Refurbishment of the Houghton College Scanning Transmission Electron Microscope (STEM)

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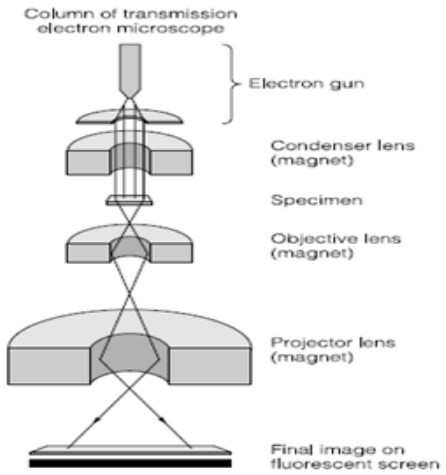
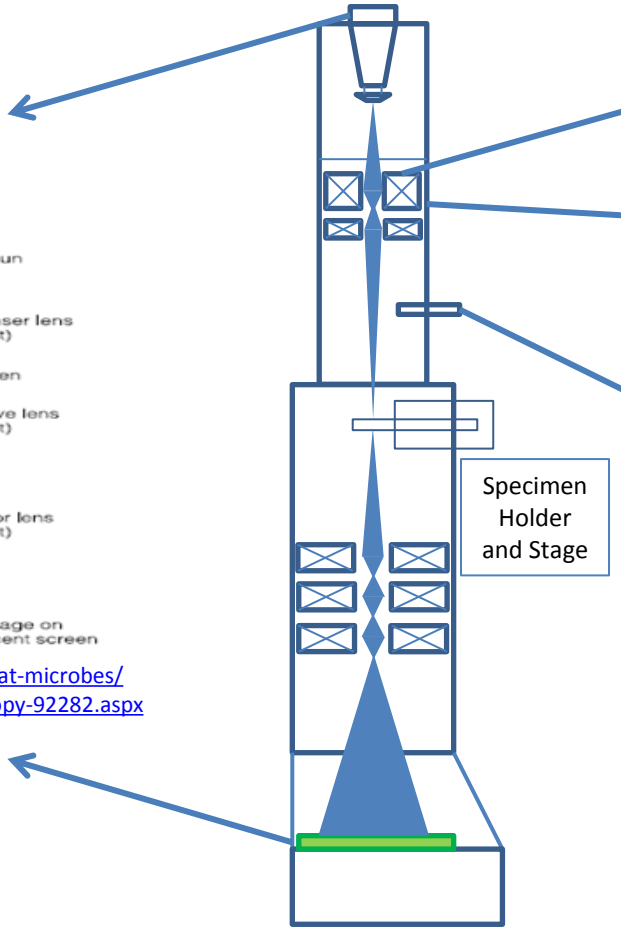
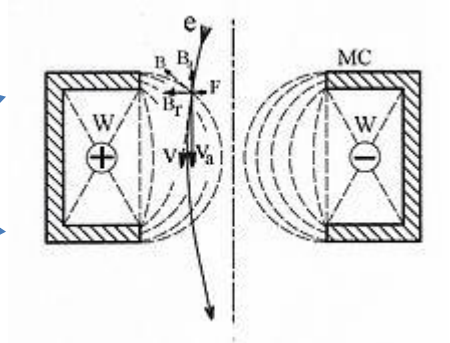
JEOL CX-100

- Why this electron microscope?

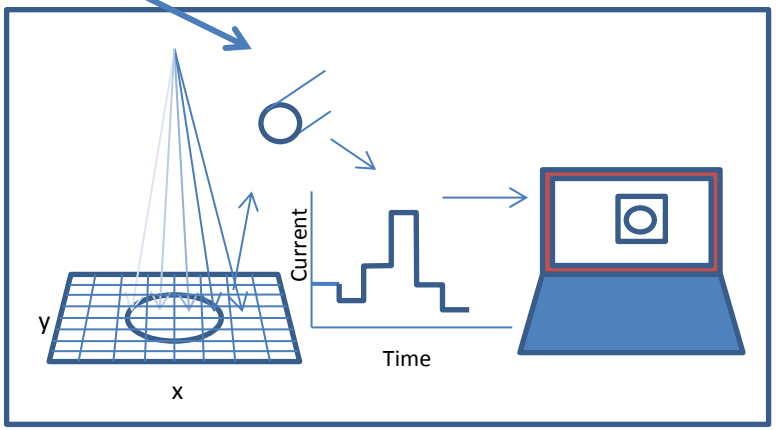


http://www.expertsmind.com/topic/looking-at-microbes/transmission-and-scanning-electron-microscopy-92282.aspx

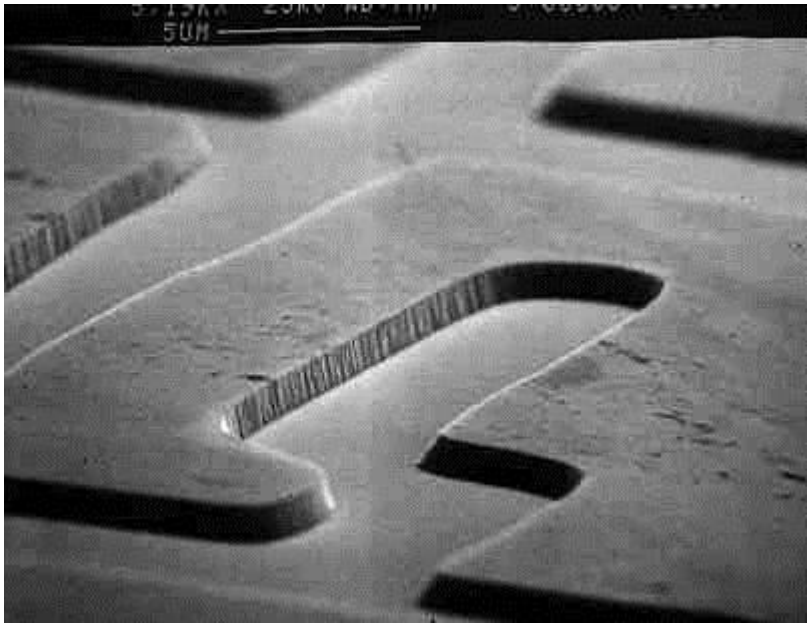




http://en.wikipedia.org/wiki/Electron_beam_welding



Why Use Electron Microscopes?



http://www.pitt.edu/~qiw4/

Ultimate Resolution

- Limiter: DeBroglie Wavelength

Wavelength vs. Particle Type	
Particle	Wavelength (m)
Photon (violet)	~1 x 10^{-7} m
Electron (80 kV)	~1 x 10^{-12}

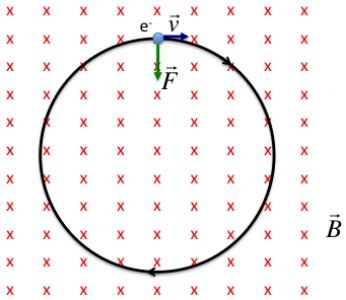
Thin Films

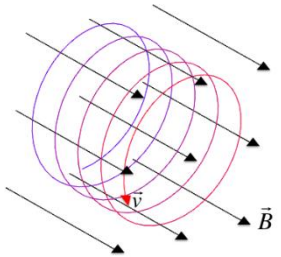
- 100's of nanometers thin
- Surface features easily seen with electron microscope

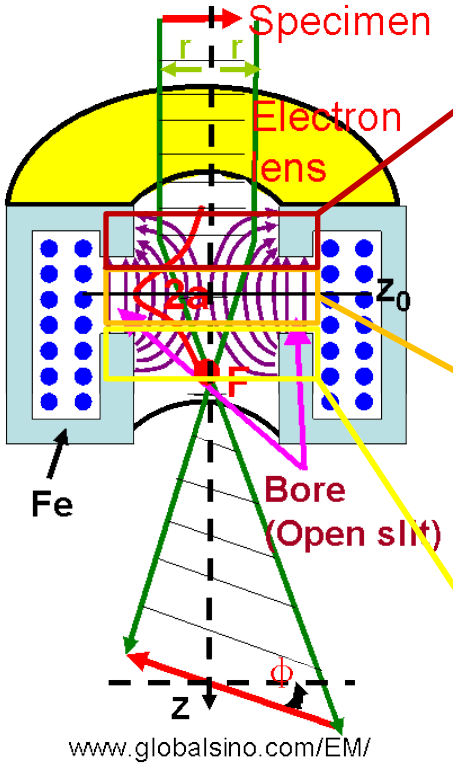
Electrodynamics

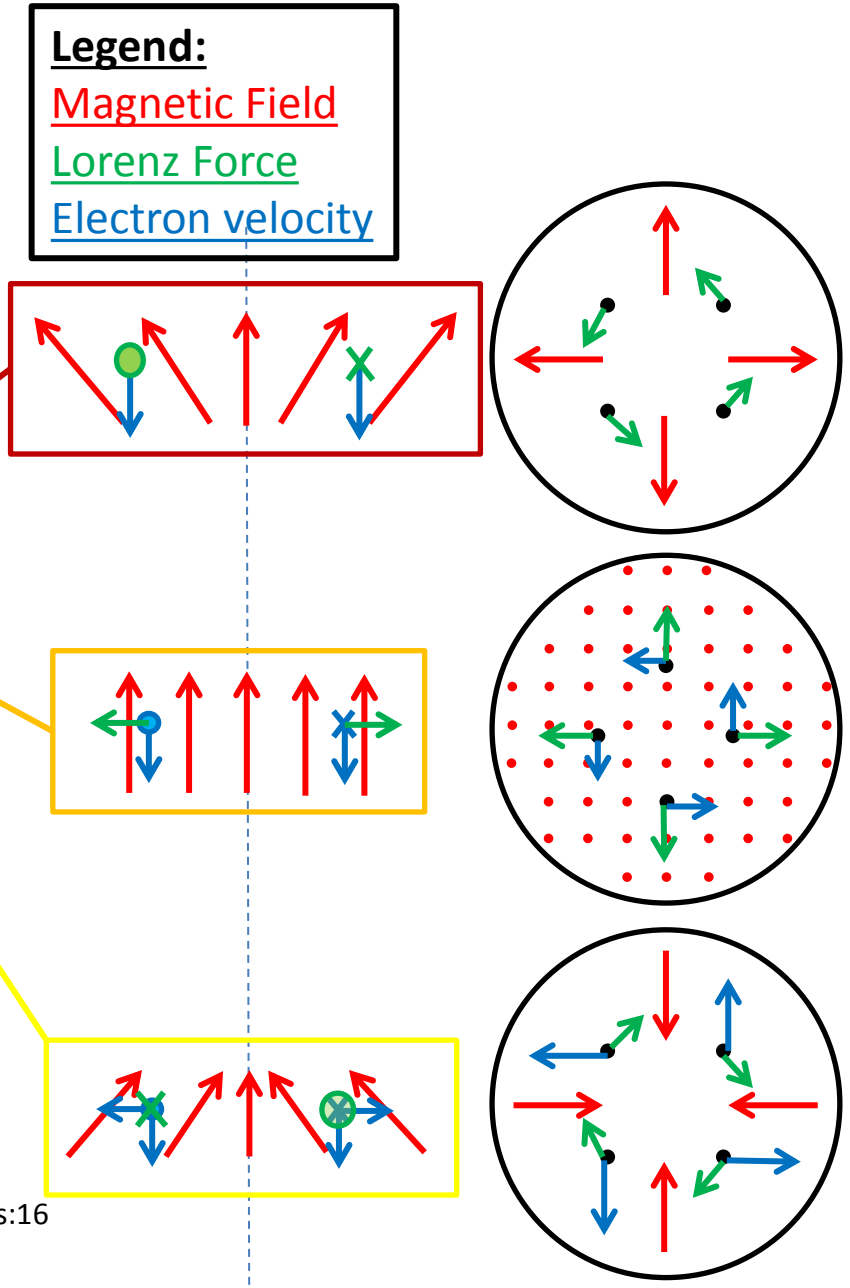
Lorenz Force

- $\vec{F} = q(\vec{v} \times \vec{B})$



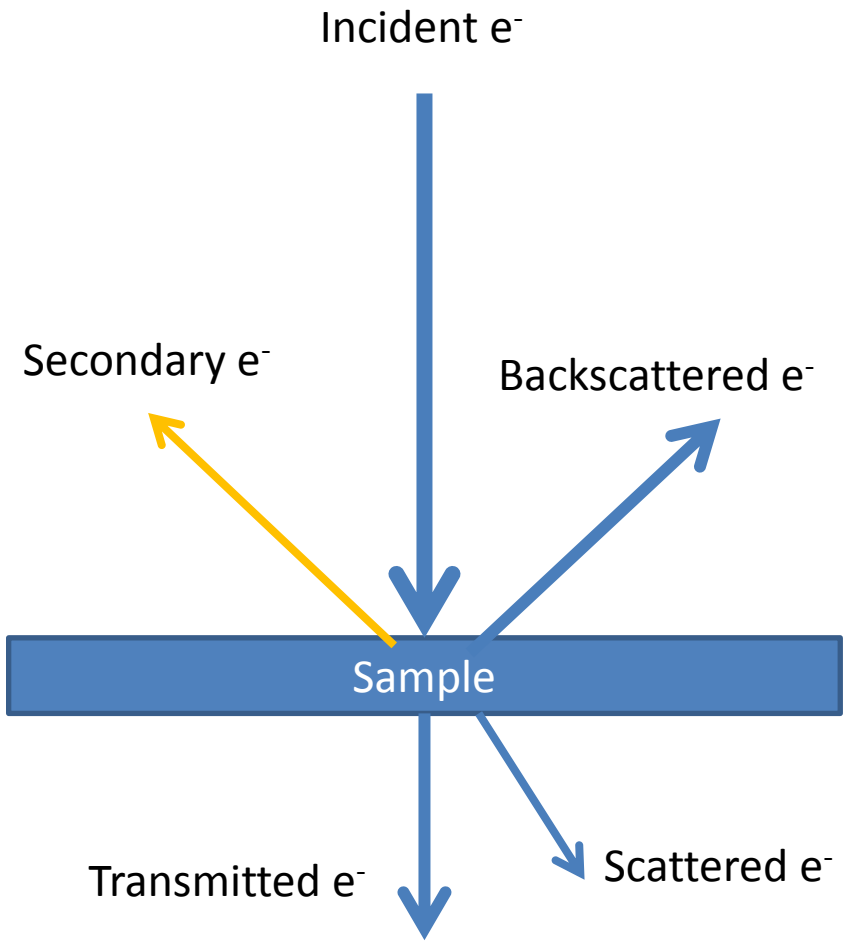






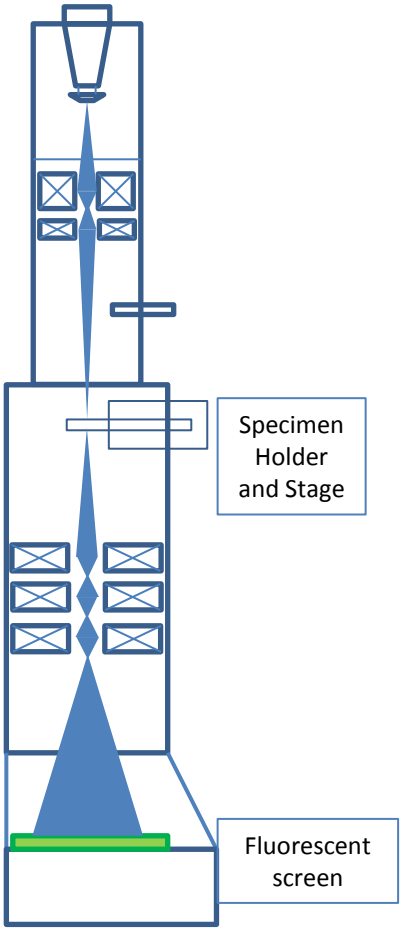
http://www.ic.sunysb.edu/Class/phy141md/doku.php?id=phy142:lectures:16

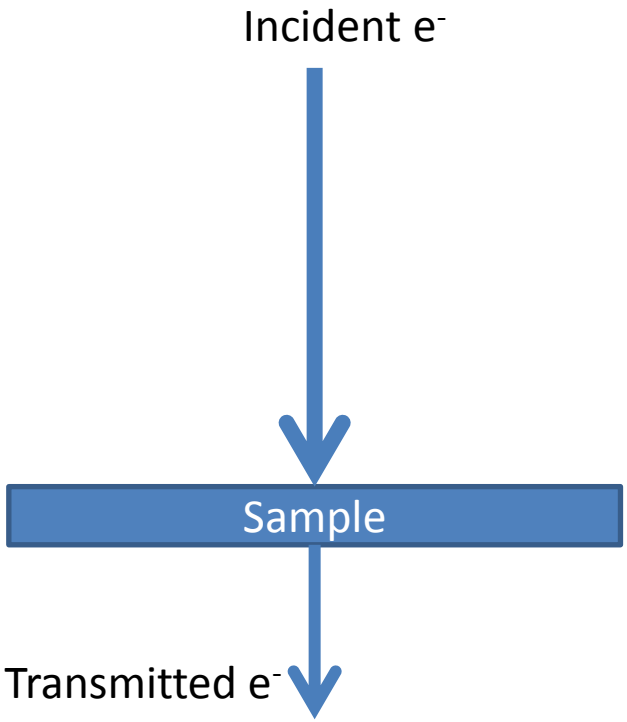
Electrons and Matter



TEM

- Transmission Electron Microscopy

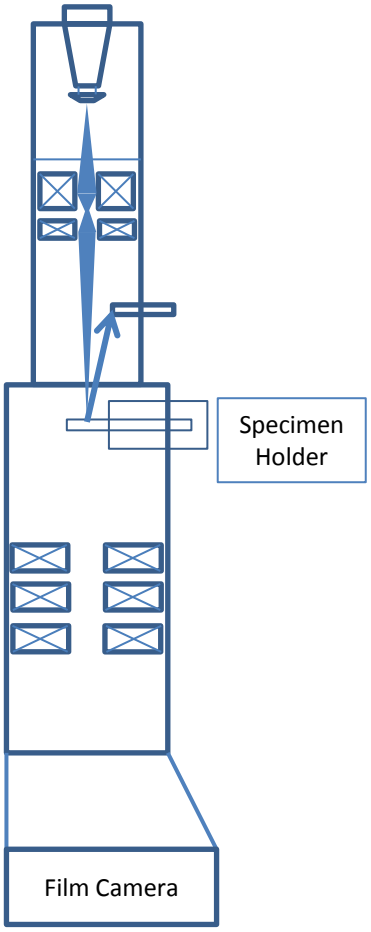


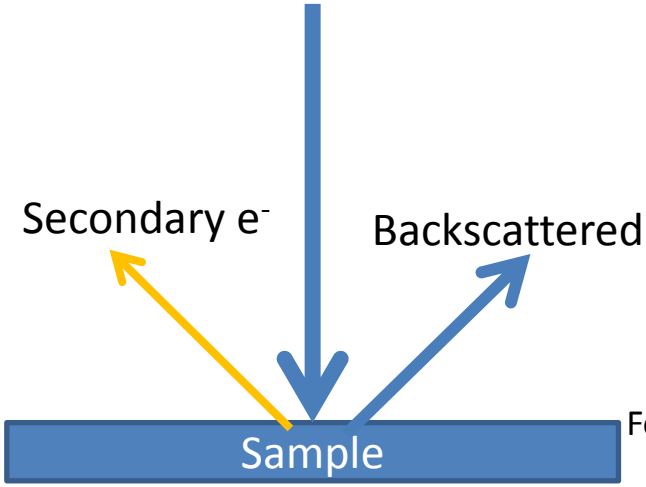


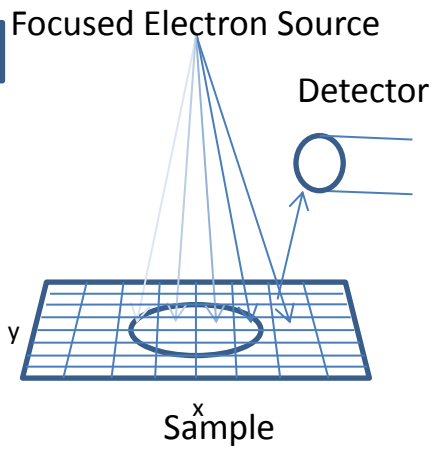
- Creates density map

SEM

- Scanning Electron Microscopy
- Backscattered Electron Microscopy

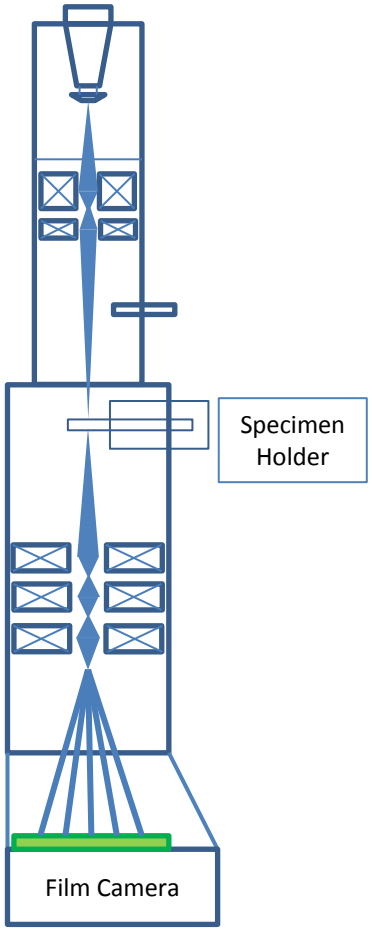




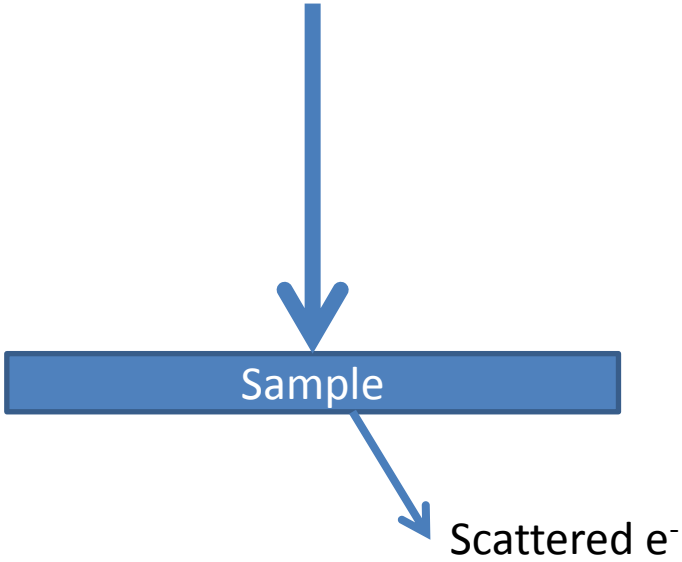


- Creates topographic map

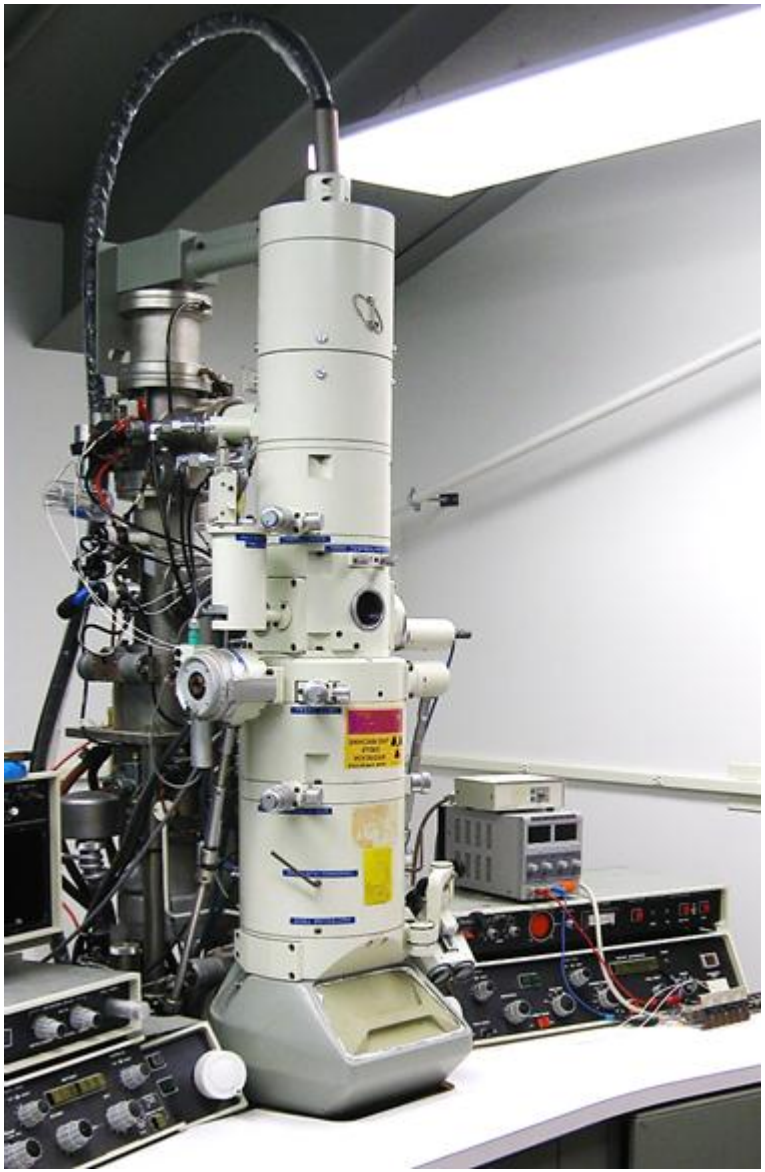
Electron Diffraction

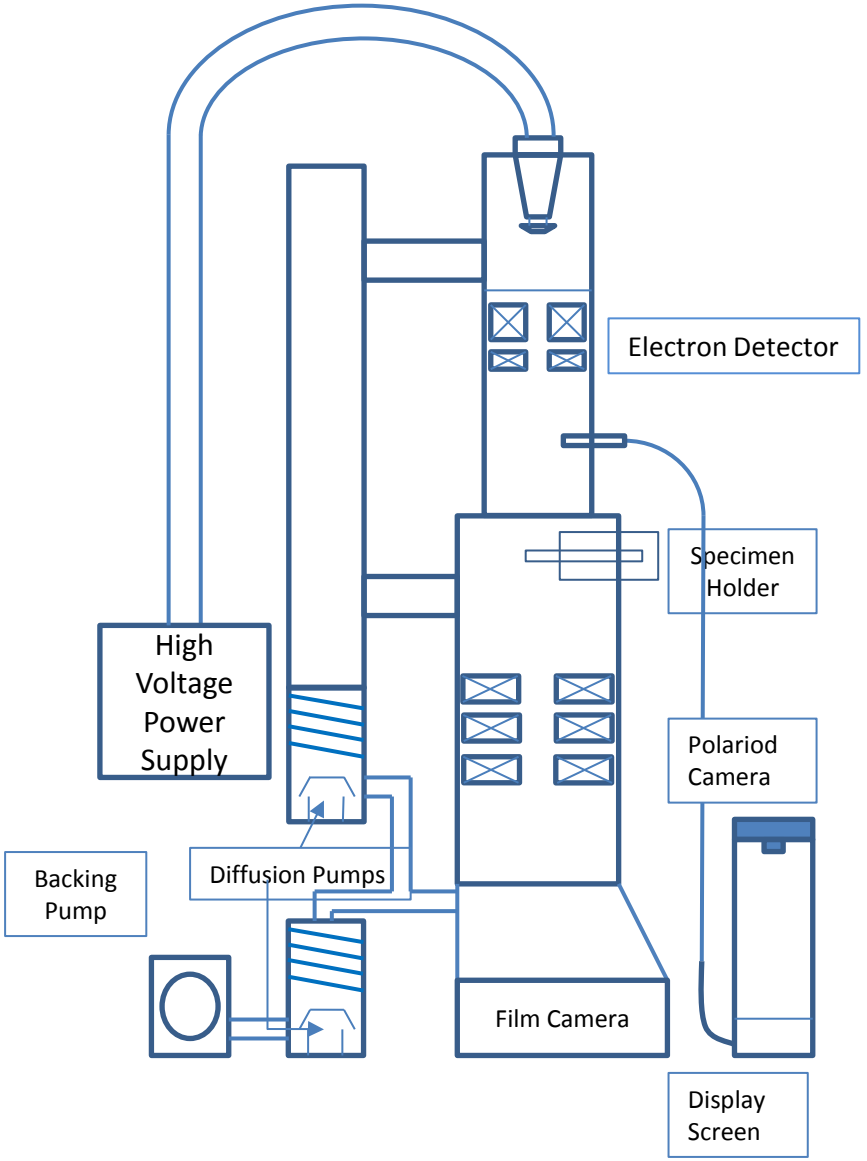


- Texture map
- Density map

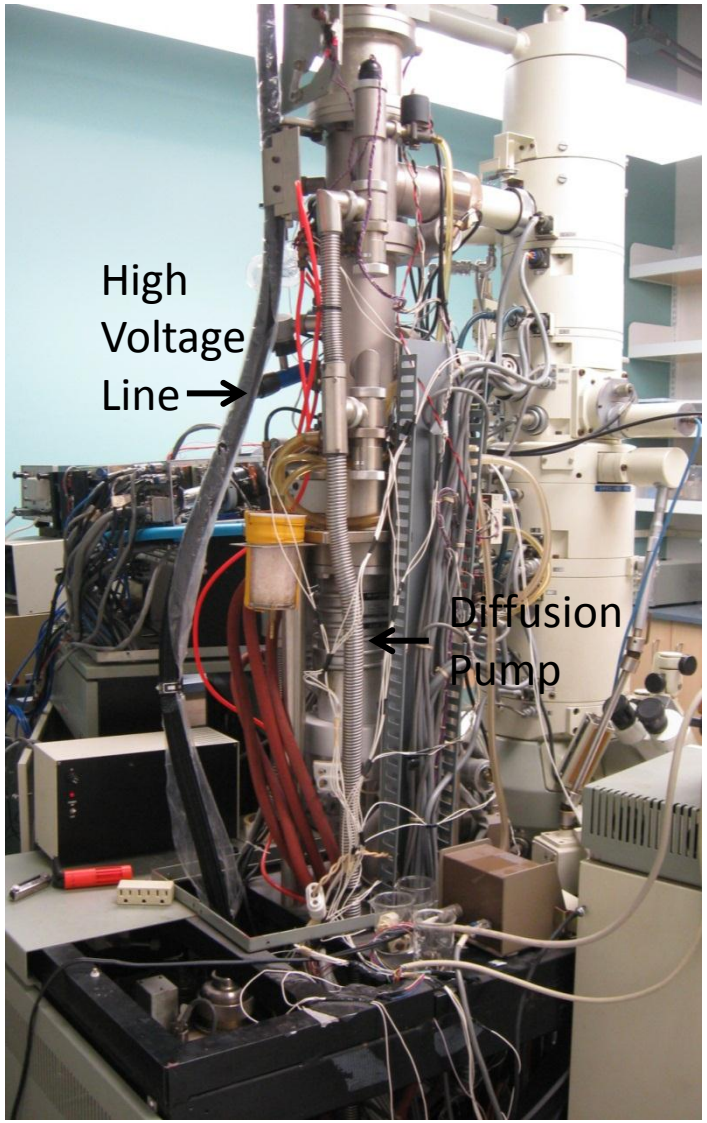


JEOL CX-100

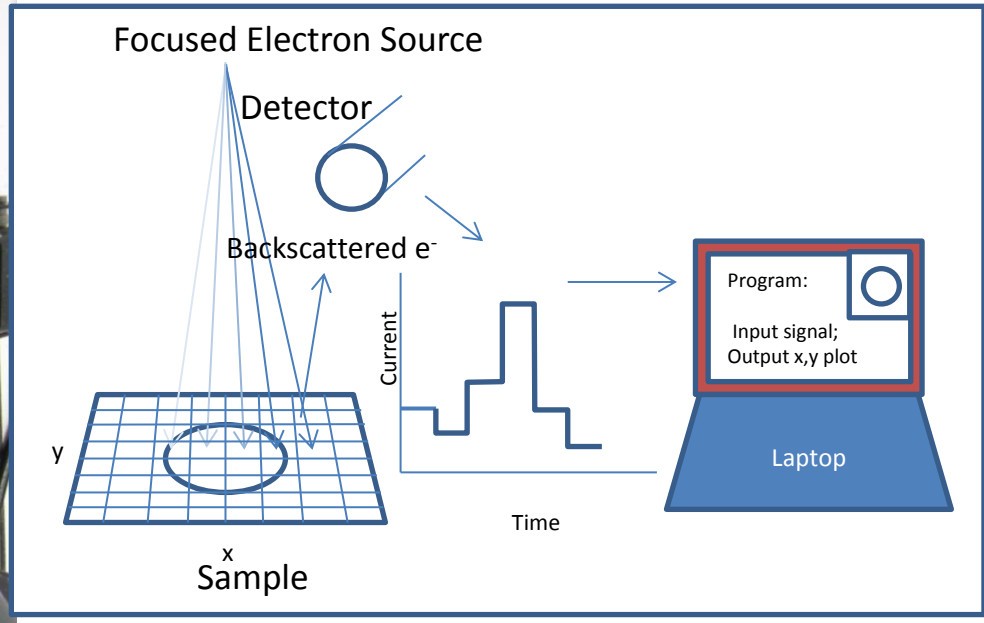



Electron Detector
Specimen Holder
High Voltage Power Supply
Polariod Camera
Backing Pump
Diffusion Pumps
Film Camera
Display Screen

Refurbishment



Photography & Labview



Conclusion and Future Plans

- Older equipment takes time to maintain
- Program almost complete

Questions?