

PhD summer school

“Microbial insights into non-CO<sub>2</sub>  
greenhouse gas production and terrestrial  
biogeochemical cycles under climate  
change”

University of Vienna  
16-20 Sept 2024

Organized by:



Research Action Network for Reducing Reactive  
Nitrogen Losses from Agricultural Ecosystems

Local contact:

Prof. Christa Schleper, Dr. Melina Kerou, Dr. Logan Hodgskiss,  
Mag. Nathalia Jandl

Location:

University Biology Building (UBB)  
University of Vienna  
Djerassiplatz 1  
1030 Vienna

<b>Monday, 16 September</b>	
<b>Morning session</b>	
09:00-11:30	[ACTIONr internal meeting], (Seminar room 1.4)
11:45-13:00	Arrival of participants and lunch (IMP cantina)
<b>Afternoon session</b>	
13:00-13:30	Tour through the Archaea laboratories
13:30-15:00	Presentation round with participating students – 5 min each (Seminar room 1.4)
15:00-15:15	Coffee break
15:15-16:15	Opening lecture (public): <b>Lisa Stein:</b> “ <i>Microbial metabolisms and Climate Change</i> ” Lecture Hall 2, UBB
19:30	Speakers’ dinner

<b>Tuesday, 17 September</b>	
<b>Morning session</b>	
09:00-10:15	<b>Dimitris Karpouzas:</b> “ <i>The use of ammonia oxidizing microorganisms in soil microbial ecotoxicology</i> ”
10:15-11:30	<b>Evangelia Papadopoulou:</b> “ <i>Introduction to Nitrification Inhibitors: A Strategy to Decelerate Nitrogen Cycling</i> ”
11:45-13:00	Lunch (IMP cantina)
<b>Afternoon session: Practical training</b>	
13:00-14:00	Introduction to methanogens - <b>Nevena Maslac</b>
14:00-16:00	Group rotations for methanogen sampling
16:00	Methanogen data discussion

<b>Wednesday, 18 September</b>	
<b>Morning session</b>	
09:00-10:15	<b>Stephan Glatzel:</b> “ <i>Carbon storage and greenhouse gas release from mires and peatlands</i> ”
10:15-11:30	<b>Lisa Stein:</b> “ <i>Observations on unexpected enzyme targets of BNIs</i> ”
11:45-13:00	Lunch (IMP cantina)
<b>Afternoon session: Practical training</b>	
13:00-14:00	Introduction to bioreactors - <b>Simon Rittmann</b>
14:00-16:00	Group rotations for reactor handling
16:00	Reactor data discussion
19:30	Summer School dinner

<b>Thursday, 19 September</b>	
<b>Morning session</b>	
9:00-10:15	<b>Andrea Söllinger:</b> “ <i>Microbial responses to warming – physiological adjustments and potential consequences</i> ”
10:15-11:30	<b>Graeme Nicol:</b> “ <i>Linking physiology of laboratory isolates to ecophysiology in soil</i> ”
11:45-13:00	Lunch (IMP cantina)
<b>Afternoon session: Practical training</b>	
13:00-14:00	Nitrifier metabolism - <b>Logan Hodgskiss</b>
14:00-16:30	Nitrifier cultivation with and w/o inhibitors, Microrespiratory chamber

<b>Friday, 20 September</b>	
<b>Morning session</b>	
9:00-10:15	<b>Henri Siljanen:</b> “ <i>Microbial impact on GHG dynamics in boreal and Arctic regions, in above and below ground ecosystems</i> ”
10:15-11:30	<b>Christina Hazard:</b> “ <i>Viruses of microbial populations mediating greenhouse gas fluxes in soil</i> ”
11:45-13:00	Lunch (IMP cantina)
<b>Afternoon session: Practical training</b>	
13:00-16:30	Wrap-up of experiments

All talks and discussions take place in seminar room 1.4 (Monday, Friday) and seminar room 1.7 (Tuesday, Wednesday, Thursday), unless otherwise noted.

## About this course

This summer school aims to give an overview of how microbial networks contribute to the production of the GHG methane (CH<sub>4</sub>) and nitrous oxide (N<sub>2</sub>O) 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-CO<sub>2</sub> greenhouse gases methane and CO<sub>2</sub>. 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 September 2024 at 12:30 p.m., and ending on Friday, 20 September 2024 at 4:30 p.m.

## Topics covered

- Greenhouse gases (GHG) and climate change
- Microbial metabolisms relevant to non-CO<sub>2</sub> 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 CH<sub>4</sub> and N<sub>2</sub>O

## 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 analysing 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 9:00 a.m. 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 18 September 2024. 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 25 August 2024 to Nathalia Jandl: [nathalia.jandl@univie.ac.at](mailto:nathalia.jandl@univie.ac.at).

## Updates and more information at:

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



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