



International Leibniz Research School

For Microbial and Biomolecular Interactions

The [Leibniz Institute for Natural Product Research and Infection Biology – Hans Knöll Institute](#) – in cooperation with the Friedrich Schiller University, the University Hospital Jena and the Max Planck Institute for Chemical Ecology are offering an international graduate training programme. The

International Leibniz Research School (ILRS Jena)

gives doctoral researchers the possibility to prepare for their PhD exam in an ambitious program providing excellent research conditions. The ILRS is part of the “[Jena School for Microbial Communication](#)” (JSMC) which is the early career program of the Cluster of Excellence “[Balance of the Microverse](#)”.

We invite applications for a

Doctoral Researcher Position (Ref.No. ILRS_01/2019)

Modeling and deciphering the dynamic metabolic regulation of microbial central metabolism

Proper regulation of metabolism is a cornerstone of microorganisms so that they can prevail in fluctuating environments and during interactions with other cells. Hence, evolutionary processes have shaped optimal strategies to regulate the flux through metabolic pathways. Further, the concept of optimality is also relevant in systems biology and metabolic engineering. Those highly dynamic regulatory strategies are difficult to explore *in vivo* and can be made more accessible using modeling and simulation approaches. Nevertheless, most available approaches neglect temporal dynamics by assuming a steady state of metabolic systems. Recently, dynamic optimization models of metabolic regulation provided insights into activation and regulation of metabolic pathways. Further, these dynamical regulatory strategies are crucial in preventing accumulation of toxic intermediates. They have become increasingly important to improve biosynthesis along native and synthetic pathways in different model organisms like *Escherichia coli* or *Saccharomyces cerevisiae*. However, the dynamic regulation of larger and complex metabolic networks is still elusive.

This project includes analyses of central (and possibly secondary) metabolism in microorganisms by dynamic optimization in multiscale systems. The knowledge about dynamic regulatory strategies will be used to improve pathway enrichment analysis, which is frequently used to determine active metabolic pathways from gene expression data.

Predictions will be made on how microorganisms optimally regulate biosynthetic pathways and which are the appropriate enzymes to realize an efficient synthetic production. To this end, models will be developed and validated in close collaboration with experimentalists studying natural product synthesis. In addition, the knowledge of key regulated enzymes is valuable to understand microbial interactions as well as host pathogen interactions and to identify drug targets.

We expect:

- a Master's degree (or equivalent allowing you to pursue a PhD degree) in Natural or Life Sciences, preferably in bioinformatics or mathematical/computational biology. Research at ILRS is centred around "**Microbial and Biomolecular Interactions**". Candidates in the final stages of obtaining their degree are eligible to apply.
- desirable methodological skills: basics in computer programming, fundamentals of algebra and differential calculus, interdisciplinary thinking
- highly motivated individuals with an interest in joining one of the interdisciplinary research areas of the ILRS
- the ability to work creatively and independently towards developing your own research project
- an integrative and cooperative personality with enthusiasm for actively participating in the dynamic ILRS community
- excellent English communication skills, both written and spoken

We offer:

- a top-level research environment
- efficient supervision by a team of advisors
- a comprehensive mentoring programme and courses in state-of-the-art technologies and soft skills
- a highly communicative atmosphere within a scientific network providing top-level research facilities
- Jena – **City of Science**: a young and lively town and a vibrant local cultural agenda

The three-year Doctoral Researcher position is available starting from May 2019. The position will be financially supported according to TV-L (salary agreement for public service employees). HKI is an equal opportunity employer. Disabled persons with comparable qualifications will receive preferential status.

Further information:

Prof. Dr. Stefan Schuster, PI: stefansch@hki.uni-jena.de

Dr. Christine Vogler, ILRS Coordinator: ilrs@leibniz-hki.de

Applications are exclusively accepted via the Online Application Portal:

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

Please acquaint yourself with the scientific projects offered on our [website](#). **Please note that you can choose up to 3 projects of interest in your application. It is only necessary to fill in the application form for your first preference of projects; the other two projects can be selected in the application form.**

Deadline for application: March 20, 2019.

Selected applicants will be invited to a recruitment meeting in Jena on April 10-11, 2019 or May 15-16, 2019.



The ILRS is part of the "Jena School for Microbial Communication" (JSMC) which is the early career program of the Cluster of Excellence "Balance of the Microverse", funded through the Excellence Strategy of the German federal and state governments and the Carl Zeiss Foundation.