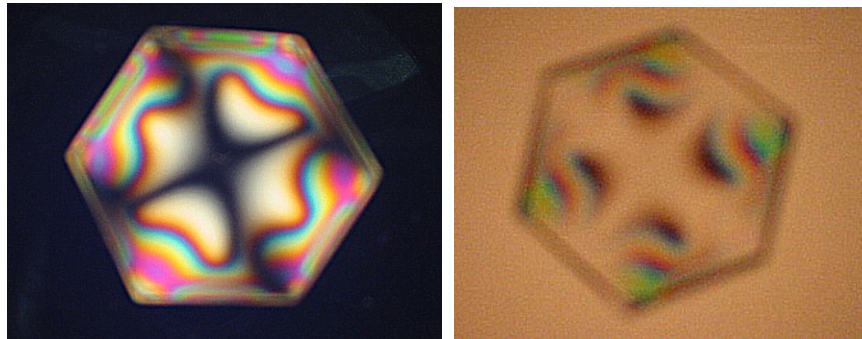


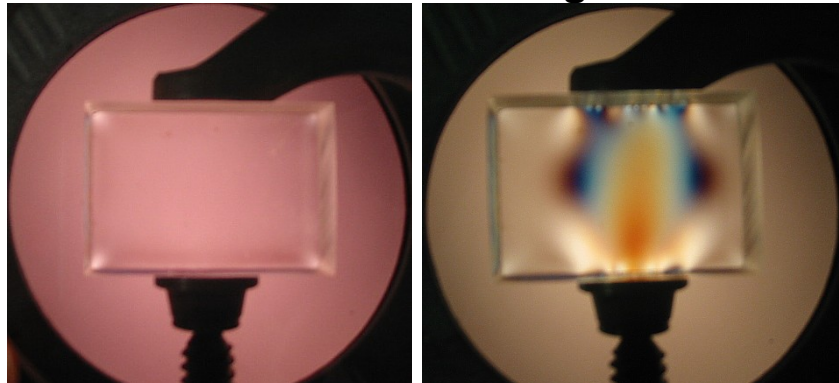
Birefringence



Polarization Table



Mechanical Birefringence



No Stress

Stressed

Purpose: Demonstrates rotation of polarization that can occur when light passes through matter.

The apparatus consists of a light source and two polarizers. You will probably have to use a camera for the audience to see. By simply rotating the top polarizer (the analyzer) you can demonstrate Malus's law very clearly.

As additional eye candy, place some plastic artifacts on the stage. When a material is stressed, it takes on optical properties of a uniaxial crystal (– under compression and + under tension): the index of refraction is different in different directions, so that initially linearly polarized light becomes rotated upon passage through the sample. This induced birefringence is proportional to the stress.

Most objects come pre-stressed, e.g. the hexagon shown at right. For extra fun, put the C-clamp on the rectangular piece of plastic. Before tightening, there is no observable stress. Then, when you crank down on the clamp, you can see the stress patterns evolve.

This phenomenon is a useful tool for studying stresses in mechanical structures. One often makes a transparent model of the object under design. The patterns can produce a very quantitative map of the internal stress.

Note: See Hecht and Zajac's *Optics*, section 8.11.1

Extra Equipment: None

Location: Shelf C4