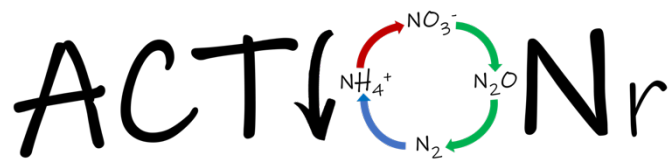


PhD summer school

“Microbial insights into non-CO₂
greenhouse gas production and
terrestrial biogeochemical cycles under
climate change”

Organized by:



Research Action Network for Reducing Reactive
Nitrogen Losses from Agricultural Ecosystems

University of Vienna
16-20 Sept 2024

Local contact:

Prof. Christa Schleper, Dr. Melina Kerou, Dr. Logan Hodgskiss



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	Monday 16.9	Tuesday 17.9	Wednesday 18.9	Thursday 19.9	Friday 20.9
Morning session					
09:00-10:15	(ACTIONr internal meeting)	Dimitris Karpouzas: “The use of ammonia oxidizing microorganisms in soil microbial ecotoxicology”	Glatzel Stephan: “Carbon storage and greenhouse gas release from mires and peatlands”	Andrea Söllinger: "Microbial responses to warming – physiological adjustments and potential consequences"	Henri Siljanen: “Microbial impact on GHG dynamics in boreal and Arctic regions, in above and below ground ecosystems”
10:15-11:15	(ACTIONr internal meeting)	Evangelia Papadopoulou: “Introduction to Nitrification Inhibitors: A Strategy to Decelerate Nitrogen Cycling.”	Christina Hazard: “Viruses of microbial populations mediating greenhouse gas fluxes in soil”	Christa Schleper “Ammonia oxidizing archaea: Key players in the nitrogen cycle”	Round discussion on open questions in the field
11:30-12:30		Lisa Stein: “Observations on unexpected enzyme targets of BNIs”	Graeme Nicol: “Linking physiology of laboratory isolates to ecophysiology in soil”	Sustainable lab practices (Green Labs Austria)	
12:30-13:30	Arrival of participants and lunch	Lunch	Lunch	Lunch	Lunch
Afternoon session					
13:30-15:00	Presentation round with participating students	Practical training: Principles of anaerobic cultivation, growth rate calculations - Setup of batch cultures of methanogens	Practical training: Anaerobic cultivation in bioreactors - Interpreting bioreactor data	Practical training: Anaerobic cultivation in batch or fermentation unit – measurement of CH ₄	Practical training: Wrap-up of experiments
15:00	Opening lecture (public): Lisa Stein “Microbial metabolisms and Climate Change”	Cultivating nitrifiers, inhibition experiments	Cultivating nitrifiers, inhibition experiments	Microrespiratory chamber demo	

19:30	ACTIONr dinner with invited speakers		Summer School dinner with invited speakers		
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About this course

This summer school aims to give an overview of how microbial networks contribute to the production of the GHG methane (CH₄) and nitrous oxide (N₂O) in terrestrial ecosystems by leading scientists in the field of environmental microbiology. In addition, we will explore how microbial metabolisms are affected by anthropogenic climate change, and the potential consequences and mitigation strategies of anthropogenic perturbations of biogeochemical cycles, with a focus on the non-CO₂ greenhouse gases methane and CO₂. Lectures will be accompanied by laboratory sessions where the participants will be taught state-of-the-art cultivation methods of key anaerobic and aerobic microbial lineages such as methanogens and nitrifiers, and get hands-on experience with bioreactors. Moreover, we will cover strategies for the characterization of microbial physiologies involved and methods to explore the interplay between the two biogeochemical cycles of methane and nitrogen.

The course will be held in English, starting on Monday 16.09 at 12:30, and ending on Friday 20.09 at 16:30.

Topics covered

- Greenhouse gases (GHG) and climate change
- Microbial metabolisms relevant to non-CO₂ GHG production and sinks: methanogenesis, nitrification and methylotrophy
- Interplay between methane and nitrogen cycling
- Microbial physiologies, biogeochemical cycles, host-virus networks and GHG fluxes in rapidly warming ecosystems
- Mitigation of GHG emissions: The case of nitrification inhibitors

Speakers/Tutors

- [Prof. Lisa Stein, University of Alberta](#)
- [Prof. Stephan Glatzel, University of Vienna](#)
- [Prof. Christa Schleper, University of Vienna](#)
- [Prof. Dimitrios Karpouzias, University of Thessaly](#)
- [Prof. Graeme Nicol, CNRS Director of Research, École Centrale de Lyon](#)
- [Assistant Prof. Evangelia Papadopoulou, University of Thessaly](#)
- [Dr. Andrea Söllinger, University of Tromsø](#)
- [Dr. Christina Hazard, École Centrale de Lyon](#)
- [Dr. Henri Siljanen, University of Eastern Finland](#)
- [Dr. Logan Hodgskiss, University of Vienna](#)
- [Dr. Simon Rittmann, University of Vienna](#)

Research methods and skills covered

- Anaerobic cultivation methods (batch and bioreactor) with a focus on methanogens
- Cultivation of nitrifiers and inhibition profiles, methods for measuring activity and physiological characterization
- Measurement of the GHG gasses CH₄ and N₂O

Learning objectives

By the end of the course, participants will:

- Have acquired an understanding of the basic physiology of methanogens and nitrifiers
- Have acquired an understanding of how terrestrial biogeochemical cycling (with a focus on methane and nitrogen cycling) contributes to climate change but is also affected by warming
- Have acquired an understanding of GHG fluxes in terrestrial ecosystems
- Have learned the basics of anaerobic microbiology, working with bioreactors and analyzing data from continuous cultures in bioreactors
- Have learned how to cultivate nitrifiers, assess their activity and interpret inhibition profiles
- Have explored the strategic application of nitrification inhibitors as a method to mitigating nitrogen cycling, thereby enhancing their understanding of sustainable agricultural practices.

Target group, capacity and ECTS credits

PhD students and junior postdocs with experience in aspects of environmental microbiology and ecology. Knowledge of microbial physiology concepts advantageous, but all participants are welcome. The course capacity is 12-15 participants.

ECTS credits: 2

Upon successful completion of the program, the Summer School offers a Certificate of Attendance that mentions the workload of 50 hours. Students can apply for recognition of these credits to the relevant authorities in their home institutions, therefore the final decision on awarding credits is at the discretion of their home institutions. We will be happy to provide any necessary information that might be requested in addition to the certificate of attendance.

Format

Morning sessions will involve interactive one-hour lectures with subsequent discussion starting at 9:00am. Afternoon sessions will involve practical hands-on training on cultivation methods of methanogens and nitrifiers and lectures on associated concepts and data handling.

Venue

University of Vienna Biology Building, Djerassiplatz 1, 1030, Vienna, Austria

Costs and applying

The course fee is 190€, covering all lunches and coffee breaks and laboratory materials for the five days of the summer school, including the summer school dinner with all invited speakers on September 18th. The fee does not include accommodation costs, but a list of affordable options will be provided.

To apply, send a CV including a brief description of your current PhD topic and a short motivation statement until August 25th to Nathalia Jandl: nathalia.jandl@univie.ac.at.

Updates and more information at:

<https://archaea.univie.ac.at/news-events/actionr-phd-summer-school-2024/>