Homework #1: Due April 11th

1) On the microscopy Explore! Page at http://myscope-explore.org/2_2_filament.html there is the statement "When the wire gets hotter still, the electrons can even pop out of the wire." Explain what this means, correcting any simplifications in this sentence.

2) Using the pages at https://myscope.training/#/TEMlevel_3_5 explain the role of:

a) The Wehnelt
b) Image Deflectors
c) CCD camera

3) On page https://www.microscopemaster.com/transmission-electron-microscope.html there is the statement "The image can be manipulated by adjusting the voltage of the gun to accelerate or decrease the speed of electrons as well as changing the electromagnetic wavelength via the solenoids." Comment on this, explaining in more detail. (Caution: while this page has useful information, do not assume that everything in it is correct.)

4) View the page https://tours.nanofab.ualberta.ca/ARMinstall/ on the installation of a recent microscope. At the end of the video tour a rectangular set of coils is installed around the microscope. Explain how these could be used to compensate for magnetic fields that would otherwise degrade the image. (Hint: google "magnetic field compensation".)

5) Estimate the full-width half-maximum of the coherence in mRad for a field-emission source for 200kV electrons. Note: you will need to look up the typical size of the source, and you should assume no magnification/demagnification.