

## Light travels in a straight line.

### Pinhole Camera

#### Find

- Scissors or utility knife
- Tape
- 2 pieces of black cardboard, 8x8 inches (20x20 cm)
- 1 piece of wax paper, 7x7 inches (18x18 cm)

#### How?

1. Cut out a 5x5 inch hole (13x 13 cm) in the center of the black cardboard; this will make a frame for your wax paper.
2. Tape the wax paper over the opening, tape it so it stays tight and there are no wrinkles.
3. For the pinhole lens use the pin to poke a hole in the middle of your other 8x8 inch (20x20 cm) piece of cardboard.
4. Hold this pinhole about 2 feet (.6 meter) away from the bulb.
5. Hold your sheet 2 feet (.6 meter) away from the pinhole. You should see a dim, upside down version of the light bulb. If it looks like a smudge to you, move the screen closer to the pinhole.

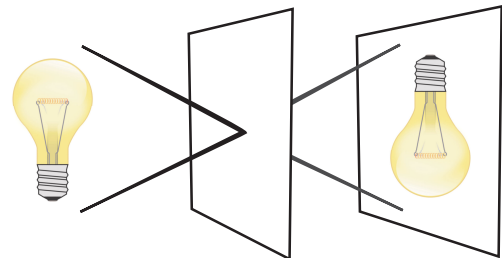
#### What happened?

Since light travels in a straight line in all directions, the only light waves that travel through the small pinhole will be at an angle. This angle is what causes the image seen on the screen to be upside down. If you make the hole bigger, it should make the image brighter, but less sharp.

Light travels in a straight line unless it's diverted, so light travelling from the base of an object will travel in a straight line through the hole and hit the top of the surface opposite the hole. This is why the image appears upside down.

All camera designs, from the simplest homemade box camera to the newest digital camera combine the same basic elements. Photography, lighting, telescopes and microscopes all exist because light travels in a straight line.

Experiment with different sized holes to find out which size gives the best effect. The hole is called the aperture: the bigger the aperture, the brighter the image. But as it gets bigger, the picture gets more out of focus.



#### Science Standards

- UK National Curriculum Key Stage 2 – LIGHT AND SOUND
- National Science Education Standards K-4 – LIGHT, HEAT, ELECTRICITY, AND MAGNETISM, SCIENCE 5 A HUMAN ENDEAVOR and K 5-8 TRANSFER OF ENERGY

#### Light in Action, Pinhole Experiment, YouTube.com

Request free copies of this DVD at [www.spie.org/lightinaction](http://www.spie.org/lightinaction).  
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