

Light through Pin Holes and the Exploration of Shadows

Go to the Physics Exploration Center. Enter through the resource room 311/312 Thaw Hall.

The first part of the exploration involves learning about shadows formed by obstacles based upon what you know about geometrical optics. The second part involves exploration of pin-holes and images formed by them. Go to the station with a source of light, an obstacle (in the shape of a black arrow) and a screen (set-up P111-3A.pdf).

(1) Turn on the source of light. Describe what you see on the screen. Does the entire screen light up?

(2) Now move the obstacle (black arrow) into the path of the light rays between the source of light and the screen. Play with the set up by moving the obstacle closer or farther from the source and describe what you see on the screen. Now move the obstacle to the red line between the source and the screen. Draw a quick sketch of your observation on a graph paper by placing it behind the screen.

(3) Now move the obstacle to the blue line between the source of light and the screen. Draw a quick sketch of your observations on a graph paper by placing it behind the screen.

(4) Does the shadow of the obstacle increase or decrease in size with increase in the distance from the light source? Explain why this makes sense based upon the fraction of light that gets blocked when the obstacle is at the red line vs. the blue line (please think before you write your answer).

(5) Go to the other experiment (set-up P111-3B.pdf) which has a source of light (with an arrow marked on it so that you can easily find its image) and a pinhole (a very small hole). Predict what you should see on the screen that is placed behind the pinhole. Perform the experiment and verify your prediction (you can adjust the distance of the screen or pinhole in order to focus what you see on the screen). If you observed something other than what you predicted, can you reconcile the difference? Explain the observations using a ray diagram which clearly shows the source of light, pinhole and screen (hint: remember that every point on the light source is giving out light radially in all directions and light rays travel in a straight line).