



Course on High-Resolution Respirometry

IOC-30. Mitochondrial Physiology Network 10.2: 1-4 (2005)

©2005 OROBOROS®
Last update: 2005-04-14

International Course on High-Resolution Respirometry: Oxygraph-2k, TIP-2k and DatLab 4.

8-12 April 2005



Schrócken, Vorarlberg, Austria

The 30th Course on High-Resolution Respirometry will start with a demo experiment using cultured cells, providing a practical overview of the **Oxygraph-2k** in action, with integrated on-line analysis by **DatLab 4.1**, and with an application of the **TIP-2k** in a



FCCP titration. Specific emphasis will be placed on hands-on practical sessions to introduce the technical and operational details of high-resolution respirometry.

Experienced tutors guide small working groups step-by-step through the approach of high-resolution respirometry. Four Oxygraph-2k, two TIP-2k and four PCs are available to provide everybody with a do-it-yourself opportunity for both hardware and software.



The course will take place in Hotel Mohnenfluh. During lunch breaks, sufficient time will be available for skiing (skiing lifts operate until Sunday, 10th April), relaxing (snowshoe) walks and talks, to enjoy the refreshing scenery of the alpine environment, or use the spare time for specific tutorials.

Whereas snowfall may interfere with snowshoe walks or skiing, performance of the OROBOROS Oxygraph-2k is independent of the weather. DatLab 4 effectively changed the structure of our O2k Course, since now we accomplish data analysis on-line during the experiment, providing final results and their graphical presentation by the end of an experimental run. Thus we gain sufficient time to see the new Titration-Injection microPump TIP-2k in action and practice its simple and automatic operation.



Lecturers and Tutors

From left to right:
Assegid Garede (1st)
Brigitte Haffner (3rd)
Erich Gnaiger (4th)
Eveline Hütter (5th)



Philipp Gradl (2nd from left) is responsible for the electronics and mechanics development and production of the Oxygraph-2k and Lukas Gradl (on the right) takes care of the DatLab software development.

Programme

Friday, 8. April

Afternoon/Evening Check in at Hotel Mohnenfluh, 19:30
dinner: Bauernbüffet.
Before/after dinner:
Setting up the instruments with a glass of wine.

Saturday, 9. April

The final time schedule will depend on weather conditions and corresponding timing for skiing breaks.



08:45 - 11:45 From switching on the Oxygraph-2k to the experimental result.

- Oxygraph-2k demo experiment with DatLab 4;
- Oxygen calibration;
- Addition of cells and closing the chamber;
- "Phosphorylation control titration": Routine respiration, oligomycin-induced state 4_o, uncoupled state 3_u, inhibition by rotenone and antimycin A;
- FCCP titration with the TIP-2k.

13:00 - 16:00 Ski break (bus leaves at 12:22 from Hotel Mohnenfluh); alpine walks and talks; tutorials.
16:15 - 19:00 Hands-on with the Oxygraph-2k: Cell respiration experiment (Practical Session 1).
19:00 Dinner
20:30 The elements of high-resolution respirometry.

Sunday, 10. April

08:45 - 11:45 **Working groups: Hands-on experiments with the Oxygraph-2k** (Practical Session 2).
12:00 - 16:00 Ski break (bus leaves at 12:22 from Hotel Mohnenfluh); alpine walks and talks; tutorials. Lunch at Hotel Körbersee - www.koerbersee.at.
16:45 - 19:30 **Working Groups: Hands-on experiments with the Oxygraph-2k** (Practical Session 3).
20:00 Dinner

Monday, 11. April

08:45 - 12:15 **Working groups: Hands-on experiments with the Oxygraph-2k** (Practical Session 4).
13:00 - 17:00 Snowshoe walk from Schröcken to a welcome at the the *Alpmuseum uf m Tannberg*. Snowshoes can be rented, hiking boots and skiing sticks



are recommended.

Alpmuseum uf m Tannberg.

17:30 - 19:00

Working groups: Hands-on experiments with the Oxygraph-2k. Practical Session 4.

19:00

Dinner at Hotel Mohnenfluh

21:00

Discussion - Summary - Conclusions



Batzen www.alpmuseum.at

CONTENTS: OVERVIEW ON HIGH-RESOLUTION RESPIROMETRY

Introduction: Mitochondrial and cellular respiratory physiology – new challenges for high instrumental performance.

High-resolution respirometry – what makes the difference? Presentation of the OROBOROS Oxygraph-2k

- Low oxygen and measurement of cellular oxygen consumption – pushing the limits of detection.
- Optimum system design - the OROBOROS Oxygraph-2k.
- On-line recording of oxygen concentration and flux; linear slope versus oxygen flux as a function of time.
- The concept of high-resolution calibrations – instrument demonstration.

OROBOROS Oxygraph-2k and TIP-2k: On-line instrumental performance

- Instrumental background: measurement and correction as a function of pO_2 .
- High resolution of respiratory flux at various steady-states.
- Conceptual and methodological advantages of measurement at physiological low levels of oxygen.
- High time resolution for kinetic analyses: Determination of the time constant, dynamic corrections.

Polarographic oxygen sensor and Oxygraph service

- Cleaning of anode and cathode.
- Electrolyte and membrane application.
- Oxygraph-2k and TIP-2k: instrumental maintenance.

DatLab 4 – the specialized software for High-Resolution Respirometry: Data acquisition and analysis.

Accommodation and Location

Hotel Mohnenfluh www.mohnenfluh.at; Tel.: +43 5519 203; hotel@mohnenfluh.at

The course takes place at Hotel Mohnenfluh (Sylvia Schramm-Strolz). Accommodation for all participants is arranged at Hotel Mohnenfluh.

Skiing www.intermaps.com/skimaps/snowworld.

Bus trips are free from Schröcken to the skiing area of Salober, leaving at 12:11 at Hotel Tannberg (near Hotel Mohnenfluh; or at 11:06 from Hotel Mohnenfluh). For the afternoon after 12:30, the skiing pass is EURO 22.50 for the skiing lifts of Salober and Warth. There is also excellent crosscountry skiing around lake Kalbelesee and Körbersee, as well as easy walking in magnificent winter scenery. Ski rental is available in Schröcken and at Salober. Top ski (+boots) is Euro 16.- (+7.-; 1 day), 30.- (+12.-; 2 days), 42.- (+17.-; 3 days) or 52.- (+22.-; 4 days). You can return to Schröcken by skiing (depending on snow conditions) or by the free bus (leaving 15:30 at Salober). *Prices may have been subject to change.*



Weather The weatherforecast predicts snowfall over the weekend. Sunny days in spring may be warm, but sub-freezing temperatures are possible in April. Sunshine is very strong – bring sunglasses and sunscreen, even if you do not plan to go skiing. Protect yourself against wind and the expected snowfall (gloves, jacket, etc.).

Further information Introductory course material is available on our homepage www.orooboros.at.

Contact

Erich Gnaiger, PhD
Department of Transplant Surgery
D. Swarovski Research Laboratory
Innsbruck Medical University
Innrain 66/6
A-6020 Innsbruck, Austria
Tel: +43 512 504 24623 (24626)
Fax: +43 512 504 24625
E-mail: erich.gnaiger@uibk.ac.at
www.mitophiology.org

OROBOROS INSTRUMENTS
high-resolution respirometry

Oxygraph-2k



Schöpfstrasse 18
A-6020 INNSBRUCK, Austria
Tel/Fax: +43 512 566796
E-mail: instruments@orooboros.at
Homepage: <http://www.orooboros.at>
Cooperation and Feedback in Science

Participants

Bach Jeppe, Department of Medical Physiology, The PANUM Institute, Denmark 2200 Copenhagen; jeppebach@mfi.ku.dk

Beck Thomas, Department of Medical Physiology, The PANUM Institute, Denmark 2200 Copenhagen; tbeck@mfi.ku.dk

Carmona Orozco Maria, Institut Louis Bugnard, 31432 Toulouse, France; carmen.carmona@toulouse.inserm.fr

Garedew Assegid, OROBOROS INSTRUMENTS, Schöpfstr. 18, A-6020 Innsbruck, Austria; assegid.garedew@orooboros.at

Gnaiger Erich, Innsbruck Medical University, Dept. Transplant Surgery, D. Swarovski Research Laboratory, Innrain 66/6, 6020 Innsbruck, Austria; and OROBOROS INSTRUMENTS, Schöpfstr. 18, A-6020 Innsbruck, Austria; erich.gnaiger@uibk.ac.at

Hauptmann Susanne, Pharmakologisches Institut für Naturwissenschaftler, Universität Frankfurt, Biozentrum Niederursel, 60439 Frankfurt am Main, Germany; sannehau@web.de

Haffner Brigitte, OROBOROS INSTRUMENTS, Schöpfstr. 18, A-6020 Innsbruck, Austria; brigitte.haffner@orooboros.at

Hahn Dagmar, Institut für Klinische Chemie, Inselspital, 3010 Bern, Switzerland; dagmar.hahn@insel.ch

Hütter Eveline, Institute for Biomedical Aging Research, Austrian Academy of Sciences, 6020 Innsbruck, Austria; eveline.huetter@oeaw.ac.at

Kaczor Jan, Hamilton Health Sciences, McMaster Hospital, Hamilton Ontario L8N 3Z5, Canada; kaczorj@univmail.cis.mcmaster.ca

Loffhagen Norbert, Umweltforschungszentrum, Leipzig/Halle GmbH, Sektion Umweltmikrobiologie, D-04318 Leipzig, Germany; norbert.loffhagen@ufz.de

Müller Andrea, UFZ-Centre f. Environmental Research Leipzig-Halle Ltd., Dept. of Human Exposure Research a. Epidemiology, D-04318 Leipzig, Germany; a.mueller@ufz.de

Pichova Alena, Institute of Microbiology, Czech Academy of Sciences, CZ-142 20 Praha 4; pichova@biomed.cas.cz

Raboel Rasmus, Huidoure Hospital, Dept. of Endocrinology, DK-2650; rraboel@dadlnet.dk

Schulz Kathrin, Pharmakologisches Institut für Naturwissenschaftler, Universität Frankfurt, Biozentrum Niederursel, 60439 Frankfurt am Main; Kathrin.Schulz@em.uni-frankfurt.de