

# Job advertisement

Vacancy ID: 2389/2022

Closing date: 25.08.2022



FRIEDRICH-SCHILLER-  
UNIVERSITÄT  
JENA

Friedrich Schiller University is a traditional university with a strong research profile rooted in the heart of Germany. As a university covering all disciplines, it offers a wide range of subjects. Its research is focused on the areas Light—Life—Liberty. It is closely networked with non-research institutions, research companies and renowned cultural institutions. With around 18,000 students and more than 8,600 employees, the university plays a major role in shaping Jena's character as a cosmopolitan and future-oriented city. Microbiology, and the application of physical sciences to microbiological systems, are core strengths of the University, supported in particular by the Cluster of Excellence "*Balance of the Microverse*", which combines expertise in life, material, optical and computational sciences to elucidate fundamental principles of the interactions and functions in microbial communities in diverse habitats. The affiliated early career program of the *Jena School for Microbial Communication* (JSMC) offers an ambitious, structured and interdisciplinary post-graduate training based on top-level fundamental research.

The Theoretical Microbial Ecology research group, led by Prof. Rosalind Allen, seeks to understand how bacteria grow, how they are inhibited by antibiotics, and how they evolve resistance to antibiotics. To do this, we combine computational and theoretical models with lab experiments, to gain insights that could not be obtained from experiments alone.

The Priority Programme "Emergent functions of bacterial multicellularity" (SPP 2389) funded by the Deutsche Forschungsgemeinschaft (DFG) investigates spatially structured microbial populations, focusing on the physiological benefits and molecular mechanisms of the emergent functions as the driving forces of bacterial multicellularity, and the architecture, dynamics and biophysical properties of **the multicellular forms** as the structural framework from which a multicellular function can emerge.

As part of the SPP 2389 programme, the Professorship for Theoretical Microbial Ecology in the Faculty of Biological Sciences at the Friedrich Schiller University, led by Prof. Rosalind Allen, invites applications for a

## Doctoral Researcher Position (m/f/d)

to conduct research on the project

### "Biophysical modelling of antibiotic efflux in bacterial biofilms"

Biofilms are multicellular assemblies of bacteria in which cell-cell interactions via metabolism and signalling lead to emergent structural and functional properties. Biofilms are notoriously difficult to kill with antimicrobial substances, a phenomenon that is known as tolerance. Tolerance is an emergent multicellular trait, arising from interactions between the bacteria in the biofilm, and it can be a stepping stone on the pathway to resistance. Previous studies suggest that efflux pumps, which use energy to pump antibiotic out of the bacterial cell, and persister cells, which enter a dormant growth state that is not susceptible to antibiotic, could both be involved in tolerance. Moreover there is also a coupling between efflux and persister cell generation. In this PhD project, we will use mathematical and computational modelling to disentangle the relationship between efflux, persistence and tolerance in spatially structured bacterial biofilms. The project will combine coarse-grained modelling (deme-based models) with more individual-based biofilm modelling. This position is part of the SPP 2389 project 'Antibiotic tolerance of biofilms emerging from multicellular effects of antibiotic efflux', in collaboration with the group of Dr. Frank Schreiber at the Federal Institute for Materials Research and Testing (Bundesanstalt für Materialforschung und -prüfung) in Berlin. You will interact closely with a PhD student in the Schreiber group who will perform experiments on antibiotic tolerance in biofilms and you will also perform data analysis of microfluidic experiments from that group. If desired, there is also scope to combine your theoretical modelling with experimental work in our own microbiological lab.

### Your responsibilities:

- Conduct research on the DFG-funded project 'Antibiotic tolerance of biofilms emerging from multicellular effects of antibiotic efflux', using theoretical techniques including computer simulations.



- Develop and modify code in languages such as python, c++, matlab etc.
- Produce and analyse results, and interact productively with experimental data provided by external collaborators, including using experimental data as input to simulations, and analyzing data from microfluidics experiments.
- Contribute to the development of project direction, as the project evolves.
- Produce high-quality written reports and draft papers.
- Present your results at local meetings and national and international conferences, including participating actively in activities organised by the DFG priority program "Emergent Functions of Bacterial Multicellularity (SPP 2389)".
- Write a dissertation to obtain a doctorate at the FSU Jena.
- Assist with training other researchers, including Masters' and undergraduate project students, where required.
- Assist with the teaching activities of the group where required.
- Contribute to maintaining the friendly, welcoming and collaborative environment within the group.

### Your profile

- An MSc (or equivalent) in Physics, Biophysics, Bioengineering, Mathematics, Computer Science or related discipline. Candidates with life science degrees and a strong interest in mathematical modelling are also welcome. Candidates in the final stages of obtaining their degree are eligible to apply.
- Required methodological skills: computer programming (e.g. python, C, C++, matlab or other languages), computer simulation.
- Desired methodological skills: Experience in biophysical modelling, systems biology, image analysis, statistical data handling, computational biology or related topic. Prior microbiological knowledge is not required but interest in the topic is essential.
- Interest in performing experimental work as well as theory/simulations is welcome but is not required.
- You should be a highly motivated individual with an interest in joining an interdisciplinary research group and interacting with individuals from many different scientific backgrounds.
- Excellent skills at writing and oral communication, in English, are essential.

### We offer:

- A highly communicative atmosphere within an energetic scientific network
- A comprehensive mentoring program and soft skill courses for early career researchers
- *Jena – City of Science*: a young and lively town with a vibrant local cultural agenda
- A family-friendly working environment with a variety of offers for families: University Family Office 'JUniFamilie' and flexible childcare ('JUniKinder');
- University health promotion and a wide range of university sports activities;
- Attractive fringe benefits, e.g. capital formation benefits (VL), Job Ticket (benefits for public transport), and an occupational pension (VBL)
- Remuneration based on the provisions of the Collective Agreement for the Public Sector of the Federal States (TV-L) at salary scale E 13 — depending on the candidate's personal qualifications—, including a special annual payment in accordance with the collective agreement.



This is a three year full-time doctoral researcher position (65% TV-L E13) with the option of a further extension. The Friedrich Schiller University Jena is an equal opportunity employer and part-time contracts can be discussed.

To promote gender equality in science, applications by woman are especially welcome. Candidates with severe disabilities will be given preference in the case of equal qualifications and suitability.

Applications in English should comprise a cover letter, a detailed curriculum vitae and copies of academic certificates. Please submit your application by email as a single PDF file, stating the vacancy ID 2389/2022 by 25 August 2022 via the JSMC Online Application Portal:

<https://apply.jsmc.uni-jena.de/>

For further information for applicants, please also refer to [www4.uni-jena.de/stellenmarkt\\_hinweis.html](http://www4.uni-jena.de/stellenmarkt_hinweis.html) (in German)

Please also note the information on the collection of personal data at [www4.uni-jena.de/en/jobs\\_information\\_collecting\\_personal\\_data.html](http://www4.uni-jena.de/en/jobs_information_collecting_personal_data.html)