

Faculty of Mathematics and Natural Sciences

Profile report: Microbial Ecology and Evolution (Microbiële ecology en evolutie)

- Discipline: Microbiology
- Level: tenure-track assistant or associate professor
- Fte: full time (1,0)

1. Scientific discipline

Microbial ecology and evolution is a sub-discipline of microbiology that focusses on the ecology and evolution of microbes and their interactions with the environment aiming at understanding fundamental principles in ecology and evolution at micro scale and the potential use of these principles for societal applications.

2. Vacancy

This position is opened by the Board of the Faculty (letter JK/gl/16/00664 of August 9 2016) and will be embedded in the Groningen Institute for Evolutionary Life Sciences in the expertise group "Genomics Research in Ecology and Evolution in Nature (GREEN) (with research on microbial ecology, as well as marine biology and ecophysiology of plants). The position falls within the framework of 'Career Paths in Science 3' ('Bèta's in Banen 3'). Please see link for [criteria and conditions](#).

3. Selection committee (BAC)

Prof.dr Ton Groothuis (Director GELIFES)
Dr. Louis van de Zande (Deputy director teaching programme)
Prof.dr Joanna Falcao-Salles (Microbial community ecology)
Prof.dr Theo Elzenga (Ecophysiology of plants)
Prof.dr Irene Tieleman (Animal Ecophysiology)
Prof.dr George Kowalchuk (Environmental and rhizosphere microbiology, University of Utrecht)
Sanne Moedt (Student member GELIFES)

Advisors:

Lourens Boomsma (HR)
Prof.dr Han Olf (advisory group Adaptive Life programme)

4. Research area

Microbes are present everywhere, in all, even extreme, ecological conditions on this globe, outside and inside organisms, in soils and in the air, often in large biomass and diversity, with a large impact on many biological and chemical processes. Microbial ecology and evolution is the field in which the adaptations, interactions and evolutionary dynamics of microbe species are studied in a community and ecosystem context. Due to their fast life span, microbes are often excellent models to

study fundamentals of ecology and evolution but the field yields also societal applications for combatting disease, increase food production and understanding global change. Two currently important questions are, among others, the role of the microbiome of animals in relation to health and disease, neurobiology and behavior, and the plant-microbe interactions in the rhizosphere and their consequences for ecosystems and their management.

5. Embedding: institute

Microbial ecology and evolution is a field that integrates both mechanistic and functional/evolutionary approaches. In Groningen, the integration of physiological and ecological mechanisms with evolutionary theory is the core of the new Faculty strategic theme Adaptive Life. The institute in which the position will be embedded, The Groningen Institute for Evolutionary Life Sciences (GELIFES), is the main home basis of this theme, providing a fitting embedding for the field.

The institute has currently 6 expertise groups, consisting of several professors and tenure-trackers, with a non-hierarchical internal structure. The current and strong research in microbial ecology (J.F. Salles, J.D van Elsas), which is part of the expertise group *GREEN (genomic research in ecology and evolution in nature)*, provides the main embedding for the new staff member. This group contains genomic expertise and additional investment in genomics are underway. It also houses research focusing on the ecophysiology of plants, being relevant in case the new staff member would focus on plant-microbe interactions. This focus offers also clear connections with the *Conservation Ecology* group regarding the community ecology and dynamics of marine and terrestrial ecosystems. The institute has excellent greenhouse and climate chamber facilities, and is operating a well-equipped field station on the nearby island of Schiermonnikoog. It also houses marine biology research, providing opportunities to study the importance of the microbiome in marine animals or plant-microbe interactions in marine sediments (as salt marshes). In case of a focus on the animal microbiome, the *Neurobiology group* and the new program in Evolutionary Medicine provide excellent collaborations too, especially with those PI's focusing on the neurobiology of social behavior, and on neuroendocrinology of metabolism and eating disorders in rodents. In addition, the *Behavioural and physiological ecology* group provide excellent opportunities for embedding of the ecological approach, especially concerning birds. Other expertise groups are *Theoretical Research in Evolutionary Life Sciences*, (focusing among a variety of topics on eco-evolutionary dynamics) and *Evolutionary Genetics, Development and Behaviour*, (focusing among others on behavioural and molecular genetics and behavioural development from an evolutionary perspective). Finally, in Groningen microbial research is conducted outside the institute in the bordering Groningen Biomedical Science and Biotechnology Institute (GBB) and the Medical Faculty with which we both collaborate.

6. Local and (inter)national position

Local: The Microbial Ecology group at the University of Groningen has a strong tradition in soil and plant microbiology, where ecological theories and concepts are used to understand and explore these microbial communities. The group has a strong reputation in linking microbial diversity in soils to functional aspects, such as understanding the N cycle. Recently, knowledge on microbiomes has expanded to include the microbiomes of birds, insects, rodents and also humans. The group is well known for its ability to combine high throughput molecular data, bioinformatics and modelling approaches to unravel the ecological principles driving microbial communities, a unique combination in Europe. Current work includes soil microbial succession, microbial invasions, microbial consortia for lignocellulose degradation, plant-microbe interactions, bacterial-fungal interactions, horizontal gene transfer, the microbiome of birds and the importance of the gut microbiome in depression and cognitive disorders. In addition to collaborations within the institute, there are strong links with the Groningen Biomolecular and Biotechnology institute (GBB) on plant-associated bacteria. GBB recently started to work on the microbiome of animals too. Finally, the institute is internationally renowned for its ecological and evolutionary research, and has at the same time tight connections with the Medical Faculty and the University Medical Centre Groningen. It coordinates master programs in evolution and ecology, marine biology as well as in medical and behavioural neurobiology. The institute participates in the interfaculty research school Behavioural and Cognitive Neurosciences, coordinating its selective master program, and has its own Research School in Ecology and Evolution.

Nationally, the research focus on integration of mechanistic and evolutionary approaches to adaptation characterizes the institute. Microbial Ecology research has strong ties with Universities of Wageningen, Utrecht, and Amsterdam, and with the National Institute for Public Health and the Environment (RIVM) and the Royal Netherlands Institute for Ecology (NIOO), as well as with the companies EcoStyle (Dr. Doornbos) and Corbion (Dr. Ruijsenaars). The aforementioned labs cover the ecology of fungi, insects and viruses (Wageningen), the ecology of soil and plants (Utrecht), biotechnology-oriented microbiology (Amsterdam, Delft) and societal (antibiotic resistance) and marine microbiology (RIVM, NIOZ). The Microbial Ecology research in Groningen has unique complementary expertise that enables productive collaborations with these labs.

Internationally, major collaborative partners (not exclusive) are situated in Europe (Germany, France, the UK, Sweden, Slovenia, Portugal, the Czech republic, Iceland, and >5 more), the USA and Canada (several partners), China (several partners), Brazil (>6 collaborative partners) and Australia. Both PI's in the Microbial Ecology group have served or are serving as leaders of diverse international collaborations, including EU-sponsored projects (METAEXPLORE, VITISMART and >8 others). They are also [leading] members of the International Society for Microbial Ecology (ISME) and the International Society for Environmental Biogeochemistry (ISEB). Finally, they serve on the boards of a number of International congresses, i.e. the two-yearly BAGECO, the two-yearly SYMBIOSIS, and the ISEB conferences.

7. Expected contributions to research

The new staff member is expected to set up an independent research line within the field of microbial ecology and evolution, resulting in publications in high ranking journals, substantial external funding and successful supervision of PhD students. The research should preferably strengthen ongoing research lines in microbial ecology and form a linkage to some of the other ongoing research within the institute (such as for example plant eco-physiology, conservation ecology, animal eco-physiology, behavioural neurobiology, endocrinology and metabolism, or genomics), and possibly also outside the institute (GGB, medical faculty).

8. Expected contributions to teaching

The candidate is expected to contribute to teaching in microbiology and other fields, at the bachelor level, (both general biology and the program for ecology and evolution, and possibly the program for medical biology, the master level (both courses and research projects) and at the level of PhD education.

9. Expected contributions to the organization

The candidate is expected to have an active interest in the management and organizational tasks of the institute. The candidate will participate in relevant national and international organisations.