Lab 3 – The Polarization of Light

You are supplied with 3 polarizers, one on a motorized rotation stage.

1. Go in the hallway and look at the light reflected off the floor. Is it polarized, and if so, along what direction? Use this effect to calibrate the polarization axis of your polarizers.

2. Connect the polarizer to the stepper motor. Measure the degree of polarization of the laser beam by recording the transmitted intensity as a function of polarizer angle. Rotate the laser in its mount to orient the polarization axis horizontal (parallel to the table).

3. Verify Malus' Law for one and two polarizers using your laser. A demonstration that mystifies many observers is that placing a polarizer in between two crossed polarizers allows light to be transmitted that was previously blocked. Set up this system and figure out why this is so.

4. Determine Brewster's angle for the block of glass.
Hint: Collimate unpolarized light from an incandescent lamp with a converging lens and illuminate the block of glass. Measure the degree of polarization of reflected light as a function of incident angle. Find the angle that maximizes the polarization. Compare your curve to the theory prediction.

5. Multiple scattering of light can affect the polarization state. Why? Measure the polarization of initially polarized light after passing through a piece of waxed paper.

6. An optically active medium has a different index of refraction for right- and left-circularly polarized light, which has the effect of rotating linearly polarized light. Sugar molecules are chiral - they have a lefthanded twist, so a sugar solution is optically active. Measure the effect of transmitting polarized light through a cell containing corn syrup.