INSTITUTE OF PHYSIOLOGY CAS

CZECH BIOIMAGING
Imaging principles of life

COURSE

Measurement of biological structures for engineers

October 29–30, 2019

organized by the Institute of Physiology CAS (IPhys) (Czech-BioImaging)
suitable especially for students of technical universities and engineers

Venue:
IPhys, Dept. Biomathematics, building DaI, room 011,
Vídeňská 1083, Prague 4, 14220

Short description of the course:
The course will provide introduction to image acquisition by advanced optical microscopic techniques which are available at the Czech-BioImaging-IPhys microscopy facility, demonstrations and hands-on exercises of various types of analysis of acquired image data. The course is intended especially for under- and post-graduate students of technical universities and engineers. The course participants should have basic knowledge about image processing and analysis. The course will give them the opportunity not only to work with advanced microscopes and image data but also to get acquainted with specific practical applications in biological and medical research. For example, various techniques of confocal and two-photon microscopy and optical projection microscopy will be presented, as well as applications of image analysis and stereology for measurement of capillaries, nerves, Langerhans islets, leaves and needles. Based on the obtained results, the participants will understand their importance in addressing specific questions, raised by biologists and medical doctors in their scientific research and therapeutic approaches.

Course coordinator: RNDr. Lucie Kubínová, CSc.
List of instructors:
Mgr. Daniel Hadraba, PhD.
RNDr. Jiří Janáček, PhD.
RNDr. Lucie Kubínová, CSc.
RNDr. Barbora Radochová, PhD.
Mgr. David Vondrášek
Mgr. Zuzana Kubínová

MINISTRY OF EDUCATION, YOUTH AND SPORTS

MEYS LM2015062 CZECH BIOIMAGING supported event MEYS LM2015062

29th October

9:00 - 10:00	Introduction to confocal and two-photon microscopy **(Hadraba)** Lecture (meeting room DaI)
10:00 - 10:40	1st group: Image acquisition by confocal microscopy (brain capillary samples, spruce needles). **(Vondrášek)** Demonstration and hands-on (SP8 lab)
	2nd group: Introduction to spinning disk confocal microscopy and measurement errors. **(Hadraba)** Demonstration and hands-on (CARV lab)
10:40 – 10:55	*Coffee break*
10:55 – 12:20	1st group: Image acquisition by two-photon microscopy, FLIM/PLIM imaging **(Vondrášek)** Demonstration and hands-on (SP8 lab)
	2nd group: Image acquisition of fluorescence microscope test slide (FocalCheck™) and displaying an effect of chromatic aberration. **(Hadraba)** Demonstration and hands-on (CARV lab)
12:20 – 12:25	*Break*
12:25 – 13:00	1st group: Visualization of unstained cells by phase-contrast microscopy (optical thickness estimation of epidermal and epithelial cells) **(Vondrášek)** Demonstration and hands-on (meeting room DaI)
	2nd group: Analysis of the acquired images and chromatic aberration correction – theoretical and practical approaches. **(Hadraba)** Demonstration and hands-on (meeting room D)
13:00 – 14:00	*Lunch*
14:00 – 14:40	1st group: Introduction to spinning disk confocal microscopy and measurement errors. **(Hadraba)** Demonstration and hands-on (CARV lab)
	2nd group: Image acquisition by confocal microscopy (brain capillary samples, spruce needles). **(Vondrášek)** Demonstration and hands-on (SP8 lab)
14:40 – 14:55	*Coffee break*
14:55 – 16:20	1st group: Image acquisition of fluorescence microscope test slide (FocalCheck™) and displaying an effect of chromatic aberration. **(Hadraba)** Demonstration and hands-on (CARV lab)
	2nd group: Image acquisition by two-photon microscopy, FLIM/PLIM imaging **(Vondrášek)** Demonstration and hands-on (SP8 lab)
16:20 – 16:25	*Break*
16:25 – 17:00	1st group: Analysis of the acquired images and chromatic aberration correction – theoretical and practical approaches. **(Hadraba)** Demonstration and hands-on (meeting room D)
	2nd group: Visualization of unstained cells by phase-contrast microscopy (optical thickness estimation of epidermal and epithelial cells) **(Vondrášek)** Demonstration and hands-on (meeting room DaI)
17:00 - 19:00	Discussion (meeting room DaI), excursion within Czech-BioImaging-IPhys facility, refreshments (meeting room DaI)

30th October

9:00 – 9:30 Introduction to sampling and stereology **(L. Kubínová)** Lecture (meeting room DaI)

9:30 – 10:00 Image analysis and visualization in 3D **(Janáček)** Lecture (meeting room DaI)

10:00 – 10:30 Installation of SW for image analysis and stereology on notebooks to course participants + Coffee Break

10:30 – 11:30 1st group: Surface area measurement by stereological methods (Fakir method, plant leaf/needle) **(Z. Kubínová)** Demonstration and hands-on (meeting room D)

2nd group: Image acquisition and reconstruction of human nerve specimen using OPT **(Radochová)** – specimen preparation, image acquisition and reconstruction Demonstration and hands-on (meeting room DaI and OPT)

11:30 – 11:35 Break

11:35 – 12:15 1st group: Image analysis and visualization in 3D **(Janáček)** Demonstration and hands-on (meeting room D)

2nd group: Analysis of OPT images - volume measurement of Langerhans islet by 3D stereology (Cavalieri - spatial point grid, fakir method) **(Radochová)** Demonstration and hands-on (meeting room DaI)

12:15 – 13:00 1st group: Image analysis and stereological measurements of length, branching, direction of fibrous structures (brain/muscle capillaries) **(Janáček)** Demonstration and hands-on (meeting room D)

2nd group: Counting particles by stereological methods (disector, stained cells) **(Radochová)** Demonstration and hands-on (meeting room DaI)

13:00 - 14:00 Lunch

14:00 – 15:00 1st group: Image acquisition and reconstruction of human nerve specimen using OPT **(Radochová)** – specimen preparation, image acquisition and reconstruction Demonstration and hands-on (meeting room DaI and OPT)

2nd group: Surface area measurement by stereological methods (Fakir method, plant leaf/needle) **(Z. Kubínová)** Demonstration and hands-on (meeting room D)

15:00 – 15:15 Coffee Break

15:15 – 15:55 1st group: Analysis of OPT images - volume measurement of Langerhans islet by 3D stereology (Cavalieri - spatial point grid, fakir method) **(Radochová)** Demonstration and hands-on (meeting room DaI)

2nd group: Image analysis and visualization in 3D **(Janáček)** Demonstration and hands-on (meeting room D)

15:55 – 16:00 Break

16:00 – 16:45 1st group: Counting particles by stereological methods (disector, stained cells) **(Radochová)** Demonstration and hands-on (meeting room DaI)

2nd group: Image analysis and stereological measurements of length, branching, direction of fibrous structures (brain/muscle capillaries) **(Janáček)** Demonstration and hands-on (meeting room D)

More information

Contact and registration:

No registration fee

Registration requested until October 9th 2019, participation will be confirmed.

For registration and administrative requests contact Pavla Chotěborská: **pavla.choteborska@fgu.cas.cz**, phone: **731 123 391**

For special requests contact Lucie Kubínová: **lucie.kubinova@fgu.cas.cz**

Address of Event: Institute of Physiology CAS, meeting room, building DaI, Vídeňská 1083, Prague 4, 14220

Public transport: bus 193, stop: Zelené domky, bus 138, 203 stop: Ústavy akademie věd

Car: Parking is available on campus.

Conditions:
Participant must bring **his/her own notebook** (MS Windows) with relevant SW/data downloaded before the course starts – instructions will be provided in advance.

No registration fee.

Registration is obligatory and requested **until 15 October 2019** (max. capacity: 16 participants).

The language of the course is English.

Coffee breaks, lunches, refreshments will be for free.