Practical course on Transmission Electron Microscopy

Where: Newtonstrasse 15, TEM lab 0´503
When: Monday, 3 p.m. - 7 p.m., course accompanies the lecture on electron microscopy and usually starts at 4th week of the semester

Topics:

1. ***Microscope: general introduction***
   - Vacuum system, cooling water supply, electron gun, lenses, sample holders, camera system

2. ***Alignment (part 1): Illumination***
   - Generation of an electron beam
   - Alignment of electron source, condenser aperture, beam centering
   - Beam centering for different spot sizes

3. ***Alignment (part 2): Illumination***
   - Recall of alignment (part 1)
   - Adjustment of Pivot points
   - Stigmatism of condenser system

4. ***Alignment (part 3): Image formation***
   - Recall of alignment (part 1 and 2)
   - Finding the specimen
   - Adjustment of eucentric height, focus, under and over focus
   - Current centre, objective stigmatism

5. ***Transmission electron diffraction***
   - Alignment for diffraction mode, adjustment of objective aperture and selected area aperture
   - Zone axis orientation of a single crystalline specimen, Bragg condition, Laue condition

6. ***Diffraction contrast TEM imaging***
   - Recall of diffraction conditions
   - Alignment for bright-field, dark-field, and weak-beam TEM imaging
   - Bright-field and dark-field TEM imaging

7. ***High resolution TEM***
   - High-resolution TEM imaging: specimen alignment, diffraction condition, image processing
   - Components of Spectrometer, X-ray spectrum, quantitative analysis, scanning TEM mode for point spectrum, line scan, elemental map

8. ***Convergent beam electron diffraction***
   - Alignment for convergent beam electron diffraction
   - Higher order Laue zone lines, Large-angle CBED

9. *Analytical TEM (part1) – Energy dispersive X-ray spectroscopy (EDXS)*

- Components of an EDX spectrometer
- Demonstration: spectrum acquisition, spectrum analysis, point spectrum, line scan, elemental map

10. *Analytical TEM (part2) – Electron energy loss spectroscopy (EELS)*

- Components of an EEL spectrometer
- Demonstration: spectrum acquisition, spectrum analysis, point spectrum, line scan, area scan, elemental mapping by EFTEM