**Session Proposal**

# Session Title

The rise and fall of microbial diversity in soil: drivers, consequences, and implications

# Session Organizers

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| --- | --- | --- | --- | --- |
| No. | Name | Affiliation | Email |  |
| 1 | Zhongjun JIA | Northeast Institute of Geography and Agroecology, CASInstitute of Soil Science, CAS | jia@issas.ac.cnjia@iga.ac.cn  | Primary contact |
| 2 | Xue-Xian Zhang | University of Auckland | xue-xian.zhang@auckland.ac.nz  | Primary contact |
| 3 | Makoto Ikenaga | Kagoshima University | ikenaga@agri.kagoshima-u.ac.jp  |  |
| 4 | Junjie Liu | Northeast Institute of Geography and Agroecology, CAS | liujunjie@iga.ac.cn  |  |
| 5 | Cécile Gubry-Rangin | University of Aberdeen, UK | c.rangin@abdn.ac.uk  |  |

# Session Description

Soil microbiome plays a fundamental role in sustaining agricultural ecosystems by driving nutrient cycling, enhancing soil fertility, and promoting plant resilience to environmental stressors. This session will explore the underlying eco-evolutionary processes and implications of soil microbial diversification, including the metabolic theory of ecology, species-area relationships, kin selection, contemporary versus historical contingency, the evolution of mutualism, the Black Queen hypothesis, as well as the influences of various abiotic and abiotic factors. In addition to the principles governing microbial community assembly in soil, this session will also feature discussions on advanced techniques that can revolutionize our understanding of microbial communities, particularly the single-cell genomic and transcriptomic sequencing. This brainstorming session will provide a unique opportunity for all participants, especially early-career researchers, to share the latest theories and cutting-edge tools for studying soil microbial communities and to foster potential international collaborations.

# Format

This session will include oral presentation and panel discussions.

# Proposed Speakers

1. Speaker 1. Prof. Dr. Paul Rainey. Director of the Max Planck Institute for Evolutionary Biology. Dr. Rainey is among the top evolutionary biologist in the world, having published over 30 research articles in Nature, Science and PNAS. Dr. Rainey has worked at the University of Oxford and University of Massey before he moved to Germany. Dr. Rainey is currently Director of the Department of Microbial Population Biology at the Max Planck Institute for Evolutionary Biology in Plön (since 2017), Professor at ESPCI in Paris. He is a Fellow of the Royal Society of New Zealand, a Member of EMBO and honorary professor at Christian Albrechts University in Kiel (since 2019).
2. Speaker 2. Prof. Dr. Ashley Shade. Director of Research with the Institute of Ecology and the Environment of Le Centre National de la Recherche Scientifique. Dr. Ashley Shade received her Ph.D. from the University of Wisconsin Microbiology Doctoral Training Program in 2010, and afterwards was a Gordon and Betty Moore Foundation postdoctoral fellow of the Life Sciences Research Foundation at Yale University. In 2014, she started her position in the Department of Microbiology and Molecular Genetics at Michigan State University. Her research interests concern the microbial ecology of environmental systems, including plants, soils, and their feedbacks. She applies an ecological approach to understand how microbial communities respond to stressors, and what determines their resilience as a system. Her lab employs ‘omics tools (metagenomics, metatranscriptomics, exometabolomics) with both field and laboratory studies. Dr. Shade is an advocate of reproducible research and open science, and her lab’s analysis workflows are on [GitHub](https://github.com/ShadeLab). In addition, Shade has developed a [popular workshop on microbial metagenome analysis](https://edamamecourse.org/). She is a member of the [Earth Microbiome Project](http://www.earthmicrobiome.org/)  and the International Society for Microbial Ecology, and serves as an editor at the American Society for Microbiology journal mSystems.
3. Speaker 3. Prof. Dr. Angus Buckling, University of Exeter. Dr. Buckling is currently a joint Associate Pro-Vice-Chancellor, Research and Impact and Deputy Head of Department, Ecology & Conservation. Dr. Buckling work on the evolutionary ecology of microbes, primarily by studying evolution and ecology in real time in controlled environments. He is particularly interested in the evolution and ecology of biotic interactions: microbial cooperation, microbial communities, bacteria and bacteriophage and plasmids. His work work uses general ecology and evolutionary theory to inform our understanding of microbes, and then using these insights for practical benefits. Dr. Buckling has a H-index of 88 with citations of 27,070.
4. Speaker 4. Jennifer B. H. Martiny. The [University of California, Irvine.](https://en.wikipedia.org/wiki/University_of_California%2C_Irvine%22%20%5Co%20%22University%20of%20California%2C%20Irvine) Dr. Martiny received her B.S. in Ecology, Behavior, and Evolution at UC San Diego and her Ph.D. in Biological Sciences at Stanford University. Her research aims to uncover fundamental principles of the generation and maintenance of diversity in microbial communities. To do this, she brings together perspectives from microbiology, ecology, and evolutionary biology. She is currently a Professor and Graduate Advisor in the Dept. of Ecology and Evolutionary Biology at UC Irvine, the co-Director of the UCI Center for Microbiome Science, and leads the Microbiome Centers Consortium, a national network of over 40 microbiome centers. Dr. Martiny is a fellow of the Ecological Society of America, the American Academy of Microbiology, and the American Association for the Advancement of Science.
5. Gavin Lear. University of Auckland, New Zealand. Dr. Lear’s laboratory explores the complex interactions among microbial communities and the varied environments that they inhabit. A key goal is to use microbial responses to such events as a quantitative indicator of the impact of human activities on our environments. Dr. Lear uses modern molecular tools to conduct a wide range of research in the broad fields of microbial ecology, biotechnology and environmental science.