



## Oxygraph-2k

Mitochondrial Physiology Network 03.03: 1-22 (2013)

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## International Oxygraph Courses (IOC) on high-resolution respirometry since 1991

### **IOC00. 6th International Symposium on Microcalorimetric Applications in Biology, Schröcken, September 9-12, 1988.**

The laboratory model - the Cyclobios Oxygraph - was presented, with novel features of Peltier temperature regulation, electronically controlled magnetic field stirrer, digital output, and exclusion of materials with high oxygen solubility, such as Teflon or perspex.

Published in: *Physiological and Biochemical Microcalorimetry* (Gnaiger E, ed) *Veröffentl. Univ. Innsbruck* 168: 58-59 (1988).

### **IOC01. Innsbruck, University (AT) 1991, July 21-29: International summer course Innsbruck. Calorimetry, respirometry, and biological energetics: from the organelle to the organism.**

MiPNet-IOC01

Lecturers: Brian L. Bayne (Plymouth Marine Laboratory, UK); Erich Gnaiger (Univ. Innsbruck, AT); Lena Gustafsson (Univ. Gothenberg, SE); Steven C. Hand (Univ. Colorado, Boulder, US); Peter Hochachka (Univ. British Columbia, Vancouver, CA); Ismo J. Holopainen (Univ. Joensuu, FI); Lighton John (Utah, US); Aimo Oikari (Univ. Joensuu, FI); Urs von Stockar (Swiss Federal Inst. Technol., Lausanne, CH); Wolfgang Wieser (Univ. Innsbruck, AT).

Participants (international and national): Aalto Sari (Joensuu, FI); Albeis Bert (Neuherberg, DE); Anlauf Andreas (Köln, DE); Berger Elisabeth (Vienna, AT); Bochdanský Alexander (Vienna, AT); Capelli Carlo (Udine, IT); Finn Roderick Nigel (Bergen, NO); Fritzsche Dirk (Rostock, DE); Gamenick Inez (Hamburg, DE); Geiger Walter (Mondsee, AT); Van Ginneken V.J.G. (Leiden, NL); Hamburger Kirsten (Hillerod, DK); Hardewig Iris (Düsseldorf, DE); Helminen Harri (Turku, FI); Hokkanen Timo (Joensuu, FI); Karasowa Jitka (Prague, CZ); Karjalainen Juha (Joensuu, FI); Keckeis Hubert (Vienna, AT); Kidawa Anna (Konopnickiey, PL); Koop Jochen (Düsseldorf, DE); Kukkonen Jussi (Joensuu, FI); Larsson Christer (Lausanne, CH); Mäkelä Petteri (Joensuu, FI); Menoud Laurent (Lausanne, CH); Messana Giuseppe (Firenze, IT); Ortel Johanna (Vienna, AT); Penttinen Olli-Pekka (Joensuu, FI); Saariko Jarmo (Joensuu, FI); Schiedek Doris (Münster, DE); Schneider Anke (Düsseldorf, DE); Schneeweisz Bruno (Vienna, AT); Schultze-Motel Paul (Berlin, DE); Steeger Hans-Ulrich (Düsseldorf, DE); Vanura Katrina (Tulln, AT).

Participants (Univ. Innsbruck): Burgstaller Wolfgang; Dalla Via Josef; Dallinger Reinhard; Flandorfer Astrid; Gruber Alexandra; Insam Herbert; Moore Christian; Schwarzbach Pablo; Thomaser Astrid; Wappler Edwin; Zanella A.

Collaborators: Haller Thomas; Krotthammer Manfred; Krumschnabl Gerhard; Méndez Gabriela; Ortner Martin; Reck Michael; Reindl Sonja; Rieger Gunde; Steinlechner Rosmarie.

International Oxygraph Seminar Series EU Project COMETT II-C: Metabolic Energetics Research Group in Europe (MERGE). Organizer: E. Gnaiger

**IOC02. Innsbruck, University (AT) 1992, July 6-7: High-resolution respirometry: instrumental design, function, and application in biomedical energetics.**

Lectures:

- Gnaiger Erich (Univ. Innsbruck, AT): Design, function and an overview on applications of the CYCLOBIOS/OROBOROS Oxygraph.
- Reck Michael, Gnaiger Erich (Univ. Innsbruck, AT): DatGraf 2.0 Analysis: An overview for the analysis of Oxygraph data in bioenergetics.
- Brdiczka Dieter (Univ. Konstanz, DE): The importance of the outer mitochondrial compartment for the regulation of respiration and oxidative phosphorylation.
- Gnaiger Erich, Mendez Gabriela, Steven Hand (Univ. Innsbruck, AT; Univ. Colorado, Boulder, US): Mitochondrial respiratory control: Steady state and initial rate measurements by stopped flow and injection respirometry and microcalorimetry.
- Gellerich Frank (Medizinische Akademie, Magdeburg, DE): Application of the Oxygraph for the determination of flux control coefficients of mitochondrial enzymes.
- Haller Thomas (Univ. Innsbruck, AT): Effects of mitochondrial density and BSA on respiratory control. A methodological Oxygraph study.
- Steinlechner Rosmarie (Univ. Innsbruck, AT): Oxygen dependence of respiration: Diffusion limitation versus down-regulation in coupled and uncoupled gill tissue of marine mussels.

Participants: Fiebich Karin (GSF München, DE); Germann Klaus (Paar, Graz, AT); Karasová Jitka (Charles Univ. Prague, CZ); Kasper Karin (Med. Klin. Graz, AT); Konwalinka Günther (Univ. Hospital Innsbruck, AT); Koukol (Centec, Hanau, DE); Krewedl Günter (Oberstufenrealgymnasium, Volders, AT); Nittinger Jürgen (Univ. Hohenheim, Stuttgart, DE); Ölz Regine (Univ. Göteborg, SE); Oertl Michael (Univ. Innsbruck, AT); Ulrike Wicker (Univ. Konstanz, DE).

**IOC03. Bordeaux-Bombannes (FR) 1992, Sept 24-28: Advances in metabolic and biomedical research. Respirometric and calorimetric instrumentation (Satellite to 5<sup>th</sup> BTK Meeting).**

Lectures:

- Soboll Sibylle, Conrad Annette (Univ. Düsseldorf, DE): Regulation of mitochondrial creatine kinase in rat heart mitochondria.
- Clark Joseph F (Univ. Oxford, GB): Heart mitochondrial response to the creatine analogue  $\beta$ -GPA.
- Gellerich Frank (Medizinische Akademie, Magdeburg, DE): Effect of dextrans on the kinetic properties of mitochondrial creatine kinase.
- Brdiczka Dieter (Univ. Konstanz, DE): Regulation of the outer membrane pore protein by transmembrane potential and macromolecules.
- Kuznetsov Andrey (Medizinische Akademie, Magdeburg, DE): Functional investigation of oxidative phosphorylation in isolated human muscle mitochondria and skinned muscle fibers.
- Kunz Wolfram S (Medizinische Akademie, Magdeburg, DE): Flux control in oxidative phosphorylation: The load of phosphate and load enzyme properties.
- Méndez Gabriela, Gnaiger Erich (Univ. Innsbruck, AT): Respiratory control by phosphate and adenylates in rat liver mitochondria: an experimental follow-up with stopped-flow respirometry after the MEGEshop in Vienna.
- Nicolay Klaas, Laterveer F, van Dorsten F, van der Toorn A (Univ. Utrecht, NL): The communication between the cytosolic and mitochondrial branches of energy metabolism.

- Hoerter Jacqueline A, Guiglio-Crouzet M, Mateo P (Université Paris-Sud, FR): Sarcolemmal inorganic phosphate transport and cardiac contractility:  $^{31}\text{P}$  NMR evidence of  $\text{P}_i$  influx in the perfused heart.
- Schuster R, Portais JC, Canioni P (Humboldt-Univ. Berlin, DE; CNRS and Univ. Bordeaux II, FR): Calculation of metabolic fluxes from NMR spectroscopy data. Mathematical modelling of carbon-13 distribution in intermediary metabolism.

Participants: J.P. Axelsson JP (Kabi Pharmacia, Stockholm, SE); Azzone GF (Univ. Padova, IT); Dilley RA (Purdue Univ., West Lafayette, US); Falkner Gernod (Institut Limnol. Mondsee, AT); Gustafsson Lena (Univ. Göteborg, SE); Kell Douglas (Univ. Coll. Wales, UK); Kessler A (Univ. Bonn, DE); Mazat Jean-Pierre (Univ. Bordeaux II, FR); Ribay F (Roucaire, Velizy Villacoublay, FR); Ventura-Clapier Renée (Université Paris-Sud, FR); Wyss Markus (ETH Zürich, CH).

#### **IOC04. Innsbruck, University Hospital (AT) 1992, Oct 28: Exogenous and endogenous limitation of oxidative phosphorylation: hypoxia and mitochondrial defects.**

Lecturers and participants: Gellerich Frank (Medizinische Akademie, Magdeburg, DE); Gnaiger Erich (Univ. Innsbruck, AT); Hackl (Univ. Hospital Innsbruck, AT); Haisjackl Markus (Univ. Hospital Innsbruck, AT); Hasibeder Walter (Univ. Hospital Innsbruck, AT); Lanznaster Norbert (Univ. Hospital Innsbruck, AT); Lutz Gabriela (Univ. Hospital Innsbruck, AT); Luvisetto Siro (Univ. Padova, IT); Oertl Michael (Univ. Innsbruck, AT); Pfaller Walter (Univ. Innsbruck, AT); Plattner Robert (Univ. Hospital Innsbruck, AT); Schneider Michaela (Univ. Hospital Innsbruck, AT); Reinhard Schranzhofer (Univ. Hospital Innsbruck, AT); Sperl Wolfgang (Univ. Hospital Innsbruck, AT); Steinlechner Rosmarie (Univ. Innsbruck, AT); Widschwendter Martin (Univ. Hospital Innsbruck, AT)

#### **IOC05. Aberystwyth, University of Wales (UK) 1993, March 1-3: Metabolic energetics in ecological, cellular and biomedical research.** MiPNet-IOC05

Local organizer: Richard B Kemp

##### **1. Methods in Biological Calorimetry and Respirometry**

- Gnaiger Erich (Univ. Innsbruck, AT): Design, function and an overview on applications of the OROBOROS Oxygraph.
- Gnaiger Erich (Univ. Innsbruck, AT), Kemp Richard B (University of Wales, Aberystwyth, UK): Design, function and an overview on biological applications of the ThermoMetric Thermal Activity Monitor.
- Kemp Richard B (University of Wales, Aberystwyth, UK): The potential of calorimetric measurements in the analysis of growth by cultured animal cells.
- Gnaiger Erich, Mendez Gabriela (Univ. Innsbruck, AT): The measurement of P/O ratios in isolated mitochondria: High-resolution ADP pulse respirometry versus stopped-flow respirometry.
- Kemp Richard B (University of Wales, Aberystwyth, UK): Aerobic and anaerobic metabolism in cultured mammalian cells.
- Gnaiger Erich, Steinlechner Rosmarie (Univ. Innsbruck, AT): Oxygen dependence of respiration: Oxygen limitation and down-regulation.
- Gnaiger Erich, Mendez Gabriela (Univ. Innsbruck, AT): Efficiency of oxidative phosphorylation under severe hypoxia: A novel approach by oxygen injection calorimetry.

##### **2. Biological Applications of Mass Spectroscopy**

- Lloyd David (University of Wales, Cardiff, UK): Membrane inlet quadrupole mass spectroscopy for the measurement of biological gas exchange.
- Benstend Julie (University of Wales, Cardiff, UK): On the measurement of gaseous exchange in methanogenic systems.
- Goodacre Roy, Neal MJ, Kell Douglas B (University of Wales, Aberystwyth, UK): Who's there? Quantification and classification of biological systems using pyrolysis mass spectroscopy and neural networks.

**3. Dielectrics**

- Pethig Ronald (University of Wales, Bangor): Dielectrophoresis.
- Davey CL, Kell Douglas B (University of Wales, Aberystwyth, UK): Dielectrics and the quantification of microbial biomass.

**4. Instrument and software demonstrations**

- OROBOROS Oxygraph and DatLab. Erich Gnaiger, Innsbruck.
- Thermal Activity Monitor and DIGITAM, ThermoMetric. Bob Taylor, Northwich.
- GEPASI, Metabolic Simulator. P. Mendes, Aberystwyth.
- Biomass Monitor. Aber Instruments Ltd., Aberystwyth. Douglas Kell, Aberystwyth.

**IOC06. Neuherberg, München, GSF (DE) 1993, Dec 01: Calorimetry and respirometry in ecology and microbiology.**

Lecturers: Braun-Lüllemann Annette (Univ. Göttingen, DE); Fiebich Karin (GSF, Neuherberg, DE); Gnaiger Erich (Univ. Innsbruck, AT); Meier-Schneiders (Univ. Stuttgart, DE); Taubmann Henry (C3-Analysetechnik, Baldham, DE).

**IOC07. Utrecht, University (NL) 1994, Feb 13-15: Introduction to high-resolution respirometry in mitochondrial and cellular research.**

Local organizer: Klaas Nicolay

Lecturers: Gellerich Frank (Univ. Hospital Innsbruck, AT); Gnaiger Erich (Univ. Hospital Innsbruck, AT).

**IOC08. Innsbruck, University Hospital (AT) 1994, March 4-8: Exogenous and endogenous limitation of oxidative phosphorylation: hypoxia and mitochondrial defects.**

MiPNet-IOC08

Lectures:

- Sperl Wolfgang (Univ. Hospital Innsbruck, AT): Clinical bioenergetics and mitochondrial diagnosis: introduction.
- Gnaiger Erich (Univ. Hospital Innsbruck, AT): Oxygraph design and function - basis for high-resolution respirometry.
- Gellerich Frank (Univ. Hospital Innsbruck, AT): Mitochondrial respiration in small samples of muscle tissue.
- Kunz Wolfram S (Univ. Magdeburg, DE): Oxygraphic determination of mitochondrial defects in human mononuclear cells.
- Saltin Bengt (The Copenhagen Muscle Research Center, Copenhagen, DK): Athletic performance and mitochondrial function.
- Gnaiger Erich (Univ. Hospital Innsbruck, AT): P/O ratios and efficiency in mitochondrial oxidative phosphorylation.
- Ruitenbeek Wim (Academic Hospital Sint Radboud, Nijmegen, NL): A review on radiochemical methods for functional evaluation of oxidative phosphorylation.
- Scholte HR (Erasmus University, Rotterdam, NL): Polarography in the diagnosis of mitochondrial myopathies. A review.

Participants: Bangsbo Jens (August Krogh Institute, Univ. Copenhagen, DK); Barash Varda (Hadassah University Hospital, Jerusalem, Israel); Deufel T (Univ. Münster, DE); Eberl Thomas (Univ. Hospital Innsbruck, AT); Endres Wolf (Univ. Hospital Innsbruck, AT); Fischer Johan C (Wilhelmina Children's Hospital, Utrecht, NL); Germann Klaus (Paar, Graz, AT); Honzak Lidija (School of Medicine, Ljubljana, Slovenia); Knoblichner Anton (Univ. Hospital Innsbruck, AT); Koller Arnold (Univ. Hospital Innsbruck, AT); Krummschnabel Gerhard (Univ. Innsbruck, AT); Kvittingen Elianne (Rikshospitalet, Oslo, NO); Lanznaster Norbert (Univ. Hospital Innsbruck, AT); Nittinger Jürgen (Univ. Hohenheim, Stuttgart, DE); Parise Graziano Giuseppe (University of Florence, Udine, IT); Schulze Andreas (Klinikum der Universität Heidelberg, DE); Skladal Daniela (Univ. Hospital Innsbruck, AT); Steinlechner Rosmarie (Univ. Hospital

Innsbruck, AT); Trettnak Wolfgang (Joanneum Research; Graz, AT); Wendel Udo (Academic Hospital Sint Radboud, Nijmegen, NL); Wyss Markus (Univ. Hospital Innsbruck, AT).

### **IOC09. Innsbruck, University Hospital (AT) 1994, June 1-3: High-resolution respirometry and microcalorimetry in bioenergetic studies of hypoxic cells.** MiPNet-IOC09

Lectures:

- Gnaiger Erich (Univ. Hospital Innsbruck, AT): Oxygraph design and function - basis for high-resolution respirometry.
- Steinlechner Rosmarie (Univ. Hospital Innsbruck, AT): Respiration in cultured endothelial cells. Stability of oxygen flux and dependence on oxygen pressure.
- Gnaiger Erich, Steinlechner Rosmarie (Univ. Hospital Innsbruck, AT): Oxygraph calibration and the importance of basal corrections in high-resolution respirometry at low  $pO_2$ .
- Wyss Markus, Gnaiger Erich (Univ. Hospital Innsbruck, AT): High time resolution in Oxygraph respirometry. Determination of the time constant and the importance of time corrections in kinetic studies.
- Gustafsson Lena (Univ. Göteborg, SE): Microcalorimetry and respirometry in yeast cells in various oxidative and fermentative states.
- Rigoulet Michel (IBGC-CNRS, Bordeaux, FR): Control of oxidative phosphorylation in yeast.
- Kemp Richard B (Univ. Wales, Aberystwyth, UK): The value of the calorimetric/respirometric ratio in metabolic and toxicological studies of cultured mammalian cells.
- Gellerich Frank (Univ. Hospital Innsbruck, AT): Respirometry of human tissues for studies of mitochondrial function and defects.

Participants: Knobloch Anton (Univ. Hospital Innsbruck, AT); Larsson Christer (Univ. Göteborg, SE); Leverve Xavier (Université J Fourier, Grenoble, FR); Skladal Daniela (Univ. Hospital Innsbruck, AT); Striedner Johannes (Umweltbundesamt Klagenfurt, AT); Weber Max (IG Zürich, CH).

### **6<sup>th</sup> BioThermoKinetics (BTK) Meeting: *What is Controlling Life?***

#### **IOC10. Schröcken (AT) 1994, Sept 20-25: Lectures on high-resolution respirometry and OROBOROS Oxygraph demonstration during the BTK meeting.**

Lectures published in: *What is Controlling Life? 50 Years after Erwin Schrödinger's What is Life?* (Gnaiger E, Gellerich FN, Wyss M, eds) Modern Trends in BioThermoKinetics 3. Innsbruck Univ. Press (1994).

- Gellerich FN, Laterveer FD, Gnaiger E, Nicolay K (1994) Effect of macromolecules on ADP-transport into mitochondria: 181-185.
- Méndez G, Gnaiger E (1994) How does oxygen pressure control oxygen flux in isolated mitochondria? A methodological approach by high-resolution respirometry and digital data analysis: 191-194.
- Gellerich FN, Steinlechner R, Wyss M, Eberl T, Müller LC, Skladal D, Sperl W, Dapunt O, Margreiter R, Gnaiger E (1994) Mitochondrial function in the atrial appendage of the human heart. Characterization by high-resolution respirometry: 263-267.
- Skladal D, Sperl W, Schranzhofer R, Krismer M, Gnaiger E, Margreiter R, Gellerich FN (1994) Preservation of mitochondrial functions in human skeletal muscle during storage in high energy preservation solution (HEPS): 268-271.
- Steinlechner R, Eberl T, Margreiter R, Gnaiger E (1994) Oxygen dependence of cellular respiration in endothelial cells: A sensitive toxicological test: 283-287.

- Knoblochner A, Steinlechner R, Schirmer M, Gellerich FN, Margreiter R, Konwalinka G, Gnaiger E (1994) The effect of 2-chlorodeoxy-adenosine on endogenous respiration of a human lymphoma cell line (U-937): 294-296.
- OROBOROS. Feeding on negative entropy:316-317.

Participants: Claude Aflalo (Weizmann Institute of Science, Israel); Giovanni F. Azzone (Università di Padova, IT); Barbara M. Bakker (University of Amsterdam, NL); Paolo Bernardi (Università di Padova, IT); Vilma Borutaitė (Kaunas Medical Academy, Lithuania); Guy C. Brown (University College of London, UK); Marcella Canton (Università di Padova, IT); Johan Hendrik Daams (The Netherlands Cancer Institute, Amsterdam, NL); M. J. Dauncey (The Babraham Institute, Cambridge, UK); Oleg Demin (Moscow State University, RU); Philippe H. Dioloz (Résonance Magnétique des Systèmes Biologiques, Bordeaux, FR); Jerzy Duszynski (Nencki Inst. Experimental Biology, Warsaw, PL); Thomas Eberl (University Hospital of Innsbruck, AT); Gernot Falkner (Österr. Akademie der Wissensch., Salzburg, AT); David A. Fell (Oxford Brookes University, UK); Itzhak Fishov (Ben-Gurion University of the Negev, Israel); Frank Gellerich (University Hospital of Innsbruck, AT); Christoph Giersch (Technische Hochschule Darmstadt; DE); Erich Gnaiger (University Hospital of Innsbruck, AT); Johann Götschl (Ludwig-Boltzmann-Institut für Wissenschaftsforschung, Graz, AT); Philip Groeneveld (Vrije Universiteit de Boelelaan, Amsterdam, NL); Yue Guan (University of Sheffield, UK); Myriam Guiral (Free University Hospital, Amsterdam, NL); Thomas E. Gunter (Univ. Rochester Medical Center, US); Lena Gustafsson (University of Göteborg, SE); Steven C. Hand (University of Colorado, Boulder, US); Reinhart Heinrich (Humboldt Universität Berlin, DE); Mae-Wan Ho (Open University, Milton Keynes, UK); Jacqueline A Hoerter (Univ. Paris-Sud, FR); Jan-Hendrik S Hofmeyr (University of Stellenbosch, South Africa); Günther Höhne (Universität Ulm, DE); Hermann Georg Holzhütter (Humboldt Universität Berlin, DE); Francois Ichas (Université Bordeaux II, FR); Jeroen AL Jeneson (Univ. Washington Medical Center, Seattle, US); Peter R Jensen (Technical Univ. Denmark, Lyngby, DK); Sophie Jouaville (Université Bordeaux II, FR); Douglas B Kell (Univ.Wales, Aberystwyth, UK); Richard B. Kemp (Univ.Wales, Aberystwyth, UK); Christiane Keriel (Université J. Fourier, Grenoble, FR); Boris N Kholodenko (Moscow State University, RU); Martin Klingenberg (Univ. München, DE); Anton Knoblochner (University Hospital Innsbruck, AT); Bernard Korzeniewski (Jagiellonian University Cracovia, Krakow, PL); Ralf Krause (Humboldt Univ. Berlin, DE); Wolfram S Kunz (Universitätsklinikum, Magdeburg, DE); Martin J. Kushmerick (Univ. Washington Medical Center, Seattle, US); Andrey V Kuznetsov (Universitätsklinikum, Magdeburg, DE); Kurt Kwast (Univ. Colorado, Boulder, US); Christer Larsson (Univ. Göteborg, SE); Fanny D Laterveer (Univ. Utrecht, NL); Thierry Letellier (Université Bordeaux II, FR); Xavier H Leverve (Université J. Fourier, Grenoble, FR); T Yu Lipskaya (Moscow State University, RU); Siro Luvisetto (Univ. Padova, IT); Ron Makins (Univ. Cambridge, UK); Monique Malgat (Université Bordeaux II, FR); Stephen Manon (CNRS, Bordeaux, FR); Achim Marx (Research Center Jülich, DE); Anita Matthias (Univ. Tasmania, Australia); Jean-Pierre Mazat (Université de Bordeaux II, FR); Jiri A Mejsnar (Charles University Prague, CZ); Pedro Mendes (Univ. Wales, Aberystwyth, UK); Geza Meszéna (Eötvös University, Budapest, HU); Vida Mildaziene (Kaunas Medical Academy, Lithuania); Joao PC Moniz Barreto (Oxford Brookes University, UK); Flavia Nicoletti (University of Rome La Sapienza, IT); Konrad Oexle (Humboldt-Universität Berlin, DE); Dagmar Piccinelli Siliprandi (Univ. Padova, IT); Patti A Quant (Univ. Cambridge, UK); Jörn Quedenau (Humboldt Univ. Berlin, DE); Michel Rigoulet (CNRS, Bordeaux, FR); Johann M Rohwer (Univ. Amsterdam, NL); Valdur Saks (Institute Chemical Physics Biophysics, Tallinn, Estonia); Jürgen S Schawe (Universität Ulm, DE); Wolfgang Schellenberger (Univ. Leipzig, DE); Ibolya Schmehl (Univ. Padova, IT); Gisela Schneider-Picard (Schopp, DE); Ronny

Schuster (Humboldt Univ. Berlin, DE); Stefan Schuster (Humboldt Univ. Berlin, DE); Jan Siegenbeek van Heukelom (Univ. Amsterdam, NL); Noris Siliprandi (Univ. Padova, IT); Jacky L Snoep (The Netherlands Cancer Institute, Amsterdam, NL); Sibylle Soboll (Univ. Düsseldorf, DE); Rosmarie Steinlechner (University Hospital Innsbruck, AT); Bas Teusink (Univ. Amsterdam, NL); Simon Thomas (Oxford Brookes University, UK); Adolfas Toleikis (Biomedical Research Institute, Kaunas, Lithuania); Ton van der Gugten (The Netherlands Cancer Institute, Amsterdam, NL); Wally C. van Heeswijk (Univ. Amsterdam, NL); Bart J. van Rotterdam (Univ. Amsterdam, NL); Henk W van Verseveld (Vrije Universiteit, Amsterdam, NL); Urs von Stockar (Swiss Federal Institute of Technology, Lausanne, CH); Jorge Wagensberg (Museu de la Ciència, Barcelona, ES); G Rick Welch (Univ. New Orleans, US); Hans V. Westerhoff (The Netherlands Cancer Institute, Amsterdam, NL); Wolfgang Wiechert (Research Center Jülich, DE); Markus Wyss (University Hospital Innsbruck, AT); Brigitte Zentgraf (Fachhochschule Furtwangen, Villingen-Schwenningen, DE).

International Oxygraph Seminar Series COMETT II-C: Metabolic Energetics Research Group in Europe (MERGE). Organizer: E. Gnaiger

**IOC11. Grenoble, Université J Fourier (FR) 1995, Feb 13-18: High-resolution respirometry in bioenergetic studies of O<sub>2</sub> and ADP kinetics in mitochondria and cells.**

Local organizer: Xavier Leverve

Lectures:

- Gnaiger Erich (Univ. Hospital Innsbruck, AT): High-resolution respirometry for the determination of the oxygen dependence in isolated mitochondria and endothelial cells.
- Gellerich Frank (Neurol. Clinic, Halle, DE): Effect of macromolecules on ADP-transport in mitochondria.
- Rigoulet Michel (IBGC-CNRS, Bordeaux, FR): Mitochondrial energetics and osmolarity.
- Saks Valdur (Université J Fourier, Grenoble, FR): The skinned fiber technique in fundamental science and practical medicine.
- Morel F (Université J Fourier, Grenoble, FR): Oxydase complexes in B-EBV phagocytes-lymphocytes.
- Douce R (Université J Fourier, Grenoble, FR): Influence of a copper deficiency on mitochondrial metabolism in plants.
- Favier A (Université J Fourier, Grenoble, FR): Effect of redox potential on transcriptional factors.

**IOC12. Bordeaux (FR) 1996, Oct 22-23: Microcalorimetry and CaloRespirometry workshop.**

Local organizer: Michel Rigoulet

Lecturers: Bacri (ThermoMetric, Grenoble, FR); Gnaiger Erich (Univ. Hospital Innsbruck, AT); Gustafsson Lena (Univ. Göteborg, SE).

**IOC13. Innsbruck, University Hospital (AT) 1997, May 9-16: Workshop on high-resolution respirometry.**

- 1. Respiratory Control by Oxygen: Molecular Structure to Cellular Integration.**
  - Cooper Chris E (Univ. Essex, UK): Non-invasive measurements of respiratory control by oxygen in patients and animal models.
  - Kuznetsov Andrey, Gnaiger Erich (Oroboros, and University Hospital Innsbruck, AT): Diffusion limitation of oxygen versus ADP in permeabilized muscle fibers.

- Gnaiger Erich, Lassnig Barbara, Kuznetsov Andrey (University Hospital Innsbruck, AT): Mitochondrial and cellular respiratory control by oxygen at high flux.
  - Beauvoit Bertrand, Rigoulet Michel (CNRS Bordeaux, FR): Control and regulation of the yeast cytochrome oxidase: role of subunit VIa.
  - Wikström Marten (Univ. Helsinki, FI): The respiratory enzyme - an oxygen-utilizing molecular machine.
  - Gnaiger Erich (University Hospital Innsbruck, AT): Mitochondrial oxygen affinity and zero oxygen calibration at the limit of detection.
  - Bourgois Jean-Jacques (Univ. Catholique de Louvain, Louvain-la-Neuve, BE): New insights into the role of oxygen in bacterial bioluminescence.
  - Stubauer Gottfried, Seppi Thomas, Obendorf Dagmar, Lukas P (Univ. Innsbruck, University Hospital Innsbruck, AT): Monitoring of oxygen at the picomolar level by HPLC-EC.
- 2. Mitochondrial Respiratory Control - Clinical Perspectives.**
- Mazat Jean-Pierre (Univ. Bordeaux II and IBCN-CNRS, FR): The use of permeabilized fibers for the diagnosis of mitochondrial diseases.
  - Kuznetsov Andrey (Oroboros, Innsbruck, AT): Alteration of mitochondrial function in mutant mice: Animal models for myopathies.
  - Kunz Wolfram S (Otto-von-Guericke-Universität, Magdeburg, DE): Evaluation of mitochondrial function in biopsies of patients with neuromuscular disorders - Clinical perspectives.
  - Skladal Daniela (University Hospital Innsbruck, AT): Case reports from pediatric patients with neuromuscular disorders.
  - Bittner Reginald (Univ. Vienna, AT): The genotype-phenotype paradox in respiratory diseases.
  - Skår Gry (Rikshospitalet, Univ. Oslo, NO): Establishing high resolution respirometry-studies of the respiratory chain in diabetes and methanol poisoning.
  - Gnaiger Erich, Rieger Gunde, Kuznetsov Andrey, Fuchs Anita, Stadlmann Sylvia (University Hospital Innsbruck, and Oroboros, AT): Mitochondrial function as a probe for cell membrane damage and respiratory defects in ischemia/reperfusion injury.
- 3. Course on Metabolic Control Analysis.**
- Visiting professor: Mazat Jean-Pierre (Univ. Bordeaux II and IBCN-CNRS, FR)
- Metabolic control analysis (MCA): an intuitive view and a simple example.
  - Experimental determination of control coefficients: oxidative phosphorylation as an example.
  - Linear (matrix) algebra used in MCA.
  - General theory of metabolic control analysis.
  - Application of MCA to mitochondrial diseases: the threshold effect.
- Participants: Bader Charles (C.M.U. Geneva, CH); Bernheim Laurent (C.M.U. Geneva, CH); Bijlenga Philippe (C.M.U. Geneva, CH); Davies Nathan (Univ. Essex, UK); Kirty Denise (Royal Children's Hospital, Melbourne, AU); Rossignol Rodrigue (Univ. Bordeaux II and IBCN-CNRS, FR); Sass Joern-Oliver (University Hospital Innsbruck, AT); Sharpe Martyn (Univ. Essex, UK); Trinkel Martina (Joanneum Research, Graz, AT).

## International Courses and Workshops on High-Resolution Respirometry

### **IOC14. Innsbruck, University Hospital (AT) 1998, May 5-7: High-resolution respirometry and mitochondrial bioenergetics: clinical and physiological perspectives.**

Lectures:

- Enn Seppett (Dept. Pathophysiology, Univ. Tartu, Estonia): Postnatal regulation of mitochondrial respiration in rat cardiac cells.



- Andrey Kuznetsov (Oroboros, Innsbruck, AT): High-resolution respirometry in the diagnosis of mitochondrial diseases: Cryoprotection of mitochondrial function in human biopsy samples.
- Richard Porter (Trinity College Dublin, Ireland): The efficiency of energy metabolism in mammals.
- Barbara Lassnig (Univ. Hospital Innsbruck, AT): Oxygen kinetics of cytochrome c oxidase versus the mitochondrial respiratory chain.
- Erich Gnaiger (Univ. Hospital Innsbruck, AT): Mitochondrial ischemia-reoxygenation injury. A study with permeabilized endothelial cells.

Participants: Janssens Dominique (Laboratoire de Biochimie Cellulaire, Namur, BE); Schmid Dirk (Universitätsklinikum Charite, Berlin, DE); Ter Veld Frank (Univ. Utrecht, NL). Further collaborators: Anita Fuchs, Kathrin Renner, Gunde Rieger.

**IOC15. Innsbruck, University Hospital (AT) 1998, Sept. 10-11: High-resolution respirometry workshop.**

**IOC16. Innsbruck, University Hospital (AT) 1998, Dec. 10: High-resolution respirometry and standardization of techniques with permeabilized muscle fibers.**

Lectures:

- Erich Gnaiger (Univ. Hospital Innsbruck, AT): Respirometric Diagnosis of Mitochondrial Diseases, Pathological and Physiological States - Is Standardization Required and Possible?
- Andrey Kuznetsov (Oroboros, Innsbruck, AT): Comparison of Approaches to Respirometric Diagnosis of Mitochondrial Diseases and Preservation Injury in Skeletal and Cardiac Muscle.
- Josef Houstek (Prague, CZ): ELFO analysis of OXPHOS complexes in fibroblasts and cybrids using mitoplasts fraction prepared by digitonin treatment.

Round Table: Interlaboratory Study On Muscle Biopsies.

- Muscle fiber (orthopedic controls or rat model) and preparation technique.
- Biopsy preservation solution with protection of mitochondrial function.
- Respiration media and incubation temperature.
- Substrate/inhibitor titration regimes for mitochondrial enzyme complexes.

Participants: Florence Appaix (Grenoble, FR); Olivier Boulat (Lausanne, CH); Carla Bovina (Bologna, IT); Zdenek Drahotka (Prague, CZ); Antonio Faundez (Geneva, CH); Gabriella Formiggini (Bologna, IT); Erich Gnaiger (Innsbruck, AT); Josef Houstek (Prague, CZ); Hana Houstekova (Prague, CZ); Andrey Kuznetsov (Innsbruck, AT); Hans Mayr (Salzburg, AT); Andreas Schulze (Heidelberg, DE); Daniela Skladal (Innsbruck, AT).

**IOC17. Copenhagen, Copenhagen Muscle Research Centre, Institute of Sport and Exercise Sciences, August Krogh Institute, Univ. Copenhagen (DK) 1999, Aug. 23-28: Ph.D course "Oxygen utilization in skeletal muscle".**

Local organizers: Bengt Saltin, Jens Bangsbo

**High-resolution respirometry: muscle mitochondrial respiration and mitochondrial capacity studied *in vitro*.**

Aim: The aim of the course is to provide the students with an up-to-date knowledge of oxygen utilization in skeletal muscle via lecturing and discussions with international specialists on mitochondrial respiration and microcirculation. The course will, moreover, focus on techniques to study muscle oxygen utilization, such as isolation of mitochondria, preparation of permeabilized fibres, determinations of microcirculatory flow and assessment of local oxygen uptake in muscle of man.

## Lectures:

*Regulation of skeletal muscle blood flow*

- Interactions Between Muscle Fibers and Microvessels (S. Segal)
- Cell-to Cell Communication in Blood Flow Control (S. Segal)

*Regulation of muscle oxygen consumption*

- Role of Nitric Oxide in the Regulation of Oxygen Consumption in Heart and Skeletal Muscle (T. Hintze)
- Muscle O<sub>2</sub> unloading at VO<sub>2</sub>max (P. Wagner)
- Control of Mitochondrial Respiration at Physiological Oxygen Levels (E. Gnaiger)
- Myoglobin Measurements: Access to Cellular PO<sub>2</sub> (R. Richardson)
- Muscle oxygen supply and utilization – perspectives (B. Saltin and P. Wagner)

Course: *Muscle mitochondrial respiration studied in vitro*

## A: E. Gnaiger

- High-resolution respirometry – the OROBOROS Oxygraph: Polarographic oxygen sensor, measuring unit, electronic control.
- DATLAB Acquisition – 1: Calibration of oxygen concentration and test of instrumental time resolution.
- What is different in high-resolution respirometry? From instrumental design (overview) to instrumental control experiments (demonstration).
- DATLAB Analysis - 1: Calibration and instrumental background.
- Permeabilized muscle fiber (rat soleus): Fiber preparation, permeabilization by saponin; DATLAB Acquisition – 2: On-line recording of ADP-stimulated oxygen flux.
- Experimental evaluation of oxygen diffusion limitation in the permeabilized muscle fiber preparation.
- DATLAB Analysis - 2: Oxygen flux with correction for instrumental background; analysis of oxygen kinetics.

## B: U. Rasmussen &amp; H. Rasmussen

- Briefing on mitochondrial metabolism.
- Briefing on methodology (preparation and measurements).
- Demonstration of small scale mitochondrial preparation.
- Oxygen electrode experiments with simultaneous demonstration and discussion.
- Demonstration of the small scale respiratory vessel.

## C: E. Gnaiger, U. Rasmussen &amp; H. Rasmussen

- Evaluation of experimental work.
- Muscle mitochondrial capacity.

Course: *Muscle oxygen uptake in humans* (Y. Hellsten and J. Bangsbo)

- Planning human experiment.
- Performing human experiment.
- Muscle enzyme analysis.
- Evaluation of experimental work.

**IOC18. Innsbruck, University Hospital (AT) 1999, Sept. 13-14: High-Resolution Respirometry Workshop.** MiiPNet04.06

Guest company: Optronix.

**IOC19. Innsbruck, University Hospital (AT) 2001, Oct. 4-5: Introductory course on high-resolution respirometry.**

## Lectures:

- Andrey Kuznetsov (Oroboros, Innsbruck, AT): Functional tests for tissue permeabilization and mitochondrial function.
- Kathrin Renner (Univ. Hospital Innsbruck, AT): Apoptosis and mitochondrial function in cultured cells.
- Erich Gnaiger (Univ. Hospital Innsbruck, AT): Mitochondrial respiratory control by oxygen and ADP supply.

Participants: Ursula Theißen (Düsseldorf, DE), Heimo Mairbäurl (Heidelberg, DE), Petr Pecina (Prague, CZ), Tomas Honzik (Prague, CZ), Walter Rossmannith (Vienna, AT), Karin Moser-Thier (Vienna, AT), Stefanie Jarolim (Salzburg, AT), Tamara Drakulic (Salzburg, AT), Peter Laun (Salzburg, AT).

**IOC20. Bari, University (IT) 2002, Feb. 28: Workshop on high-resolution respirometry.** MiPNet07.02

Local organizer: Sergio Papa

Lectures:

- Sergio Papa (Univ. Bari, IT): Introduction: Renaissance of respirometric analyses for new trends in mitochondrial bioenergetics.
- Erich Gnaiger (Univ. Hospital Innsbruck, AT): Mitochondrial respiration at low levels of oxygen and cytochrome c.

Instrument demonstration - OROBOROS Oxygraph: On-line lecture hall experiment.

**IOC21. Innsbruck (AT) 2002, June 12-15: Science Week Austria: High-resolution respirometry – presentation of the new Oxygraph-2k.** MiPNet07.05

Lectures:

- Erich Gnaiger (Univ. Hospital Innsbruck, AT): Mitochondrial and cellular respiratory physiology – new challenges for high instrumental performance.
- Vilma Borutaite (Univ. Cambridge, UK): Mitochondria-mediated apoptosis in ischaemic myocardium.
- Kathrin Renner, R Kofler, G Konwalinka, E Gnaiger (Univ. Innsbruck, AT): Apoptosis and mitochondrial respiratory function in T-ALL cells: Qualitative and quantitative changes.
- Eveline Hütter, K Renner, P Jansen-Dürr, E Gnaiger (Univ. Innsbruck, AT): Coupling and oxygen control in highly glycolytic primary fibroblasts.
- Jordi Bermudez (Univ. Barcelona, ES): Glycolysis depletion increased the cell resistance to oxidative stress and cytokines.
- Zuzana Cervinkova (Univ. Prague, CZ): Changes in mitochondrial membrane potential in permeabilized hepatocytes.
- Erich Gnaiger, AV Kuznetsov, D Strobl, E Ruttmann, A Königsrainer, R Margreiter (Univ. Hospital Innsbruck, AT): Mitochondrial cold preservation injury. Diagnostic respiratory regime in small biopsy-size samples of liver.
- Hans Mayr (Childrens Hospital Salzburg, AT): Mitochondrial energy metabolism - two competitive screening approaches.

Instrument demonstration: Respiration of young and aged wine – high resolution of the new Oxygraph-2k (with sommelier Egon Mark).

Participants: Breitenbach Michael (Univ. Salzburg, AT); Gullberg Hjalmar (Biovitrum, Stockholm, SE); Kucera O (Charles University Prague, CZ); Schinagl Christoph, OROBOROS, Innsbruck, AT).

**IOC22. Birmingham, University of Alabama at Birmingham (US) 2002, Oct. 28: NO workshop on high-resolution respirometry.**

Local organizers: David Kraus, Jeanette Doeller, Victor Darley-Usmar

Reference: Gnaiger E, Doller JE, Kraus D, Shiva S, Brookes PS, Darley-Usmar VM (2003) NO effect on mitochondrial oxygen kinetics at low oxygen. Oxygraph-2k workshop Report. *MiPNet* 8.12: 1-6.

## Mitochondrial Physiology Network (MiPNet) - International Courses on High-Resolution Respirometry

### **IOC23. Schröcken (AT) 2003, March 27-31: Workshop on high-resolution respirometry.** MiPNet08.02.

Reference:

- Renner K, Gnaiger E (2003) High-resolution respirometry with leukemia cells: Routine respiration, respiratory control and coupling. Oxygraph-2k workshop report, Schroecken, Austria, March 2003. *MiPNet* 8.9: 1-12.

Lectures:

- Jordi Bermudez (Univ. Barcelona, ES): Protective effects of fructose-1,6-P2 against hepatic injury induced by galactosamine.
- Rodrigue Rossignol (Univ. Victor Segalen-Bordeaux 2, FR) Mitochondrial remodelling occurs in cancer cells forced to derive energy from OXPHOS.
- Naïg Gueguen (INRA Unité Mixte de Recherche sur le Veau et le Porc, Saint Gilles, FR) Functional properties of mitochondria from different contractile fiber types.
- Maria del Mar González-Barroso (CNRS-UPR, Faculté de Médecine Necker-Enfants Malades, Paris, FR) The Uncoupling proteins in mice.
- Walter Rossmannith (Univ. Vienna, AT) Mitochondrial function in paraplegics with long-term denervated degenerated muscles and effects of the use of electrical stimulation to restore standing.
- Ješina Pavel (Academy of Sciences of the Czech Republic, Prague, CZ) Hydrogen peroxide production by mitochondrial glycerophosphate dehydrogenase (mGPDH).
- Valentin R. Zhelyaskov, Jie Sun (Sarasota, US) Detection of free radicals and reactive oxygen species (ROS).
- Kristin Heerlein (Medical University Clinic Heidelberg, DE) Hypoxia reduces cellular oxygen consumption and Na/K-ATPase activity of alveolar epithelial cells.
- Kathrin Renner (Tyrolean Cancer Research Institute, Innsbruck, AT) Apoptosis and mitochondrial function in glucocorticoid triggered leukemia cells with transgenic Bcl-2 expression.
- Eveline Hütter (Austrian Academy of Sciences, Innsbruck, AT) Respiration, coupling, ROS and aging in primary fibroblasts.

Participants: Giovanni Benard (Université Victor Segalen-Bordeaux 2, FR); Mikael Berrou (World Precision Instruments, UK); Eduardo Cuesta (Univ. Barcelona, ES); Eisermann Klaus (World Precision Instruments, Berlin, DE); Matthias Elstner (Neurologische Klinik, LMU München, DE); Lukas Gradl (software security networks, Innsbruck, AT); Philipp Gradl (WGT Electronics, Kolsass, AT); Karin Moser-Thier (Univ. Vienna, AT); Christoph Schinagl (OROBOROS INSTRUMENTS, Innsbruck, AT); Ilka Siebels (Universitätsklinikum Frankfurt, DE).

### **IOC24. Schröcken (AT) 2003, Sept. 9-12: Workshop on high-resolution respirometry.** MiPNet08.11.

Reference:

- Gnaiger E, Renner K, eds (2003) 3rd Conference on Mitochondrial Physiology. Schröcken, Austria, Sept 2003. Program and Abstracts. *MiPNet* 8.10: 1-38. [www.mitophysiology.org](http://www.mitophysiology.org)

Guest lecture: Robert Balaban (NIH; Bethesda, US) Regulation of reducing equivalent delivery to cytochrome chain: Application of NADH ED-FRAP.

Participants: Almsherqi Zakaria (National University of Singapore, SG); Arese Marzia (Univ. Rome, IT); Balaban Robert (National Institutes of Health, Bethesda, US); Böhm Marek (Charles University, Prague, CZ); Bouillaud Frédéric (Faculté de Médecine Necker-Enfants Malades, Paris, FR); Boushel Robert (Concordia University, Montreal, CA); Dlaskova Andrea (Academy of

Sciences of the Czech Republic, Prague, CZ); Hand Steven (Louisiana State University, Baton Rouge, US); Hollis Veronica (University College London, UK); Jezek Petr (Academy of Sciences of the Czech Republic, Prague, CZ); Kuda Ondrej (Academy of Science of the Czech Republic, Prague, CZ); Leibowitch Jacques (Hopital Raymond Poincare, Paris, FR); Lopez Roberto Justo (Univ. de les Illes Balears, Palma de Mallorca, Balears, ES); Matejkova Olga (Academy of Science of the Czech Republic, Prague, CZ); McEwen Joan (J.L. McClellan VA Hospital, Little Rock, Arcansas, US); Palacios-Callender Miriam (University College London, UK); Quintero Marisol (University College London, UK); Roig Rovira Teresa (Univ. Hospital, Barcelona, ES).

Collaborators: Gnaiger Erich (Univ. Hospital Innsbruck, AT); Gradl Lukas (software security networks, Innsbruck, AT); Haffner Brigitte (OROBOROS INSTRUMENTS, Innsbruck, AT); Pecina Petr (Academy of Science of the Czech Republic, Prague, CZ); Renner Kathrin (Univ. Innsbruck, AT); Schinagl Christoph (OROBOROS INSTRUMENTS, Innsbruck, AT).

### **IOC25. Würzburg, Universitäts-Kinderklinik (DE) Oct. 2003: Workshop on high-resolution respirometry.**

Local organizer: Dominique Singer

### **IOC26. Innsbruck, University Hospital (AT) 2003, Dec.: Workshop on high-resolution respirometry.** MiPNet08.17.

Lectures:

- Robert Nussbaum (NIH, Bethesda, US) Alpha-synuclein and a mitochondrial connection.
- Patrick Schrauwen (Maastricht Univ., NL) The role of mitochondrial uncoupling protein-3 (UCP3) in human energy and substrate metabolism.
- Laszlo Wenchich (Charles University, Prague, CZ) Comparison of polarographic and spectrophotometric methods in the diagnostics of mitochondrial disorders.
- Susana Cadenas (Fundación Centro Nacional de Investigaciones Cardiovasculares Carlos III, Madrid, ES) Regulation of hypoxia-inducible factor-1alpha by nitric oxide.
- Elena Shevtsova (Institute of Physiologically Active Compounds RAS, Chernogolovka, Moscow Region, RU) Mitochondria as a target for neurotoxins and neuroprotective agents.

Participants: Boushel Robert (Concordia University, Montreal, CA); Dommels Yvonne (RIKILT Institute of Foodsafety, Wageningen, NL); Glab Martha (Nencki Institute of Experimental Biology, Warsaw, PL); Haindl Susanne (L. Boltzmann Institut für experimentelle und klinische Traumatologie, Vienna, AT); Hesselink Matthijs (Maastricht Univ., NL); Hoeks Joris (Maastricht Univ., NL); Lancel Steve (Faculté de Médecine, Lille, FR); Manoharan Anand (University of Madras, Tamil Nadu, India); Wright-Paradis Cindy (Concordia Univ., Montreal, CA).

Collaborators: Frajo-Apor Irma (OROBOROS INSTRUMENTS, Innsbruck, AT); Gnaiger Erich (University Hospital Innsbruck, Innsbruck, AT); Gradl Lukas (software security networks, Innsbruck, AT); Haffner Brigitte (OROBOROS INSTRUMENTS, Innsbruck, AT); Pecina Petr (Academy of Sciences of the Czech Rep., Prague, CZ); Renner Kathrin (Univ. Innsbruck, AT); Sailer David (Univ. Hospital Innsbruck, AT).

### **IOC27. Schröcken (AT) 2004, April 14-16: International course and workshop on high-resolution respirometry.** MiPNet09.02.

Lectures:

- Assegid Garedeu (Frauenklinik-Forschungslabor, Würzburg, DE): Respirometric investigations on malignant and foetal human cells with special emphasis on the apparent oxygen affinity.
- Karl J. Tronstad (Institute of Medicine, Haukeland University Hospital, Bergen, NO): Mitochondrial-targeted fatty acid analog induces apoptosis with selective loss of mitochondrial glutathione in leukemia cells.
- Anne Devin (CNRS Inst Biochim Cell Neurochim, Bordeaux, FR): Yeast mitochondrial biogenesis is regulated via the cAMP protein kinase TPK3.
- Veronica Hollis (Wolfson Institute for Biomedical Research, University College London, UK): Studies of mitochondrial activity in whole cells using respirometry and light absorption spectroscopy.
- Martin J. Kushmerick (Department of Radiology, NMR Research Laboratory, University Washington Med Center, Seattle, Washington, USA): High-resolution respirometry of single mouse muscles: regulation of mitochondrial respiration in a complex intact and integrated system.
- David J. Marcinek (Department of Radiology, NMR Research Laboratory, University Washington Med Center, Seattle, Washington, USA): Mitochondrial coupling and function in vivo: new, non-invasive approaches.
- Erich Gnaiger (Innsbruck, AT): CMRC Greenland 2004 expedition. High-resolution respirometry in muscle biopsies from arm versus leg of Inuit hunters and a Danish control group.

Participants: Duszynski Jerzy (Nencki Inst. Experimental Biology, Polish Academy of Sciences, Warsaw, PL); Faist Eugen (Department of Surgery, Ludwig-Maximilians University Munich, DE); Krivakova Pavla (Faculty of Medicine, Charles University, Hradec Kralove, CZ); Martino Luca (Inst. Med. Biochem. Chem., University of Bari, IT); Parvez Suhel (Klinik für Neurologie, Univ. Magdeburg, DE); Vink Carolien (RIKILT- Institute of Food Safety, Food Bioactives, Wageningen, NL); Werner Carsten (Research Centre for Animal Production and Technology, Göttingen, DE); Williams Kari (Institute of Medicine, Haukeland University Hospital, Bergen, NO).

Collaborators: Frajo-Apor Irma (OROBOROS INSTRUMENTS, Innsbruck, AT); Gnaiger Erich (University Hospital Innsbruck, Innsbruck, AT); Gradl Lukas (software security networks, Innsbruck, AT); Haffner Brigitte (OROBOROS INSTRUMENTS, Innsbruck, AT).

### **IOC28. Schröcken (AT) 2004, Sept 15-21: International course and MiPNet meeting on high-resolution respirometry.** MiPNet09.05.

Lecturers: Almshergqi Zakaria A. (SG); Boushel Robert (CA); Cadenas Susana (ES); Fink Bruno (DE); Ghafourifar Pedram (US); Gnaiger Erich (AT); Heeren Gino (AT); Hütter Eveline (AT); Kozlov Andrey (AT); Mairbäuerl Heimo (DE); Vysokikh Mikael (RU); Wenchich Laszlo (CZ)

Participants: Dela Flemming (DK); Garedeu Assegid (AT); Gullicksen Scott (US); Haffner Brigitte (AT); Kraunsoe Regitze (DK); Özbek Zeynep (TR); Shabalina Irina (SE)

### **IOC29. Schröcken (AT) 2004, Dec 9-13: International course on high-resolution respirometry.** MiPNet09.11.

Lecturers and tutors: Garedeu Assegid (AT); Gnaiger Erich (AT); Haffner Brigitte (AT); Hütter Eveline (AT)

Participants: Audia Jonathon (US); Bermudez Jordi (ES); Blasco Solé (ES); Boada Jordi (ES); Heeren Gino (AT); Kulawiak Bogusz (PL); Lener Barbara (AT); Mishmar Dan (IL); Palchaudhuri Monika (DE); Palle Elfriede (AT); Perales Jose C. (ES); Winkler Herb (US)

**IOC30. Schröcken (AT) 2005, April 8-12: International course on high-resolution respirometry.** MiPNet10.02.

Reference: An experiment with high-resolution respirometry: Phosphorylation control in cell respiration. MiPNet 10.04: 1-13.

Lecturers and tutors: Garedeew Assegid (Austria); Gnaiger Erich (Austria); Haffner Brigitte (Austria); Hütter Eveline (Austria);

Participants: Bach Jeppe (DK); Beck Thomas (DK); Carmona Orozco Maria (FR); Hauptmann Susanne (DE); Hahn Dagmar (CH); Kaczor Jan (CA); Loffhagen Norbert (DE); Müller Andrea (DE); Pichova Alena (CZ); Raboel Rasmus (DK); Schulz Kathrin (DE)

**IOC31. Schröcken (AT) 2005, September 13-16: International course on high-resolution respirometry.** MiPNet10.08.

Lecturers and tutors: Assegid Garedeew (AT); Gnaiger Erich (Innsbruck, AT); Brigitte Haffner (AT); Eveline Hütter (AT), Ashley Naimi (CA).

Participants: Baysang GINETTE (CH); Beraud Nathalie (FR); Cadenas Susana (ES); Dela Flemming (DK); Demaison Joelle (FR); Egilsson Valgardur (IS); Elmer Eskil (SE); Guzun Rita (FR); Haas Richard (US); Haindl Susanne (AT); Hansen Birgit Sehested (DK); Hansson Magnus (SE); Kraunsoe Regitze (DK); Krivakova Pavla (CZ); Lemieux Hélène (CA); Mansson Roland (SE); Meier Fides (CH); Moellering Douglas (US); Mogensen Martin (DK); Morrow Geneviève (CA); Piskernik Christina (AT); Pyne-Geithman Gail J (US); Rhein Virgine (CH); Rousar Tomas (CZ); Skovbro Mette (DK); Wijers Sander (NL).

**IOC32. Schröcken (AT) 2006, April 21-25: International course on high-resolution respirometry.** MiPNet11.02.

Lecturers and tutors: Cadenas Susana (ES); Gnaiger Erich (Innsbruck, AT); Krivakova Pavla (CZ)

Participants: Brasseur Gael (FR); Braun Valerie (AT); Cleary Joanne (US); Galkin Alexander (DE); Grégori Gérald (FR); Hansen Lillian Lund (DK); How Ole-Jakob (NO); Hunger Miriam (AT); Keeney Paula (US); Larsen Terje (NO); Lenaers Ellen (US); Lopez Anna (ES); Palacino James (US); Petrov Svetlana (SE); Phielix Esther (NL); Sauerwein Hans (NL); Scheibye-Knudsen Morten (DK); Schoonderwoerd Kees (NL); Serlie Mireille (NL); Sluiter Wim (NL); Subarsky Patrick (CA); Swenson Lara (US); Therkelsen Ib (DK).

**IOC33. Warsaw (PL) 2006, June 9-17: FEBS Advanced Course. Laboratory section on high-resolution respirometry.**

Organizers: Adam Szewczyk (A.Szewczyk@nencki.gov.pl); Jerzy Duszyński (J.Duszyński@nencki.gov.pl); Lech Wojtczak (L.Wojtczak@nencki.gov.pl)

Lecturers and tutors - see: <http://www.nencki.gov.pl/febs2006/>

Participants: Krivakova Pavla (CZ); Medrikova Dasa (CZ); Baron Miriam (DE); Galli Soledad (DE); Kabiri Mostafa (DE); Kamiński Marcin (DE); Mogensen Martin (DK); Alcolea Maria del Pilar (ES); Euro Liliya (FI); Pisano Isabella (IT); Han Jin (KR); Arandarcikait Odeta (LT); de Boer Vincent (NL); Gibala Marta (PL); Glab Martha (PL); Labieniec Magdalena (PL); Pawlikowska Patrycja (PL); Świda Aleksandra (PL); Peixoto Francisco (PT); Emelyanova Larisa (RU); Nepryakhina Olga (RU); Kominkova Viera (SK); Pevala Vladimir (SK); Sezer Ebru (TR); Gospodaryov Dmytro (UA); Rudyk Olena (UA); Leguia Mariana (US).

**IOC34. Campinas (BR) 2006, July 5-7: Course on high-resolution respirometry.** Satellite Workshop of the Annual Meeting of the Brazilian Society of Biochemistry and Molecular Biology. Dept. de Patologia Clinica,

Faculdade de Ciências Médicas, State University of Campinas. Organizer: Prof. Dr. Anibal E. Vercesi (anibal@unicamp.br) - MiPNet Reference Laboratory.

**IOC35. Schröcken (AT) 2006, August 18-22: International course on high-resolution respirometry and MiPNet workshop.**

MiPNet11.03.

Lecturers and tutors: Gnaiger Erich (AT); Gradl Lukas (AT); Hand Steven (US); Lemieux Hélène (CA)

Participants: Fertschai Ismene (AT); Garcia-Roves Pablo (SE); Jarmuszkiewicz Wieslawa (PL); Kwak Soo Heon (KR); Mason Maria (UK); Natter Rebecca (DE); Pichova Alena (CK); Rhein Virgine (CH); Wydro Mateusz (UK).

**IOC36. Schröcken (AT) 2006, Dec 13-17: International course on high-resolution respirometry and MitNet workshop.**

MiPNet11.06.

Lecturers and tutors: Boushel Robert (CA); Doeller Jeannette (US); Gnaiger Erich (Innsbruck, AT); Hand Steven (US); Kraus David (US); Lemieux Hélène (CA)

Invited guest speaker: Arnold Susanne (DE)

Participants: Ali Zubeya (UK); Anmann Tiia (EE); Auk Pia Nenseth (NO); Bekkenkamp-Grovenstein Melissa (NL); Calzia Enrico (DE); Chabi Béatrice (FR); Djafarzadeh Siamak (CH); Dong Min (CH); Eide Lars (NO); Gröger Michael (DE); Käämbre Tuuli (EE); Kramer Evelin (NL); Liang Jinsheng (US); Lund Anne Marie (NO); Moiso Nicoleta (UK); Mouithys-Mickalad Ange (BE); Pacheco Sabrina (CA); Söll Andrea (DE); Votion Dominique-Marie (BE).

**IOC37. Seoul (KR) 2007, Feb 04: Workshop on high-resolution respirometry and mitochondrial physiology.** MiPNet12.03.

Satellite Workshop of the 4th Conference of the Asian Society for Mitochondrial Research and Medicine (ASMRM). Clinical Research Institute, Seoul National University Hospital, Seoul, Korea.

Organizers: Young Min Cho, MD, PhD, Assistant Prof. (ymchomd@snu.ac.kr); Soo Heon Kwak, MD, PhD (shkwak@snu.ac.kr); Hong Kyu Lee, MD, PhD, Prof. (hkleemd@snu.ac.kr) - MiPNet Reference Laboratory.

Lecturer: Erich Gnaiger, PhD, Prof., Medical University of Innsbruck, Austria.

**IOC38. Rome (IT) 2007, Mar 03: Workshop on high-resolution respirometry and mitochondrial physiology.** MiPNet12.04.

The Faculty of Medicine II, Department of Biochemical Sciences, University of Rome La Sapienza, Roma, Italy.

Organizer: Prof. Dr. Paolo Sarti (paolo.sarti@uniroma1.it) - MiPNet Reference Laboratory.

**IOC39. Schröcken (AT) 2007, Apr 13-17: International course on high-resolution respirometry.** MiPNet12.14.

Followed by the Satellite MitNet Workshop on MitoPathways (Apr 17-20).

Lecturers: Boushel Robert (CA); Dela Flemming (DK); Drahotova Z (CK); Elmer Eskil (SE); Gnaiger Erich (Innsbruck, AT); Haas Richard (US); Hansson Magnus (SE); Hesselink Matthijs (NL); Hoppel Charles (US); Kraunsoe Regitze (DK); Lemieux Hélène (AT); Kozlov A (AT); Phielix Esther (NL); Rossignol Rodrigue (FR); Schrauven Patrick (NL); van Marken Lichtenbelt Wouter (NL)

Participants: Aiyar Raeka (DE); Chiesi Michele (CH); Galina Antonio (BR); Gomez Ludovic (FR); Grüninger Stephan (CH); Hagland Hanne (NO); Hoeks Joris (NL); Khalid Murtaz Ahmed (NO); Larsen Steen (DK); Ellen Lenaers (NL); Riebel Virginie (CH); Rosca Mariana (US); Sabatini Massimo (FR); Sjövall



Fredrik (SE); Scandurra Francesca (AT); Smolkova Katarina (FR); Vazquez Edwin (US); Wan Kah Fei (SG); Wergedahl Hege (NO).

**IOC40. San Diego (US) 2007, Jun 16: Diagnosis and disease: workshop on high-resolution respirometry.**

Mitochondrial Medicine 2007: Riding the wave of the future. United Mitochondrial Disease Foundation, San Diego, CA; June 13-16, 2007

Reference: Petrosyan S, Naviaux R, Haas R, Gnaiger E (2007) Mitochondrial respiration with frozen bovine heart mitochondria: diagnostic tests. MiPNet 12.17: 1-3.

**IOC41. Schröcken (AT) 2007, Jul 18-22: International course on high-resolution respirometry.** MiPNet12.19

Satellite Workshop of the International Summer School on Mitochondrial Respiratory Physiology (Jul 12-18).

Lecturers and tutors: Gnaiger Erich (Innsbruck, AT); Hand Steven C. (Louisiana State University, Baton Rouge, US); Hoppel Charles (US); Lemieux H  l  ne (AT); Francesca Scandurra (AT)

Participants: Endlicher Ren   (Charles University, Hradec Kralove, CZ); Jilkova Zuzana (Academy of Sciences of the Czech Republic, Prague, CZ); Nuskova Hana (Academy of Sciences of the Czech Rep., Prague, CZ); Dalmonte M.Elena (University of Rome La Sapienza, Roma, IT); Meissner Maxi (University Hospital Groningen, NL) ; Muntean Danina (University of Medicine and Pharmacy, Timisoara, Romania); Julian David (University of Florida, Gainesville, US); Wohlgemuth Stephanie (University of Florida, College of Medicine, Gainesville, US); Votyakova Tatyana V. (Rangos Research Center, Pittsburgh, US).

**IOC42. Rio de Janeiro (BR) 2007, Aug 24: High-resolution respirometry of mitochondrial and cellular respiration.**

Rio de Janeiro, Brazil. Correio do Departamento de Bioqu  mica M  dica, Universidade Federal do Rio de Janeiro, Brazil.

Seminar: Erich Gnaiger (Medical University of Innsbruck, Austria) Mitochondrial respiratory control by multiple substrates: Convergent electron transport at the Q- junction. Local Organizer: Prof. Dr. Antonio Galina, MiPNet-Brazil.

**IOC43. Montevideo (UY) 2007, Sep 1 and 6: High-resolution respirometry of mitochondrial and cellular respiration.**

Universidad de La Republica, Center for Free Radical and Biomedical Research, Facultad de Medicina, Montevideo, Uruguay. Satellite Workshop of 'Free Radicals in Montevideo 2007' (Sep 2-6; <http://www.cfrbr.fmed.edu.uy/>).

Local organizer: Prof. Dr. Rafael Radi, MiPNet-Uruguay.

**IOC44. Schr  cken (AT) 2007, Dec 12-16: International course on high-resolution respirometry.** MiPNet12.24.

Lecturers and tutors: Fasching Mario (Innsbruck, AT); Gnaiger Erich (Innsbruck, AT); K  fler Simone (Innsbruck, AT); Lemieux H  l  ne (Innsbruck, AT); Scandurra Francesca (Innsbruck, AT); Subarsky Patrick (Innsbruck, AT).

Guest speaker: Anderson Ethan J (East Carolina University, Greenville, US)

Participants: Gallardo P  rez Esther M. (Universidad Autonoma de Madrid, SE); Gusdon Aaron M. (University of Florida, Gainesville, US); Johnson Leif (Lund University, SE); Kane Dan (East Carolina University, Greenville, US); Lanza Ian R. (Mayo Clinic, Rochester, US); Medina Torres Miguel   ngel (University of M  laga, ES); Nowak Barbara (Jagiellonian University, Krakow, PL); Pajuelo David (University Rovira i Virgili, Tarragona, ES); Perez Maria-Therese (Lund University, SE); Scatena Roberto (Universit   Cattolica, Roma, IT); Tweedie

Constance (University of Calgary, CA); Wunderlich Kirsten (Lund University, SE); Zadeh Zahra Ezzat (University of Calgary, CA).

**IOC45. Madrid (ES) 2008, Feb 18: International course on high-resolution respirometry.**

Universidad Autonoma de Madrid, Departamento de Bioquimica, Instituto de Investigaciones Biomedicas "Alberto Sols" CSIC-UAM Facultad de Medicina, Madrid, Spain.

Local organizers: Esther M. Gallardo Pérez and Rafael Garesse

Participants: Gnaiger Erich (Medical University of Innsbruck, AT); Cadenas Susana (Fundación Centro Nacional de Investigaciones Cardiovasculares Carlos III, Madrid, ES); Gomez Duran Aurora (Universidad de Zaragoza, ES); Ruiz Perez Maria Victoria (University of Málaga, ES); Ruiz Pesini Eduardo (Universidad de Zaragoza, ES); Sanchez Herrera Dario (University of Málaga, ES).

**IOC46. Schröcken (AT) 2008, Apr 4-8: International course on high-resolution respirometry.** MiPNet13.02.

Lecturers and tutors: Fasching Mario (Innsbruck, AT); Gnaiger Erich (Innsbruck, AT); Köfler Simone (Innsbruck, AT); Lemieux Hélène (Innsbruck, AT); Scandurra Francesca (Innsbruck, AT); Subarsky Patrick (Innsbruck, AT).

Guest speakers: Pierre Blier (Rimouski, CA); John Boyle (Leeds, UK); Charles Darveaux (Ottawa, CA); Christophe Rocher (Bordeaux, FR); Colin Selman (Aberdeen, UK); Russell Swerdlow (Kansas, US); Nathalia Timokhina, Kersti Tepp (Tallinn, EE); Demidmaa Tuvdendorj (Galveston, US)

Further Participants: Clarke Kieren J (Dublin, Ireland); De Palma Clara, (Milan, IT); Ehinger Johannes (Lund, SE); Fisar Zdenek (Prague, CZ); (Gómez Durán Aurora (Zaragoza, ES); Kim Miseon (Seoul, KR); Koziel Rafal (Innsbruck, AT); Leadsham Jane (Kent, UK); Morota Saori (Lund, SE); Paju Kalju (Tartu, EE); Pertuiset Claire, (Bordeaux, FR); Schmidtke Peter, (Hamburg, DE); Segales Jessica, (Barcelona, ES).

**IOC47. Schröcken (AT) 2008, Jul 12-16: International course on high-resolution respirometry.** MiPNet13.04.

Lecturers and tutors: Fasching Mario (Innsbruck, AT); Gnaiger Erich (Innsbruck, AT); Lemieux Hélène (Innsbruck, AT); Scandurra Francesca (Innsbruck, AT); Subarsky Patrick (Innsbruck, AT); Köfler Simone (Innsbruck, AT; *admin.*).

**IOC48. Tokyo (JP) 2008, Aug 12: 1<sup>st</sup> course on high-resolution respirometry in Japan. Sanyo Trading Co., Ltd., Chiyoda-ku Tokyo.**

Lecturer and instrument demonstration: Gnaiger Erich (AT)

Contact: Nakayoshi Yossi (Scientific Instruments Business Group, Sanyo Trading Co., Ltd., Tokyo)

**IOC49. Gainesville, Florida (US) 2009, Feb 23-24: Course on high-resolution respirometry. University of Florida.** MiPNet14.02.

Lecturers: Gnaiger Erich and Mario Fasching (AT)

Tutor: Stephanie Wohlgemut (US)

Contact: Christiann Leeuwenburgh

Further Participants: Bossy Blaise (FL-Orlando, USA); Chen Jing (FL-Gainesville, USA); Crane Justin (Hamilton, Canada); Darmyn Ritchie (Calgary, Canada); Dutta Debapriya (FL-Gainesville, USA); Hwang Judy (FL-Gainesville, USA); Johnson John (FL-Orlando, USA); Joseph Anna-Maria (FL-Gainesville, USA); Julian David (FL-Gainesville, USA); King Adrienne (AL-Birmingham, USA); Koves Timothy R (NC-Durham, USA); Lucioni Jumbo Patricia P (AL-Birmingham, USA); Manani Todd (FL-Gainesville, USA); Martello Ralph D (FL-

Gainesville, USA); Muoio Debbie (NC-Durham, USA); Niedziela Genevieve (GA-Atlanta, USA); Song Huang (TX-Dallas, USA); Wahl Dan (MI-Ann Arbor, USA)

**IOC50. Schröcken (AT) 2009, April 18-22: International course on high-resolution respirometry.** MiPNet14.03.

Lecturers and tutors: Fasching Mario (Innsbruck, AT); Gnaiger Erich (Innsbruck, AT); Renner-Sattler Kathrin (Regensburg, Germany); della Schiava Simone (Innsbruck, AT; *admin.*).

Guest tutors: Kane Dan A. (Greenville, USA); Tweedie Constance (Calgary, Canada)

Further Participants: Achten Jelle (Maastricht, The Netherlands); Bierau Jorgen (Maastricht, The Netherlands); Castelein Natascha (Ghent, Belgium); Doblander-Gruber Christine (Innsbruck, AT); Fasching Angelica (Uppsala, Sweden); Fazeli Walid (Hamburg, Germany); Fernández Iglesias Anabel (Tarragona, Spain); Haberberger Birgit (Neuherberg, Germany); Hagve Martin (Tromsø, Norway); Hempenstall Sarah (Scotland, UK); Kaiser Sabine (Hottersheim, Germany); Krohne Christian (Mannheim, Germany); Larsen Filip (Stockholm, Sweden); Lazarescu Adrian (Timisoara, Romania); Leloup Corinne (Toulouse, France); Pesta Dominik (Innsbruck, AT); Pontoglio Alessandro (Roma, Italy); Perkhofer Susanne (Innsbruck, AT); Schmidtke Peter (Hamburg, Germany); Sartori Bettina (Innsbruck, AT); Thouas George (Clayton Victoria, Australia); Vienne Jean-Claude (Lille, France); Wang Xiaoyang (Gothenburg, Sweden); Wessels Bart (Eindhoven, The Netherlands)

**IOC51. Schröcken (AT) 2009, April 22-26: 1<sup>st</sup> O2k-MultiSensor workshop.** MiPNet14.04.

Lecturers and tutors: Busotti Frank (Monaco, SAFAS); Derfuss Thomas (LEA Medizintechnik, DE); Fasching Mario (Innsbruck, AT); Gnaiger Erich (Innsbruck, AT); Harrison David (UK); Renner-Sattler Kathrin (Regensburg, Germany); della Schiava Simone (Innsbruck, AT; *admin.*).

Further Participants: Boushel Robert (Copenhagen, DK); Bouillaud Frédéric (Paris, FR); Czech Urszula (Cracow, PL); Doerrier Carolina (Granada, Spain); Fasching Angelica (Uppsala, Sweden); Friederich Malou (Uppsala, Sweden); Garcia-Roves Pablo M (Stockholm, Sweden); Gradl Lukas (Innsbruck, AT); Hickey Anthony J.R. (Auckland, NZ); Kane Dan (Greenville, USA); Kraunsoe Regitze (Copenhagen, DK); Lancel Steve (Lille, France); Mogensen Martin (Copenhagen, DK); Perry Christopher G.R. (Greenville, USA); Stride Nis (Copenhagen, DK); Thouas George (Victoria, Australia); Tweedie Constance (Calgary, Canada); Wang Xiaoyang (Gothenburg, Sweden); Wessels Bart (Eindhoven, The Netherlands).

**IOC52. Baton Rouge, Louisiana (USA) June 21: High-resolution respirometry of permeabilized fibers with the OROBOROS Oxygraph-2k. MiPSummer2009, Baton Rouge, USA.** MiPNet14.08.

**IOC53. Schröcken (AT) 2009, Jul 30 – Aug 04: International course on high-resolution respirometry.** MiPNet14.11.

Lecturers and tutors: Bartholmei Diana (*admin.*); Fasching Mario (Innsbruck, AT); Gnaiger Erich (Innsbruck, AT); Renner-Sattler Kathrin (Regensburg, Germany).

Further Participants: Anthonen Stine (Roskilde, DK); Asander Eleonor (Lund, Sweden); Cohen Paul M. (Pittsburgh, US); Egelanddal Bjorg (Norway); Guelden Elke (Düsseldorf, DE); Mourier Arnaud (Stockholm, Sweden); Phung Vinh (Norway); Skatvedt Knut (Oslo, Norway); Slinde Erik (Bergen, Norway); Suter Correia Cadena Sílvia Maria (Paraná, Brasil); Szendrödi Julia

(Düsseldorf, Germany); Vaca Cristina (Madrid Spain); Wagner Graham (London Ontario, Canada); Zouhar Petr (Prague, Czech Republic).

**IOC54. Schröcken (AT) 2009, Dec 11 – 16: International course on high-resolution respirometry.** MiPNet14.15.

Lecturers and tutors: Erich Gnaiger (Innsbruck, AT); Dan A Kane (Greenville, NC, US); Clara De Palma, (Milano, IT); Dominik Pesta (Innsbruck, AT); Constance Tweedie (Calgary, CA); Dominique-Marie Votion(Liège, BE).

Further Participants: Ballantyne James (Guelph, Canada); Burri Lena (Bergen, Norway); Chamberlin Mary (Arlington, USA); Dietrich Marcelo (Haven, USA); Djafarzadeh Siamak (Bern, CH); Dworetzky Steven (Pittsburgh, USA); Góralaska Joanna (Kraków, Poland); Gutierrez Nicolas (Bordeaux, France); Havlickova Vendula (Prague, Czech Republic); Hébert Chatelain Etienne, PhD Student, Université Victor Segalen (Bordeaux, France); Hejzlarova Katerina (Prague, Czech Republic); Holloway Graham (London, Canada); Iyer Shilpa (Charlottesville, USA); Krohne Christian (Mannheim, Germany); Kruse Shane (Washington, USA); Kuncova Jitka (Plzen, Czech Republic); Lindner Jessica (Biberach/Riss, Germany); Madhusudanarao Vuda (Bern, Switzerland); Mirkovitch Jelena (Bern, Switzerland); Nansoz Sandra (Bern, Switzerland); Pak Oleg (Giessen, Germany); Reinders Yvonne (Regensburg, Germany); Schild Christof (Bern, Switzerland); Schmoll Dieter (Frankfurt am Main, Germany); Strobel Ingmar (Frankfurt am Main, Germany); Sumbalová Zuzana (Bratislava, Slovakia).

**IOC55. Schröcken (AT) 2010, Apr 7 – 12: International course on high-resolution respirometry.** MiPNet15.01.

Lecturers and tutors: Gnaiger Erich (Innsbruck, AT); Pesta Dominik (Innsbruck, AT); Renner-Sattler Kathrin (Regensburg, DE); Sumbalová Zuzana (Innsbruck, AT), Wiethüchter Anita (Innsbruck, AT).

Guest tutor: Esther Phielix (Düsseldorf, DE)

**IOC56. Schröcken (AT) 2010, Apr 12 – 15: International course on high-resolution respirometry. 2<sup>nd</sup> O2k-MultiSensor workshop.** MiPNet15.02.

Lecturers and tutors: Gnaiger Erich (Innsbruck, AT); Pesta Dominik (Innsbruck, AT); Renner-Sattler Kathrin (Regensburg, DE); Sumbalová Zuzana (Innsbruck, AT), Wiethüchter Anita (Innsbruck, AT).

**IOC57. Druskininkai (LT) 2010, June 10-16: O2k-Demo at 4<sup>th</sup> MiPsummer School on mitochondrial respiratory physiology. Kaunas University of Medicine.**

Local organizer: Vilma Borutaite

**IOC58. Debrecen (HU) 2010, August 27 – Sept 02: O2k-Demo at FEBS Practical Course: techniques in free radical biology.**

Local organizer: Laszlo Virag

**IOC59. Obergurgl (AT) 2010, Oct 1-6: International course on high-resolution respirometry - Satellite to MiP2010.** MiPNet15.07.

Lecturers and tutors: Gnaiger Erich (Innsbruck, AT); Renner-Sattler Kathrin (Regensburg, DE); Wiethüchter Anita (Innsbruck, AT); MacDonald Julia (guest tutor; Auckland, NZ).

**IOC60. Schröcken (AT) 2010, Dec 11-16: International workshop on high-resolution respirometry with parallel O2k-MultiSensor workshop.** MiPNet15.10.

Lecturers and tutors: Gnaiger Erich (Innsbruck, AT); Mario Fasching (Innsbruck, AT); Pesta Dominik (Innsbruck, AT); Sumbalová Zuzana (Innsbruck, AT), Wiethüchter Anita (Innsbruck, AT).

**IOC61. Schröcken (AT) 2011, April 26 – May 1: International workshop on high-resolution respirometry: basic O2k and TPP<sup>+</sup>.** MiPNet16.01.

Lecturers and tutors: Gnaiger Erich (Innsbruck, AT); Mario Fasching (Innsbruck, AT); Pesta Dominik (Innsbruck, AT); Sumbalová Zuzana (Innsbruck, AT).

**IOC62. Innsbruck (AT) 2011, Jul 11 - 13: International course on high-resolution respirometry.**

Lecturers and tutors: Gnaiger Erich (Innsbruck, AT); Mario Fasching (Innsbruck, AT); Sumbalová Zuzana (Innsbruck, AT), Wiethüchter Anita (Innsbruck, AT).

**IOC63. Beijing (CN) 2011, Aug 26- 27: International course on high-resolution respirometry at the Chinese Academy of Sciences.**

Local organizers: Huang Song (Beijing Institutes of Life Sciences, Beijing, China), Zhan Yong (Research Institute of Sports Medicine, Tianjing, China).

**IOC64. Hyderabad (IN) 2011, Dec 08: International course on high-resolution respirometry – Satellite to 1<sup>st</sup> SMRM.** MiPNet16.02.

Local organizers: Thangaraj Kumarasamy (Centre for Cellular and Molecular Biology, Hyderabad, India).  
Satellite to the 1<sup>st</sup> Annual Conference of the Society for Mitochondrial Research and Medicine - India (1st SMRM), *Mitochondria in Biology and Medicine*, Hyderabad, India.

**IOC65. Schröcken (AT) 2011, Dec 10 – 15: International workshop on high-resolution respirometry: O2k-Basic and TPP-Basic.** MiPNet16.03.**IOC66. Innsbruck (AT) 15-16 March 2012: O2k-Fluorometry and high-resolution respirometry.** MiPNet17.06.**IOC67. Sydney (AU) Apr 2–4 2012: International course on high-resolution respirometry.** MiPNet17.07.**IOC68. Schröcken (AT) 2012 Apr 11 – 16: International workshop on high-resolution respirometry: O2k-Basic and TPP-Basic.** MiPNet17.08.**IOC69. Madrid (ES) 2012 May 8: O2k-Fluorometry and high-resolution respirometry.**

Local organizer: Prof. Dr. Rial Eduardo, Centro Investigaciones Biológicas - CSIC

- IOC70. Barcelona (ES) 2012 May 29-30: O2k-Workshop on high-resolution respirometry.** MiPNet17.10.  
Local organizer: Dr. Garcia-Roves Pablo M., Diabetes and Obesity Laboratory, Centre Esther Koplovitz (CEK), IDIBAPS-Hospital Clinic de Barcelona
- IOC71. Chongqing (CN) 2012 Nov 07-08: O2k-Workshop on high-resolution respirometry.** Satellite to ASMRM.  
Local organizer: Prof. Zhu Zhiming, MD, PhD, Center for Hypertension and Metabolic Diseases, Third Military Medical University, Daping Hospital.
- IOC72. Schröcken (AT) 2012 Dec 05-10: International workshop on high-resolution respirometry: O2k-Basic.** [MiPNet17.14.](#)
- IOC73. Kolkata (IN) 2013 Jan 15-16: O2k-Workshop on high-resolution respirometry.** Satellite to Neurocon. [MiPNet18.01.](#)  
Local organizer: Prof. Dr. Sasanka Chakrabarti, Dept. of Biochemistry, IPGME&R
- IOC74. Innsbruck (AT) 2013 Jan 22-25: International workshop on HRR and TPP/ISE.** [MiPNet18.02.](#)
- IOC75. Schröcken (AT) 2013 Apr 09-14: International workshop on high-resolution respirometry: O2k-Basic.** [MiPNet18.03.](#)
- IOC76. Prague (CZ) 2013 May 28-29: International O2k-Workshop on high-resolution respirometry.** [MiPNet18.04.](#)  
Local organizers: Jitka Zurmanová, Martin Kalous, Faculty of Science, Charles University, Prague  
Zdenek Drahota & Joseph Housftek, Institute of Physiology, Czech Academy of Science, Prague  
Zuzana Cervinková, Pavla Stanková, Medical Faculty, Charles University Hradec Kralove
- IOC77. Newport, California (US) 2013 Jun 13: Lunch workshop on high-resolution respirometry.** Mitochondrial Medicine, UMDF.
- IOC78. Copenhagen (Denmark) 2013 August 27-29: High-resolution respirometry and O2k-Fluorometry with the OROBOROS Oxygraph-2k. MiPSummer2013, Copenhagen, Denmark.** [www.mitophysiology.org/?MiPschool2013](http://www.mitophysiology.org/?MiPschool2013)  
Local organizer: Flemming Dela, Copenhagen  
Lecturer: Erich Gnaiger; Tutor: Verna Laner
- IOC79. Obergurgl (AT) 2013, Sep 19-23: International workshop on high-resolution respirometry and O2k-Fluorometry. Pre-conference workshop to MiP2013.** [MiPNet18.07.](#)
- IOC80. Schröcken (AT) 2013 Oct 09-14: International workshop on HRR and O2k-Fluorometry.** [MiPNet18.09.](#)