

## 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

Bending Light

## 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

Bending Light

## 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:

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

Transmitted:

$$T_{II} = \frac{4n_i n_t \cos \theta_i \cos \theta_t}{(n_i \cos \theta_t + n_t \cos \theta_i)^2}$$

- 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](#).