Physics 290 – Winter 2004

Assignment 11

Due April 20, 2004

1. How large is the image on your retina of a 2 meter tall (very tall) person standing 10 meters in front of you?

2. Estimate the number of total number of cones in the fovea centralis? (You will need the density of cones per unit are and an estimate of the size of the fovea.)

The threshold of visual sensitivity is about 1000 photons for a pulse of short duration (0.1 seconds or less). However only 10% of these actually stimulate rods.

3. How much energy is in the pulse of 1000 photons?

4. If the pulse is extended over a longer time, for example 1 second, it is below the visual threshold. Why?

5. Compare the optical power for the threshold of vision to the power at the threshold of hearing. To do this, you will need to estimate the area of the ear drum.

6. A laser pointer has wavelength $\lambda = 640$ nm. It appears to be the same color as the high powered 795 nm laser in my lab. How is it that this near infrared laser is visible, and why does it appear to be the same color as the laser pointer?