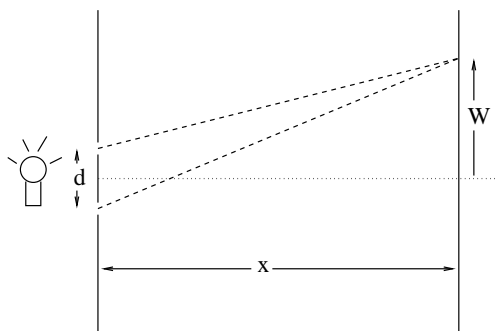


Laboratory #10
The wavelength of light

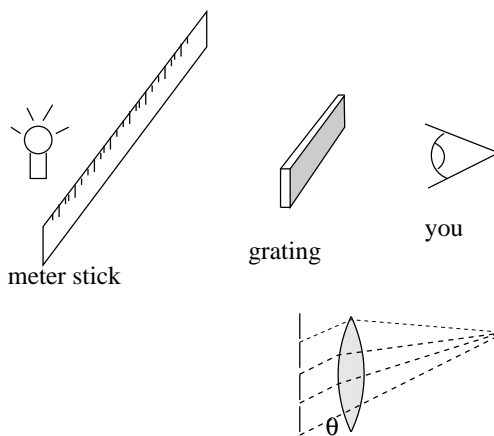
In this experiment we measure the wavelength of light using the phenomenon of interference. When a wave hits two close, narrow slits, waves come out of both slits in phase—that is to say the waves come out of the slits going up and down together. At some point, away from the slits, the waves will add up constructively and make a big wave if the difference in distances from the point to the two slits is an integral multiple of a wavelength. From the geometry of the diagram below, this means that we expect to see a bright spot if

$$\lambda = dW/x,$$

where λ is the wavelength of light, d is the distance between the slits, x is the distance between the spot and the slits, and W is the distance from the point to the perpendicular.



Now for the experiment, we have the setup the other way around, but the principle is the same. Look at the white light source through the grating by putting the grating up to your eye. You should see a broad spectrum on either side of the white light. This is because each color has a different wavelength, and the positions where the interference is constructive depends upon the wavelength. Identify three colors, one each in the middle of the reds, blues and greens. Find their wavelengths using the method below.



The diffraction grating has 13,400 lines/inch which makes $d = 1.90 \times 10^{-6}$ m. Measure the distance, x , from the grating to the light bulb and the distance, W , from the light bulb to the image of the first maximum. Use the formula above to find the wavelengths of the different colors of light.

Put a picture of this setup, with the distances labeled, in your lab books.