with GFP-tagged sarcomeric proteins, as well as molecular force-sensor data for live force measurements in developing muscle fibers. You will develop automated image analysis pipelines, and thereby quantify the gradual emergence of sarcomeric patterns using concepts from Soft Condensed Matter Physics. Full funding is available from the prestigious Human Frontier Science Program.

Looking beyond this specific biological model system, our group will explore also possible applications of biological self-organization and bottom-up self-assembly of biomolecular circuits, e.g. motor-filament arrays for biomolecular computing, in tight collaboration with the engineering paths of the cfaed. Dresden unites excellence in information and life sciences. We enjoy the close proximity of collaboration partners at the Max Planck Institute of Molecular Cell Biology and Genetics, the Biotechnology Centre, and the new Center for Systems Biology Dresden, which allows fruitful interactions with the strong Biological Physics research in Dresden.

Requirements
We are looking for a theoretical physicist or applied mathematician, who is intrigued to discover algorithms of life, and meets the following requirements: For PhD students: excellent university degree (Master) in Biological Physics, Mathematical Biology, or related field; for Postdocs: an outstanding university degree and doctoral degree in Biological Physics, Mathematical Biology, or related field; strong analytic skills, creativity, efficient problem solving skills; an aptitude for data-driven science and numeric computing (e.g. Matlab, python, C); high motivation to work on inspiring research problems at the interface of physics, biology and computer science; excellent communication skills, especially in cross-disciplinary communication; an independent, result-driven work attitude; fluency in English – oral and written.

What we offer
You will join a team of enthusiastic scientists who pursue creatively their individual research agenda inspired by the cluster’s innovative approach and support. Your research will be fostered by the cfaed philosophy to promote young researchers which includes: access to state of the art research of leading academic institutes, individual supervision by a Thesis Advisory Committee, possibility to earn (seed) grants of up to € 10,000, promotion of gender equality and family-friendly work environment.

For informal enquiries, please contact Dr. Benjamin Friedrich at benjamin.m.friedrich@tu-dresden.de.

Applications from women are particularly welcome. The same applies to people with disabilities.

Application Procedure
Your application (in English only) should include: a motivation letter, your CV with publication list, the names and contact details of two references, copy of degree certificate, and transcript of grades (i.e. the official list of coursework including your grades). Please include also a link to your Master’s or PhD thesis. Complete applications should be submitted preferably via the TU Dresden SecureMail Portal https://securemail.tu-dresden.de by sending it as a single pdf document quoting the reference number PhD-Bio1807 in the subject header to recruiting.cfaed@tu-dresden.de or alternatively by post to: TU Dresden, cfaed, Frau Dr. P. Grünberg, Helmholtzstr. 10, 01069 Dresden, Germany. The closing date for applications is 24.07.2018 (stamped arrival date of the university central mail service applies). Please submit copies only, as your application will not be returned to you. Expenses incurred in attending interviews cannot be reimbursed.
About cfaed

cfaed is a cluster of excellence within the German Excellence Initiative. As a central scientific unit of TU Dresden, it brings together 300 researchers from the university and 10 other research institutes in the areas of Electrical and Computer Engineering, Computer Science, Materials Science, Physics, Chemistry, Biology, and Mathematics. cfaed addresses the advancement of electronic information processing systems through exploring new technologies which overcome the limits of today’s predominant CMOS technology. For more information please see https://cfaed.tu-dresden.de/

About TU Dresden

The TU Dresden is among the top universities in Germany and Europe and one of the eleven German universities that were identified as an ‘elite university’ in June 2012. As a modern full-status university with 14 departments it offers a wide academic range making it one of a very few in Germany.