Biophysics 210: Biological Light Microscopy
Kurt Thorn
Syllabus

Discussion section meets Tuesdays from 1-2:30pm in MH2100
Labs meet Thursday or Friday from 2-5pm (location varies)

Week 1: Introduction to light, ray optics, the optical path of the microscope, and Kohler Illumination

Goals: Understand the basic physics of light: what the speed, wavelength, and frequency of light are and how these are inter-related. Understand basic ray optics, how to draw a ray diagram for a simple lens system, and how to calculate the magnification of the image produced by a simple lens. Know the difference between infinite- and finite-conjugate imaging, and understand the layout of the lenses in a standard research microscope. Know how and why Kohler imaging is used for microscope illumination and what the front and back focal planes (object and aperture planes) are.

Discussion Section: March 31st
Labs: April 2nd and 3rd, Genentech Hall Room S-202

Lectures (watch before discussion section):

- What is Light?
- Lenses and Image Formation
- Microscope Imaging/Koehler Illumination

Additional Reading (optional):

- Physics of Light and Color: http://micro.magnet.fsu.edu/primer/lightandcolor/index.html
- Optics Fundamentals: http://www.newport.com/Optics-Fundamentals/604533/1033/content.aspx
- The Microscope Optical Train: http://microscopyu.com/articles/optics/components.html
- Infinity Optical Systems: http://microscopyu.com/articles/optics/cfintro.html

Discussion Section Topic: Ray optics and basic optical design.
In the lab, you will be assembling simple microscopes on an optical rail. This microscope has all the same lenses as a research microscope, but they are simple lenses mounted on a rail instead of complex, expensive lenses built into a microscope. This means you can move them around and build the scope yourself to develop an understanding of the light paths in the microscope. To help prepare you for the lab, we'll work through some of the theory in the discussion section.

Lab: Build your own microscope