



I am looking for a PhD student to join my research group ‘Stochastic Evolutionary Dynamics’ at the Max Planck Institute for Evolutionary Biology. The position is part of the Collaborative Research Unit ‘Density dependent symbiosis in planktonic systems – DynaSym’, which brings together several research groups across Germany to test and develop basic concepts of density dependence of the symbiosis form (e.g., shift from predator-prey to mutualistic interaction and back).

## PhD position in Theoretical Biology (4 years)

### Modeling parasite epidemics in host populations with symbiont-mediated immunity

Protective symbionts can provide hosts with immunity against virulent parasites. Yet, symbionts themselves may also be costly for the host. The form of symbiosis is thus context dependent: mutualistic upon exposure (or infection) with the virulent parasite but parasitic in its absence. Classical theory on host-parasite systems only considers two players – the host and the virulent parasite. The possibility of protective symbiosis clearly demonstrates the need for theory that goes beyond two-species systems. In this project, we will develop theoretical models to study the joint changes in the densities of hosts, symbionts, and parasites and the associated changes in the form of symbiosis. Initially, we will mostly develop general theory, but we will later also explore models that match the biology of *Daphnia* and its parasites. In collaboration with other members of the Research Unit, models can moreover be tailored to other systems of protective symbiosis that are studied empirically within DynaSym.

The Research Unit DynaSym has recently been funded by the German Research Foundation DFG ([www.uni-konstanz.de/en/university/news-and-media/current-announcements/news-in-detail/mal-freund-mal-feind](http://www.uni-konstanz.de/en/university/news-and-media/current-announcements/news-in-detail/mal-freund-mal-feind)) and is a collaborative initiative bringing together research groups from across Germany and international collaborators. 8 projects will collaborate within the research unit and cover experimental work with plankton systems, modeling, theory development, and synthesis work. Workshops, retreats, and research visits to other research groups are planned for all participants to facilitate exchange and additional training.

The ideal student is interested in applying mathematical modeling to gain insights into biological problems, enthusiastic about math as well as about biology, and excited about engaging in the research unit. The student will learn how to set up and analyse theoretical models to describe biological processes and profit from close interactions with empirical researchers. Applicants should have a background in mathematics, physics, biology, computer science, or a related field. Good quantitative skills are essential. Prior experience in mathematical modeling and knowledge of a programming language (C, C++, Java, Python, Julia...) is an advantage.

## Working environment

The student will join the research group ‘Stochastic Evolutionary Dynamics’ at the Max Planck Institute for Evolutionary Biology. The group is part of the Department of Theoretical Biology. The student will hence be part of a community of researchers working at the intersection of mathematics and biology with many opportunities to take part in journal clubs, reading groups etc.

The Max Planck Institute is a lively institute with around 180 employees from more than 30 nations. There are currently two departments (Theoretical Biology and Microbial Population Biology) and several additional research groups. The institute hosts several workshops per year and continuously welcomes international short-term and long-term visitors, creating a stimulating and positive research environment. We maintain close interactions with Kiel University and belong to the Kiel Evolution Center. The area is a center of evolutionary biology in Germany.

## Plön

Plön is a small town, embedded into a beautiful landscape with numerous lakes and close to the Baltic Sea. The area provides ample opportunity for free time activities such as swimming, canoeing, or biking in a stunning environment. At the same time, the cities of Kiel and Lübeck ( $\geq 200,000$  inhabitants) are only half an hour train ride away. Hamburg (Germany’s second largest city) can be reached within 1.5h by train.

## Application

Interested students should send their application (motivation letter, CV, copies of certificates, contact details of two references) by email to [uecker@evolbio.mpg.de](mailto:uecker@evolbio.mpg.de) and to [bewerbung@evolbio.mpg.de](mailto:bewerbung@evolbio.mpg.de). Please use the code PhD2024 in the subject line. We ask you to refrain from including a photo on your CV.

The Max Planck Society strives for gender and diversity equality. We welcome applications from all backgrounds. The Max Planck Society is committed to employing more disabled individuals and especially encourages them to apply. The Max Planck Society seeks to increase the number of women in those areas where they are underrepresented and therefore explicitly encourages women to apply.

For further questions, please get in contact with Dr. Hildegard Uecker. Review of applications will begin immediately and will continue until the position is filled.

## Contact:

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