

MSE-638

Electron Microscopy for Life Science

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Cursus	Sem.	Type
Materials Science and Engineering		Obl.

Language of teaching	English
Credits	1
Session	
Exam	Written
Workload	30h
Hours	19
Courses	7
TP	12
Number of positions	20

Frequency

Every year

Summary

This is a two-day course. It consists of seven lectures, and 2 afternoon practical/demonstration sessions that covers the principles of preparing biological samples from electron microscopy and a basic introduction to using scanning and transmission electron microscopes.

Content**Lectures**

1. Principles of transmission electron microscopy (Graham Knott)

This lecture covers the basic principles of transmission electron microscopy, the optics of TEM, and the different imaging modes for biological samples.

2. Preparing samples for transmission electron microscopy (Graham Knott)

A lecture explaining how different types of biological samples from tissues and cells to proteins and macromolecules are prepared for electron microscopy.

3. Single particle, cryo electron microscopy (Davide Demurtas)

A lecture outlining how macromolecules, and large protein complexes can be prepared, imaged and analysed using electron microscopy. This will cover subjects such as negative staining, metal showing, as well as single particle analysis.

4. Image analysis for electron microscopists (Petr Leiman)

This lecture will introduce the field of cryo electron microscopy and how the native structure of biological samples can be imaged at high resolution with electrons. It will also cover the topic of electron tomography and how molecular structures can be determined using transmission electron microscopy.

5. Immuno electron microscopy (Celine Loussert, UNIL)

This lecture will introduce how proteins can be localised in cells and tissues using different immunocytochemistry techniques for electron microscopy.

6. Scanning electron microscopy (Graham Knott)

This lecture will cover the principles of scanning electron microscopy and introduce how biological samples are prepared for the different types of imaging modes. This will also include an introduction to the field of block face scanning EM.

7. Interpreting EM images of biological samples, and understanding the artifacts (Graham Knott)

With the range of EM imaging methods available today biologists need to understand how to interpret the types of images shown and also understand some of the common artifacts that can arise. This lecture will show, with a series of examples, some of the common problems that can arise when imaging biological samples.

Practical sessions

1. Preparing and imaging single particles for cryo electron microscopy. During this session students will learn how to freeze samples of proteins from imaging in the transmission electron microscope.

2. Cutting and imaging mammalian cells for transmission electron microscopy. Here, students will learn how to cut ultrathin sections of resin embedding mammalian cells and image them with a transmission electron microscope.

Keywords

Transmission electron microscopy, scanning electron microscopy, cell biology

Learning Prerequisites

Recommended courses

Background understanding of biological processes.

Assessment methods

Written

Resources

Websites

- <http://bioem.epfl.ch/>