

The **Jena School for Microbial Communication (JSMC)** is an ambitious Graduate School with over 130 doctoral and postdoctoral scientists. We offer structured, interdisciplinary PhD and career training programs based on top-level fundamental research. They conceptually combine different research areas to a comprehensive picture of microbial communication. The '**Cluster of Excellence 'Balance of the Microverse'**' studies the fundamental principles underlying microbial community interactions and functions in diverse habitats, ranging from oceans and groundwater to plants and human hosts.

The research groups of Rosalind Allen and Ricarda Winkelmann at the JSMC and the 'Cluster of Excellence "Balance of the Microverse"' invite applications for a

Postdoctoral Researcher (TV-L E13, 100%) in mathematical modelling of the gut-liver-lung axis as a network of tipping elements

commencing on 1st September 2026 or upon agreement. We offer a full-time position (100%) at the Friedrich-Schiller University of Jena, offered as a fixed-term position for 2 years.

It is well recognized that the function of the central organs of the human body, the gut, liver and lung, is closely linked via the so-called "gut-liver-lung axis". Failure of this axis can lead to life-threatening conditions such as acute respiratory distress syndrome. Furthermore, the function of any organ depends on a complex interplay between its physiology, its microbiome and its immune defences. Together, the gut-liver-lung axis can be viewed as a complex network of interacting "tipping elements", any one of which can influence the function of the entire network. Conceptually, this has echoes in Earth system and complex systems science, where networks of tipping elements are used to assess the risk of catastrophic climatic events. The Winkelmann group at the MPI-GEA in Jena have pioneered the theoretical analysis of such networks from an Earth system perspective, while the Allen group at the Friedrich-Schiller University Jena has expertise in modelling microbial infection dynamics. In this project, the Allen and Winkelmann groups will collaborate to apply these theoretical methods to develop the first integrated mathematical model of the gut-liver-lung axis as a network of tipping elements.

Your responsibilities:

- Establish model design and parameterization via review of clinical literature, discussion with clinical collaborators and organization of parameterization workshops. Define appropriate coupled stochastic differential equations through discussion with collaborators. Implement the resulting model in an existing python code framework and explore its dynamical behavior and stability, including via large ensemble Monte Carlo simulations. Work with clinical colleagues to identify and analyze appropriate clinical datasets for model validation. Work independently at all times.
- Analyse project results, generate figures for publications, and write scientific manuscripts for publication, including extensive liaison with collaborators from different disciplines.
- Present your results at local, national, and international meetings and conferences
- Work closely together with other researchers from diverse backgrounds in the research group and within the Cluster
- Assist with training and supervising other researchers (e.g. doctoral candidates, MSc students)
- Contribute to the friendly, welcoming, and collaborative environment in our teams

Your profile:

- A PhD in statistical physics, applied mathematics, dynamical/complex systems, biophysics or closely related disciplines. Candidates in the final stages of obtaining their PhD are also encouraged to apply.

- Desired methodological skills include numerical analysis, understanding of stochastic differential equations, python coding, familiarity with nonlinear dynamics and bifurcation theory in complex adaptive systems. Experience working with biologists and/or clinicians would be highly advantageous; enthusiasm for such interaction is essential. Relevant biological/clinical background knowledge is advantageous: interest in the clinical background of the project is essential.
- The project will require a high degree of independent working and ability to liaise extensively with multiple project partners coming from very different scientific disciplines.
- A high level of curiosity, self-motivation, enthusiasm and attention to detail
- A cooperative personality actively seeking to contribute to our interdisciplinary and inclusive Microverse community
- Very good written and spoken English communication skills

We offer:

- A highly communicative atmosphere within an energetic and interdisciplinary scientific network
- The Jena School for Microbial Communication offers a structured and interdisciplinary doctoral training program based on top-level fundamental research and provides comprehensive mentoring programs and soft skills courses
- Jena – City of Science, a young and lively city with a vibrant local cultural agenda
- A dedicated management team, providing support and information on non-scientific subjects, such as onboarding and family life, and organising individualised career development programs, and events on topics like mental health and communication
- Remuneration based on the provisions of the Collective Agreement for the Public Sector of the Federal States (TV-L) at salary scale E13 — depending on the candidate's personal qualifications—, including a special annual payment in accordance with the collective agreement

The 2-year doctoral researcher position (TV-L E13, 100%) will be funded through the JSMC through the Thuringian State government. The University of Jena and the participating research institutes are equal opportunity employers. Part-time contracts can be discussed. Candidates with severe disabilities will be given preference in the case of equal qualifications and suitability. The employment contract will be with the Friedrich-Schiller University of Jena.

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

Are you eager to join us? Then, apply by **April 25, 2026**, using our online portal.

[Online application](#)