Intro Screen

Explore bending of light between two media with different indices of refraction.

VIEW light as a ray or wave

TURN on the laser

DRAG tools from the toolbox

CONTROL the index of refraction of the material

DETERMINE the index of refraction of an unknown

MEASURE the intensity

Prisms Screen

Play with prisms of different shapes and materials, and explore the dispersion of white light.

ROTATE the laser

INVESTIGATE prisms and lenses

CHANGE the environment

CHOOSE monochromatic or white light

SEE reflections

More Tools Screen

Control the wavelength of light and explore how it bends between two media using the intensity meter, speedometer, and wave detector.

CHOOSE a wavelength

MEASURE the speed of the wave

VIEW incident, reflected, and refracted angles

COMPARE the phase and amplitude (intensity)

CONTROL the playback speed, and pause/step through the motion

Model Simplifications

- There are many types of glass; we used an index of 1.50 (at 650 nm).
- Intensities are calculated assuming a parallel polarized incident beam.

Reflected: Transmitted:

$$R_{II} = \left(\frac{n_i cos\theta_t - n_t cos\theta_i}{n_i cos\theta_t + n_t cos\theta_i} \right)^2 \qquad T_{II} = \frac{4n_i n_t cos\theta_i cos\theta_t}{\left(n_i cos\theta_t + n_t cos\theta_i \right)^2}$$

- When showing multiple reflections on the Prisms screen, light rays are terminated after 50 reflections/refractions to ensure computability.
- The index of refraction depends on the speed at which light travels through the medium. This behavior is accurately modeled in this sim, but may be easier to observe on the More Tools screen with the Angles option turned on.

Suggestions for Use

Challenge Prompts
- Are the reflection and refraction of light color-dependent? What evidence do you have?
- Explain what happens to a wave when it enters a medium with a higher index of refraction.
- Estimate the index of refraction of the mystery materials. Explain your procedure.

See all published activities for Bending Light here.
For more tips on using PhET sims with your students, see Tips for Using PhET.