



At the Institute of Quantitative and Theoretical Biology in the faculty of Mathematics and Natural Sciences of Heinrich Heine University Düsseldorf a post as a

## scientific employee (m/f/d)

(65,00 %, pay grade 13 TV-L)

is to be occupied starting 01.03.2023. The employment is limited until 31.12.2026. It is a qualification position in the sense of the Act of Academic Fixed-Term Contract (Wissenschaftsvertragsgesetz – WissZeitVG), which is to promote the scientific qualification of the employee.

The advertised project is integrated into CRC 1535 MibiNet “Microbial networking – from organelles to cross-kingdom communities” and the associated graduate research training group “MibiNet”. In addition to the HHU as the host university, CRC 1535 includes five cooperation partners, including the Research Center Jülich (FZJ), the Technical University of Aachen (RWTH), the University of Bielefeld, the University of Cologne and the Max Planck Institute for Plant Breeding Research (MPIPZ) in Cologne. Further job offers can be found on our homepage ([www.sfb1535.hhu.de](http://www.sfb1535.hhu.de)).

Phototrophic microorganisms such as green algae interact synergistically with heterotrophic bacteria and fungi in their environment. These organisms assemble into stable communities in the regions neighbouring unicellular algae, known as the phycosphere, and play roles in global carbon and energy cycles. However, the fundamental principles that govern phycosphere community assembly and dynamics are relatively poorly understood, particularly in terrestrial ecosystems. We aim to use the eukaryotic, photo-synthetic model organism *Chlamydomonas reinhardtii* to build computationally designed, stable and robust synthetic consortia to establish a solid quantitative theory to explain fundamental principles governing microbial ecosystem establishment, dynamics and resilience.

### Your tasks:

The successful candidate will develop mathematical models to theoretically investigate of the dynamics of microbial communities. A major goal is to obtain a quantitative understanding how environmental factors determine the stability, resilience and diversity of a community. This requires to also understand the interaction mechanisms between species and how these lead to community properties, such as stability and resilience. For this, differential equations-based models will be developed. The initial approach will be based on extended MacArthur consumer-resource models, which describe ecosystem dynamics based on resource availability, metabolic competition and cross-feeding. During the course of the project, the models will evolve from abstract to highly quantitative and calibrated with experimental data. The models will be developed in direct collaboration with the experimental partners Ruben Garrido-Oter (MPIPZ) and Bart Thomma (UoC), who provide high-quality, time-resolved data on dynamic communities, and perform dedicated experiments to determine the metabolic functions of the community members.

Model predictions will guide experimental design to challenge the model and optimise information gain.

### Our requirements:

- A completed scientific university education (M.Sc. / M.A. / Diploma / Magister) in in a natural science discipline (physics, chemistry, biochemistry etc.)
- Strong mathematical background
- Experience with differential equations
- Some programming skills
- A keen interest in the biological questions addressed in this project
- A spoken and written command of the English language is desirable
- Affinity to teamwork
- Good communication skills and enthusiasm for interdisciplinary exchanges are appreciated

The pay scale grouping will be, depending on the personal qualification of the applicant, up to pay grade 13 TV-L.

In principle, the employment can also take place part-time, if no compelling official reasons are opposed in an individual case.

Heinrich Heine University Düsseldorf aims at increasing the percentage of employed women. Applications from women will therefore be given preference in cases of equal aptitude, ability and professional achievements unless there are exceptional reasons for choosing another applicant. Applications from suitably qualified severely disabled persons or disabled persons regarded as being of equal status according to Book IX of the German Social Code (SGB – Soziales Gesetzbuch) are encouraged.

Your contact person in case of questions is Dr. Lilli Bismar; email: [sfb1535-application@hhu.de](mailto:sfb1535-application@hhu.de).

Please submit your application documents (cover letter, CV and certificates, additional references or resp. contact details) citing **reference no. 104.23 – 3.1** until **16.02.2023** preferably by email to

[sfb1535-application@hhu.de](mailto:sfb1535-application@hhu.de)

or in writing to:

Heinrich Heine University Düsseldorf  
Faculty of Mathematics and Natural Sciences  
Institute of Microbiology  
Attn. Dr. Lilli Bismar  
Build. 26.24.01  
Universitätsstraße 1  
40225 Düsseldorf



Please do not submit application materials in folders and be sure to send copies only, as documents will not be returned (they will be destroyed after the selection procedure has been completed).