

Solid State Physics I

Vorlesung / Lectures: Wednesday 13h00 – 15h45

Raum / Room: Y36-K-08

<http://www.physik.uzh.ch/lectures/fkp/>

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Übungen / Exercise class: **Wednesdays 16h00 – 17h00**

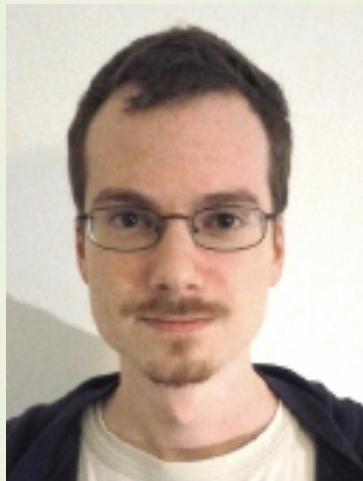
Raum / Room: Y36-K-08

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Today's Lectures

Lecture 1: Recap and continuation.

Crystal structures, Lattice vectors, crystal basis etc.

Lecture 2: Reciprocal space

Reciprocal lattice vectors & units, Brillouin zones, Miller indices

Lecture 3: Scattering Experiments

Form & structure factors

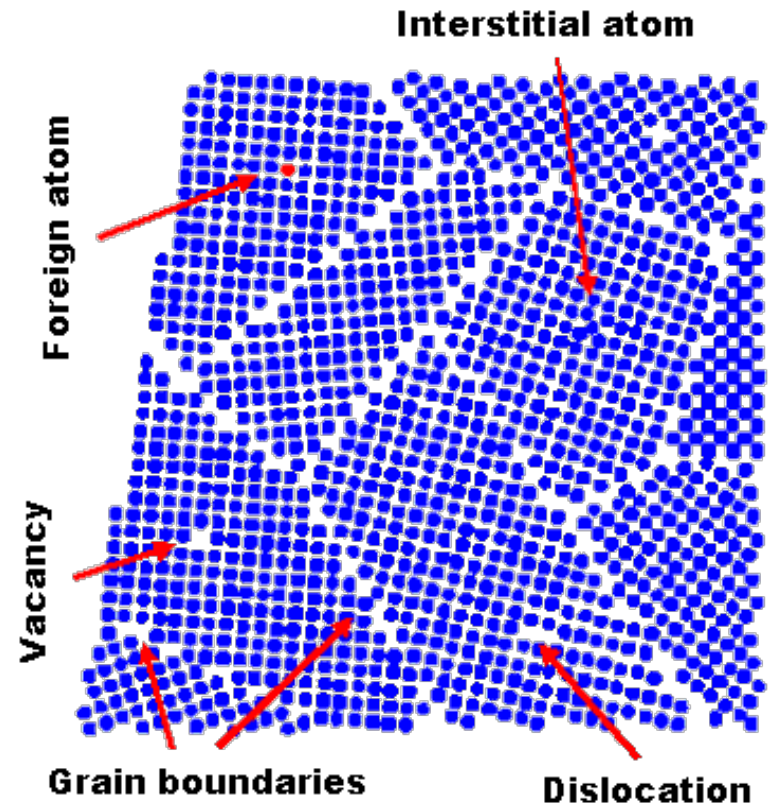
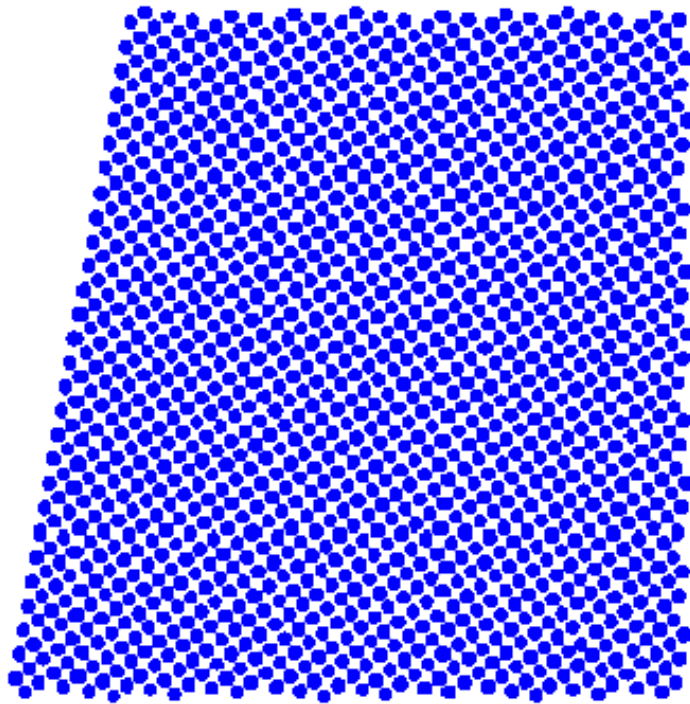
Outline

Complex structures

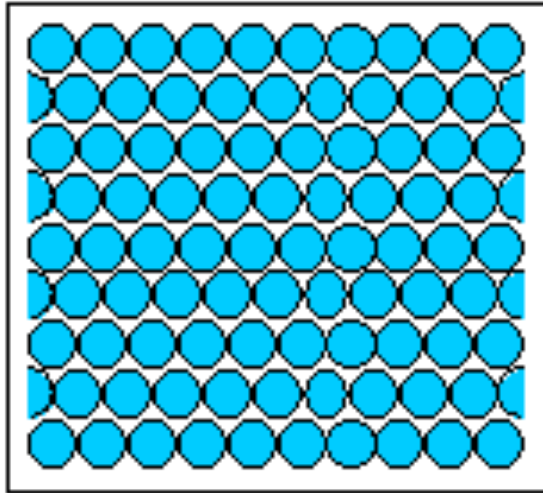
Crystal Defects and non-crystalline solids

Experimental Techniques to Map Crystal Structures
(Real Space)

Single crystal versus Polycrystal

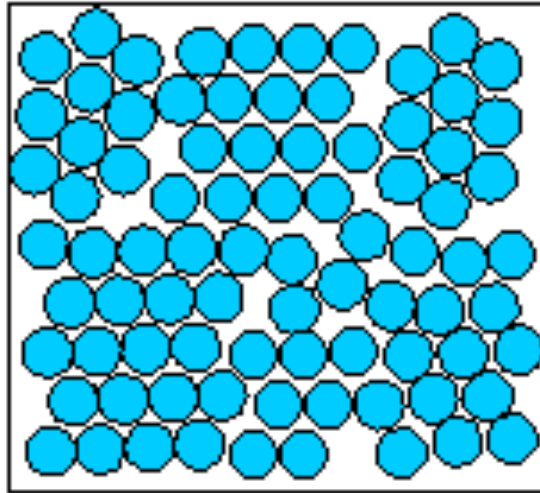


Amorphous solid



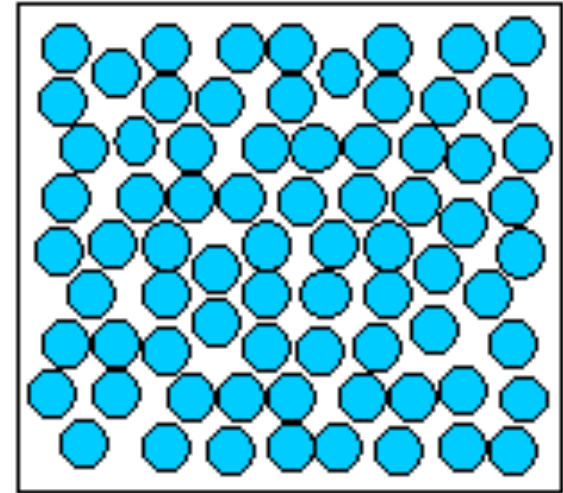
Single crystal

Periodic across the
whole volume.



Polycrystal

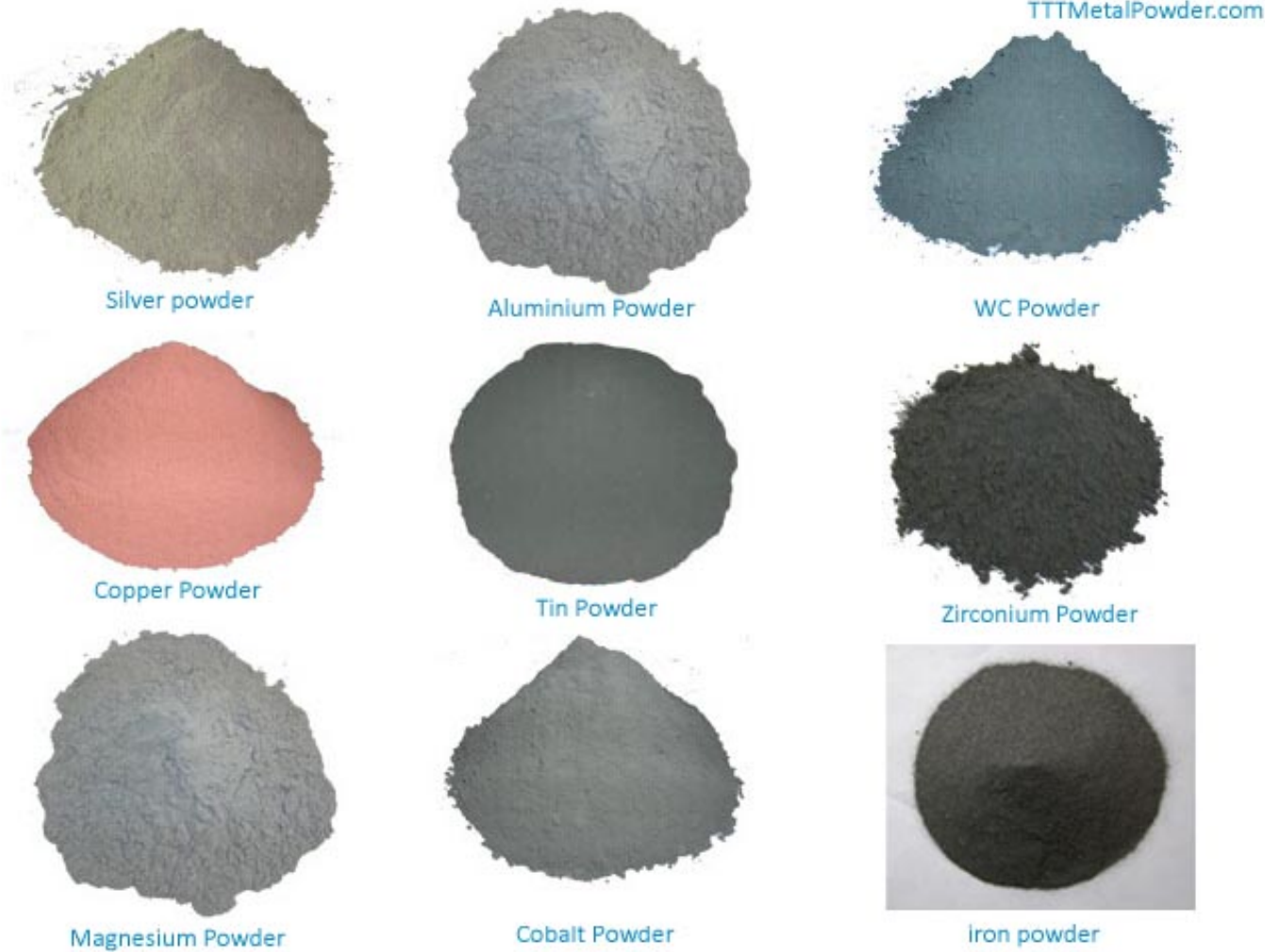
Periodic across
each grain.



Amorphous solid

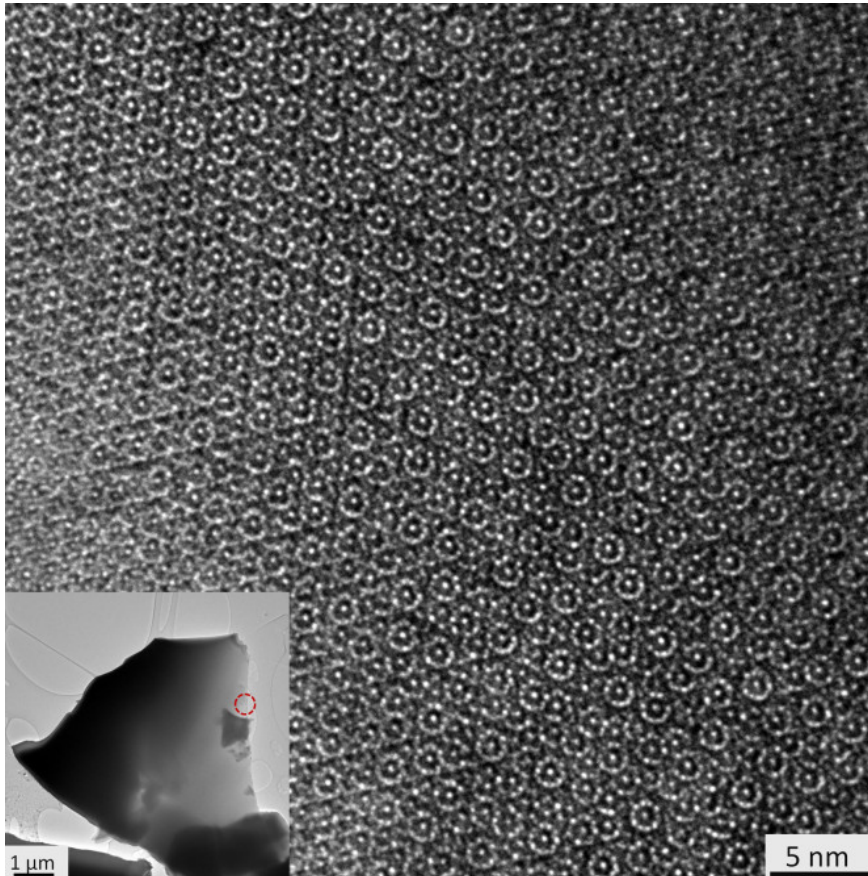
Not periodic.

Single crystal versus powder



<http://www.doitpoms.ac.uk/tlplib/atomic-scale-structure/intro.php>

Quasi-crystals



High-resolution transmission electron microscopy (HRTEM) image showing that the real space structure consists of a homogeneous, quasiperiodic and ten-fold symmetric pattern.

Sci Rep. 2015; 5: 9111

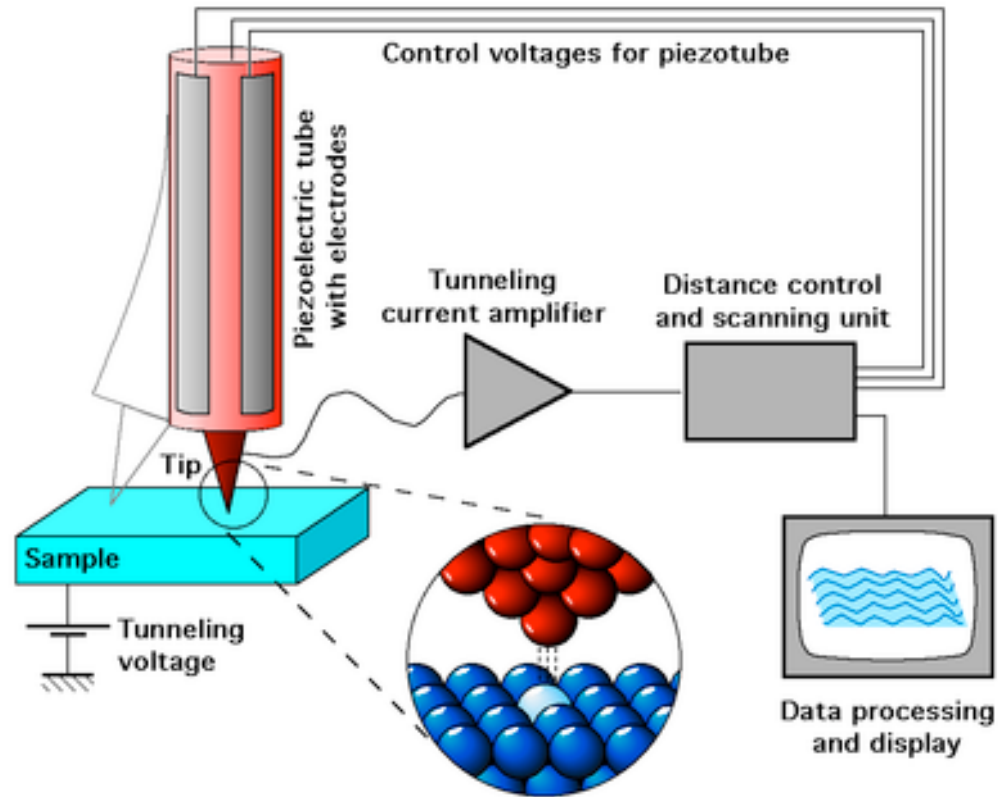
Outline

Complex structures

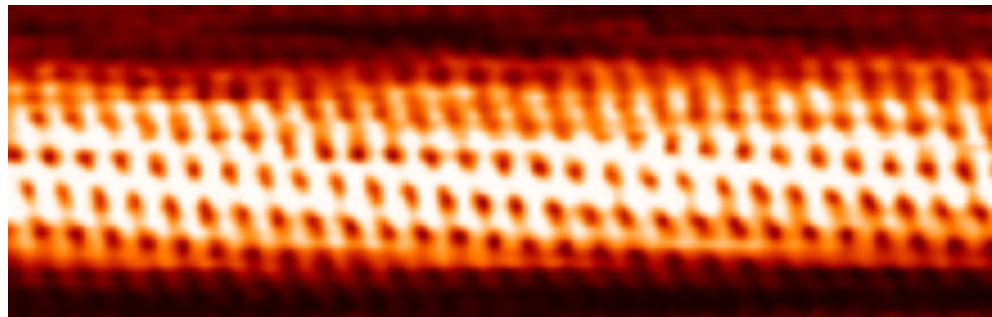
Crystal Defects and non-crystalline solids

Experimental Techniques to Map Crystal Structures
(Real Space)

Scanning tunneling microscope (STM)

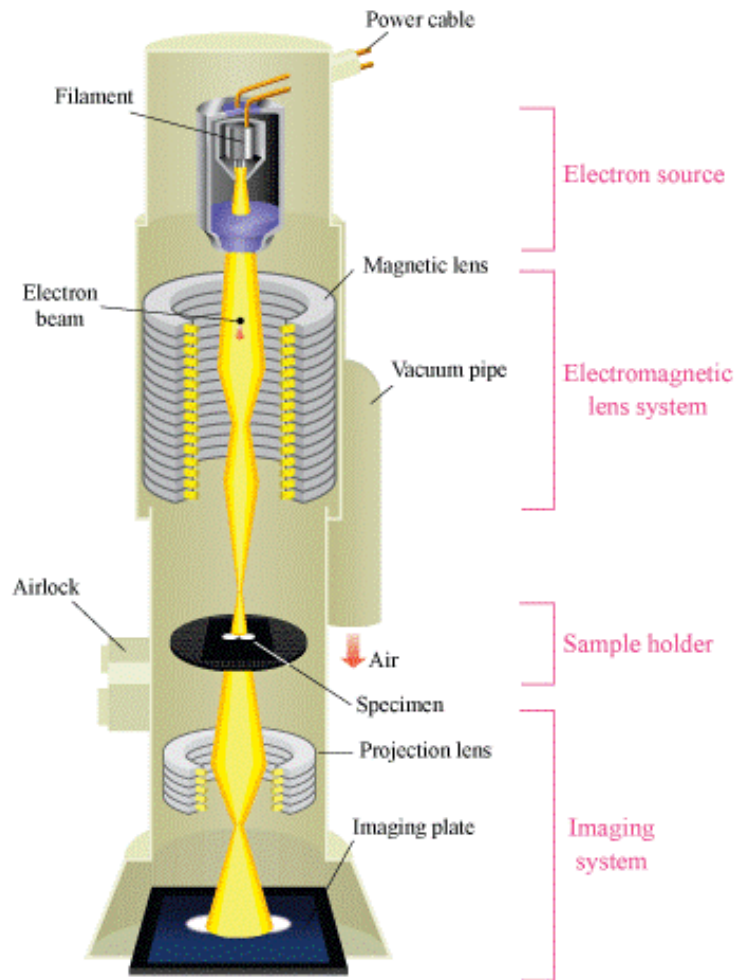


PRINCIPLES OF STM



Carbon Nano-type

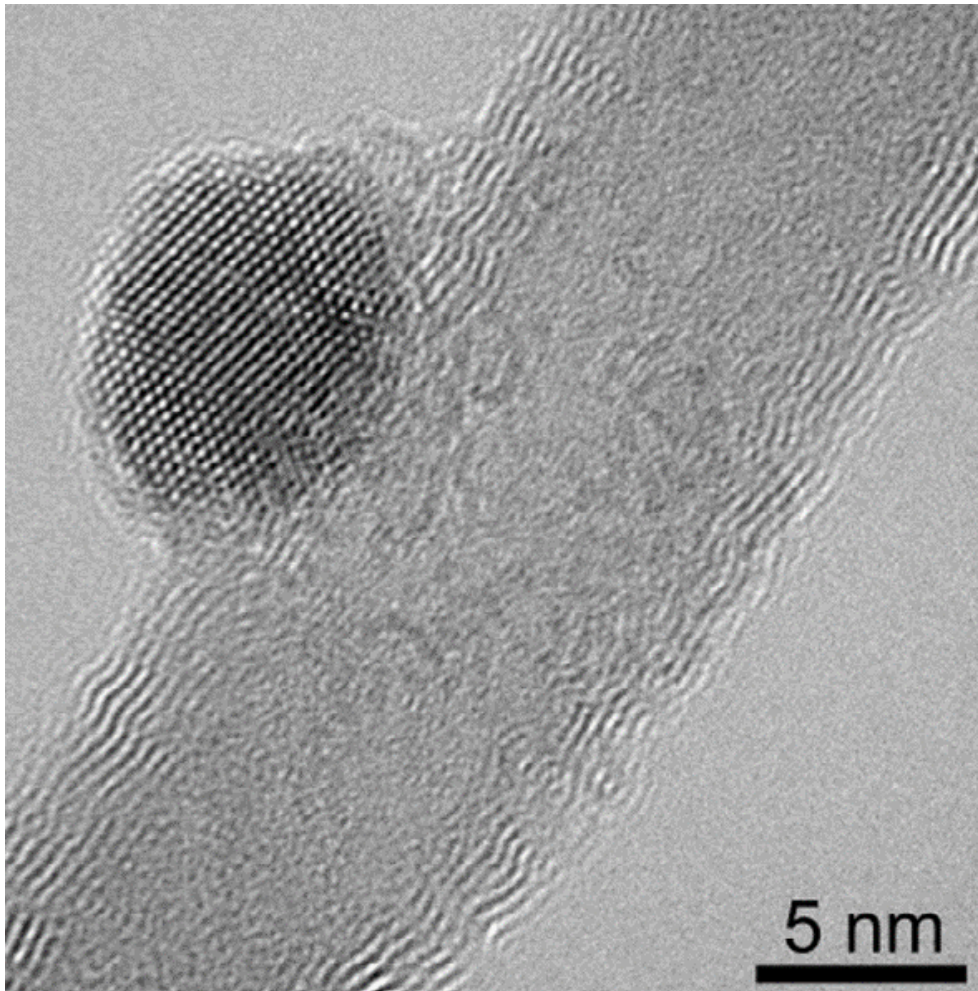
High-Resolution Transmission Electron Microscope (HRTEM)



http://www.hk-phy.org/atomic_world/tem/tem02_e.html

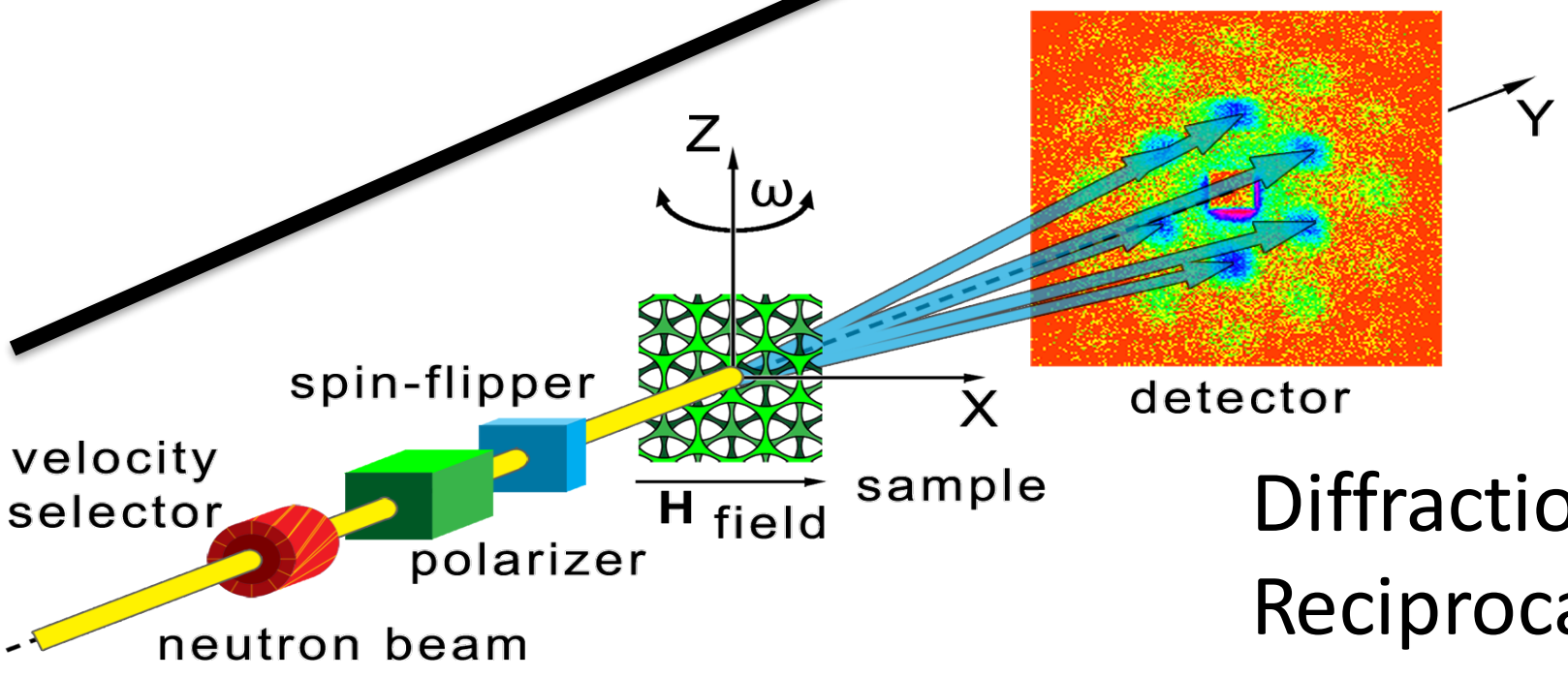
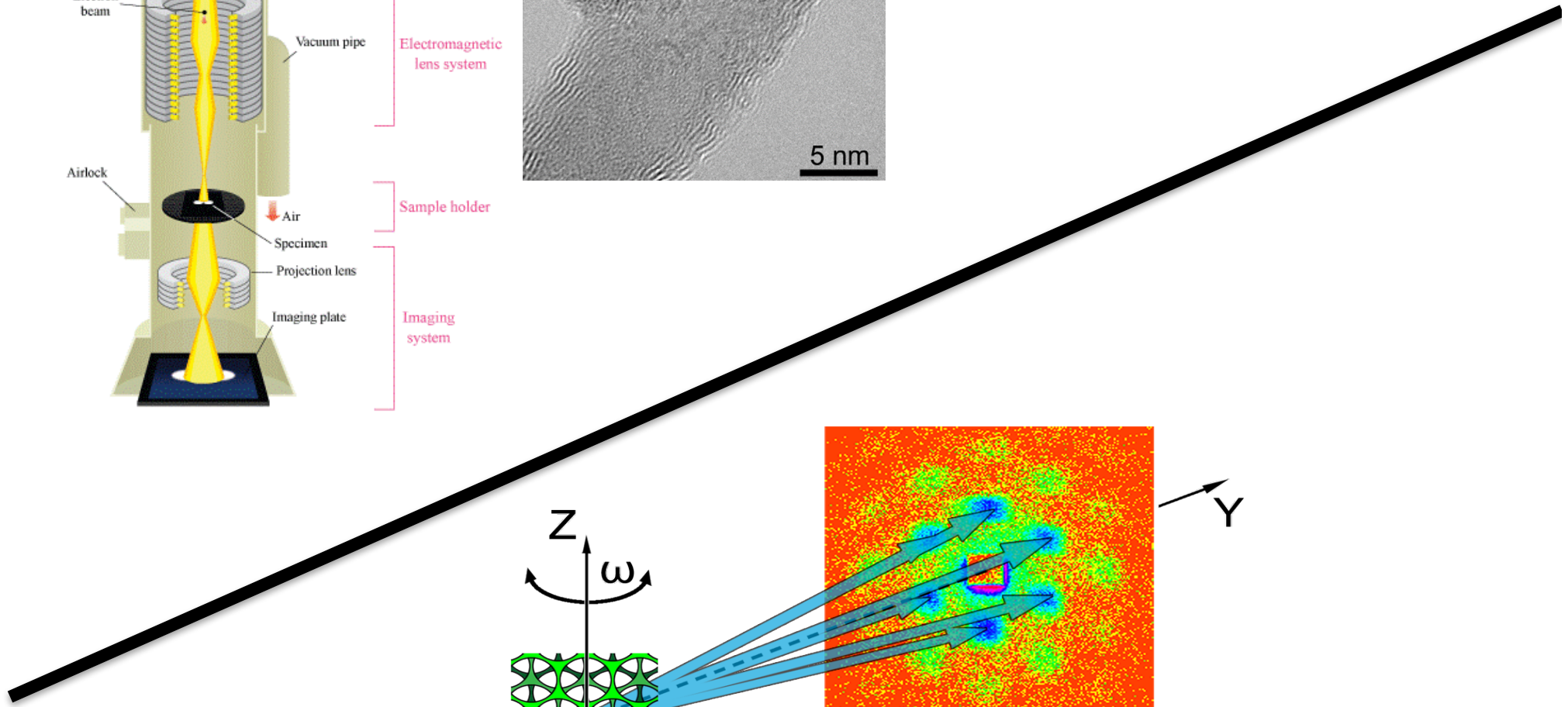
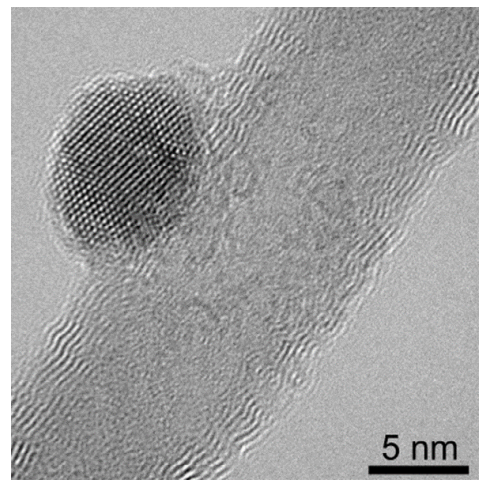
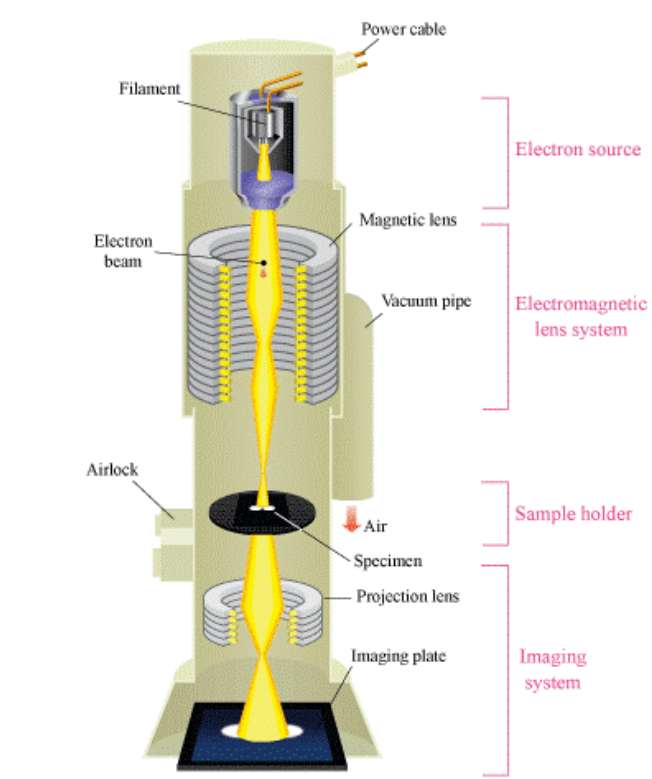
<http://www.dstuns.iitm.ac.in/microscopy-instruments.php>

High-Resolution Transmission Electron Microscope (HRTEM)



HRTEM image and focal series reconstruction of the MWCNTs with Fe₃O₄ nanoparticles attached.

<https://www.int.kit.edu/1745.php>



Diffraction
Reciprocal space

