



SUMMER COURSE FOR MEDICAL STUDENTS, July 9 – 14, 2018 Program

Monday, July 9: Introduction to Experimental Cardiovascular Research

Organized by: Institute of Physiology CAS - Departments of Developmental Cardiology and Experimental Hypertension

Venue: Institute of Physiology CAS, Vídeňská 1083, Prague 4

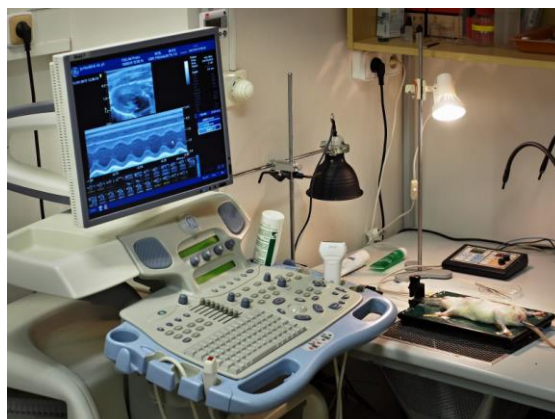
Lectures (9:00 – 12:00)

- molecular background of pacemaker potential, spreading of action potential in the heart, conduction system, regulation of heart rate, mechanism of arrhythmias
- myocardial hypoxia and ischemia/reperfusion, cardioprotective mechanisms
- myocardial hypertrophy and heart failure
- mechanisms of blood pressure regulation, calcium influx, calcium sensitization
- sympathetic component of blood pressure regulation, kidney and regulation of blood pressure
- pathophysiology of hypertension, end-organ damage in hypertension and chronic kidney disease

Lunch (12:00 – 13:00)

Demonstrations (13:00 – 16:00)

- non-invasive assessment of structural and functional properties of the heart with ultrasound (echocardiography)
- isolated perfused heart and its use in experimental cardiology and pharmacology
- preparation of isolated ventricular myocytes for physiological experiments
- use of telemetry for continuous monitoring of hemodynamic parameters (blood pressure, activity, ...)
- acute blood pressure monitoring in conscious animals
- functional assessment of embryonic cardiovascular system by videomicroscopy
- assessment of contractile properties of vascular smooth muscle





Tuesday, July 10: Introduction to Experimental Research on Metabolism

Organized by: Institute of Physiology CAS - Departments of Adipose Tissue Biology, Epithelial Physiology, Bioenergetics, and Neurohumoral Regulations

Venue: Institute of Physiology CAS, Vídeňská 1083, Prague 4

Lectures (9:00 – 12:00)

- cellular energy provision, intermediary metabolism, mitochondria, and mitochondrial oxidative phosphorylation
- mitochondrial myopathies – rare inherited diseases of mitochondrial metabolism
- energy balance, adipose tissue, obesity and associated metabolic diseases
- nutrition, types of dietary lipids, dietary interventions using n-3 fatty acids
- laser Captured Microdissection (LCMD) - general info, options and limits, and processing of LCMD samples
- basic mechanisms of circadian regulation

Lunch (12:00 – 13:00)

Demonstrations (13:00 – 16:00)

- metabolic screening using mass spectrometry
- measuring mitochondrial respiration using Oxygraph or Seahorse bioanalyzer
- preparing tissue for LCMD (staining, cutting, fixation), dissecting regions of interest
- recording of circadian rhythms - from human to Petri dish





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Wednesday, July 11: Introduction to Chemical Biology and Advanced imaging for biomedical research

Organized by: Institute of Molecular Genetics CAS

Venue: Institute of Molecular Genetics CAS, Vídeňská 1083, Prague 4

Lectures (9:00 – 12:00)

- **Chemical biology** in Academia what is probe and what is drug?
- drug repurposing, biochemical
- cell-based and model-organism-based assays
- signaling pathways, target ID
- big data and how to make sense out of it
- **Advanced bioimaging** - principles of fluorescence microscopy
- fluorochromes, confocal microscopy
- principles of super-resolution microscopy (STED, SIM, STORM/PALM)
- live cell imaging
- principles of electron microscopy
- TEM, STEM and SEM for biomedicine,
- cryoelectron microscopy and tomography
- immunodetection of molecules
- principle of analytical ultrastructural methods

Lunch (12:00 – 13:00)

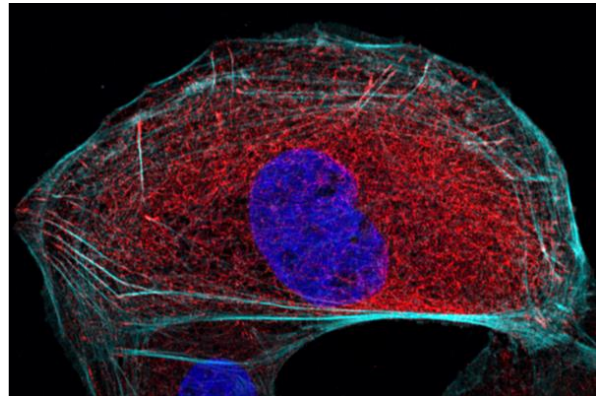
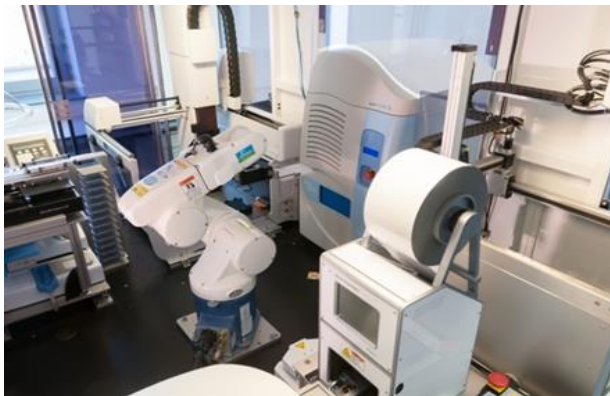
Demonstrations (13:00 – 16:00)

National Infrastructure for Chemical Biology (CZ-OPENSREEN)

- high-throughput screening - demo of laboratory automation
- high-content screening (image-based, label-free)
- compound storage and logistics – demo of advanced microplate reformatting

National Infrastructure (Czech Bioimaging)

- comparison of various imaging methods, sample preparation for photon microscopy
- various EM modes for biomedicine
- sample preparation for TEM
- demonstration of ultrastructural tomography





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Thursday, July 12: Introduction to Drug Development Process

Organized by: Institute of Organic Chemistry and Biochemistry CAS

Venue: Institute of Organic Chemistry and Biochemistry CAS, Flemingovo nám. 2,
Prague 4

Lectures (9:00 – 12:00)

- introduction
- life cycle of original drug development
- medicinal chemistry I
- medicinal chemistry II

Lunch (12:00 – 13:00)

Demonstrations (13:00 – 16:00)

- walk around the institute
- protein structure
- NMR/*in silico* modelling





Friday, July 12: Introduction to Neuroscience

Organized by: Institute of Physiology CAS - Departments of Functional Morphology, Neurophysiology of Memory, Developmental Epileptology, Cellular and Molecular Neuroendocrinology, and Cellular Neurophysiology

Venue: Institute of Physiology CAS, Vídeňská 1083, Prague 4

Lectures (9:00 – 12:00)

- pain pathophysiology and mechanisms
- electrical activity of hypophyseal cells
- molecular pharmacology of muscarinic receptors
- excitatory synaptic transmission
- pathophysiology of epilepsy and epilepsy-related comorbidities, epileptogenic insults and acquired epilepsies

Lunch (12:00 – 13:00)

Demonstrations (13:00 – 16:00)

- behavioral tests in pain research – spinal cord slice preparation for electrophysiological recording and immunohistochemical analysis
- intracellular Ca^{2+} signaling and measurement of Ca^{2+} concentration in neuroendocrine cells
- registration of spontaneous and evoked electrical activity of the brain

