The Junior Research Group “Biological Algorithms” headed by PD Dr. Benjamin Friedrich (funded by the Heisenberg Programme of the DFG) affiliated with the Cluster of Excellence ‘Physics of Life’ (PoL) offers a position as

**Research Associate / Postdoc**

in **Theoretical Biological Physics / Biological Image Analysis**

(subject to personal qualification employees are remunerated according to salary group E 13 TV-L)

starting as soon as possible until 31.05.2022 with full funding by the Human Frontiers Science Program. The period of employment is governed by the Fixed Term Research Contracts Act (Wissenschaftszeitvertragsgesetz - WissZeitVG). An extension is possible subject to the availability of additional funds.

**About the project:** Every striated muscle cell in our body contains highly regular myofibrils, whose active contraction drive all our voluntary movements. Each myofibril is a highly regular “biological crystal” built as a chain of sarcomere units, composed of regular arrangement of actin filaments and myosin molecular motors, linked together by gigantic titin springs. Alteration of this regular architecture are linked to disease states. Yet, the physical mechanisms driving the self-assembly of these myofibrils during development remain poorly understood.

In a theory-experiment collaboration with the experimental groups of Frank Schnorrer (IBDM, Marseilles) and O. Pourquie (HMSB, Boston), we are testing the hypothesis that active tension orchestrates sarcomere self-assembly. For the theory part, we develop agent-based as well as mean-field simulations of a nematic bundle of actin, myosin, and titin, which allows us to test alternative mechanisms of myofibril assembly in silico. For an early hypothesis of how actin and myosin filaments self-assemble into regular sarcomeric patterns by a combination of active forces and passive crosslinking, see [Friedrich et al. PLoS Computational Biology, 2012].

**Tasks:** An important part of this interdisciplinary project is the analysis of image data, specifically three-dimensional, multi-channel fluorescence microscopy at distinct developmental stages, as well as their statistical analysis using physical order parameters from condensed matter physics. Additionally, molecular force-sensor data for live force measurements in developing muscle fibers is available, for which data analysis algorithms shall be developed. These data sets directly constrain the hypothesis space of possible self-assembly mechanism and allows to uniquely calibrate model parameters in mathematical model developed by a separate PhD project, where you can get involved in supervision. You will be engaged in bi-weekly meetings with the experimental partners with the unique opportunity to discuss and suggest new experiments inspired by theory.

Full funding including travel funds is available from the prestigious Human Frontier Science Program. More information on the project can be found here: https://cfaed.tu-dresden.de/press-releases-201/muscle-growth-in-the-computer-international-team-wants-to-unravel-the-formation-of-myofibrils

**Requirements:** We are looking for a theoretical physicist or applied mathematician, who is intrigued to discover algorithms of life and meets the following requirements: university degree and an excellent PhD in Theoretical Physics or related field such as Applied Mathematics, or Computer Science; experience in state-of-the-art Image Analysis (feature detection, 3D tracking, multi-dimensional correlation analysis); Computational Physics (Monte-Carlo and agent-based simulations, ODEs, PDEs), and excellent programming skills (e.g. Matlab, Python, C); strong analytic
and problem-solving skills, creativity; keen interest in applying physics to biology and willingness to learn some biology en route; strong communication skills across scientific boundaries; fluency in English – oral and written.

**About us:** You will join a friendly group of enthusiastic theoretical biological physicists and mathematicians, who love to decipher the biological algorithms that drive nonlinear dynamics and self-organised pattern formation in biological cells and tissues, while interacting closely with experimentalists. [https://cfaed.tu-dresden.de/friedrich-home](https://cfaed.tu-dresden.de/friedrich-home)

Applications from women are particularly welcome. The same applies to people with disabilities. Please submit your application (in English only) including concise motivation letter (max. 2 pages), CV with publication list, link to PhD thesis, names and contact details of at least two references, copy of degree certificate and proof of English language skills preferably via the TU Dresden SecureMail Portal [https://securemail.tu-dresden.de](https://securemail.tu-dresden.de) by sending it as a single pdf document quoting the reference number PhD-Bio 0820 in the subject header to [recruiting.cfaed@tu-dresden.de](mailto:recruiting.cfaed@tu-dresden.de) or by mail to TU Dresden, cfaed, Nachwuchsforschungsgruppe “Biological Algorithms”, Herrn PD Dr. Benjamin Friedrich, Helmholtzstr. 10, 01069 Dresden, Germany. The closing date for applications is 24.09.2020 (stamped arrival date of the university central mail service applies). Please submit copies only, as your application will not be returned to you.

**Reference to data protection:** Your data protection rights, the purpose for which your data will be processed, as well as further information about data protection is available to you on the website: [https://tu-dresden.de/karriere/datenschutzhinweis](https://tu-dresden.de/karriere/datenschutzhinweis)

**About cfaed**

cfaed is a Central Academic Unit at TU Dresden. It brings together more than 100 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. [www.cfaed.tu.dresden.de](http://www.cfaed.tu.dresden.de)

**About Physics of Life**

PoL is a Cluster of Excellence at TU Dresden aimed at deciphering the ‘The dynamic organization of living matter’. It brings together experimental biologists, theoretical physicists, bioinformaticians and computer scientists from TU Dresden and several Dresden Concept partners, including two Max-Planck Institutes. [physics-of-life.tu-dresden.de](https://physics-of-life.tu-dresden.de)

**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 18 faculties it offers a wide academic range making it one of a very few in Germany.