Construct a pinhole camera

Much of what is known about the eye and vision was influenced by scientists in Muslim civilisation beginning in the 9th century. Scientist and philosopher Al-Kindi improved earlier knowledge of optics, and Ibn al-Haytham revolutionised that science. Among other things, he experimented with a pinhole camera. Your students can create their own pinhole cameras—a simple camera without a lens and with a single small aperture. Light passes through the hole and projects an inverted image on the opposite side of the box.

Each student will need:

- Shoebox
- Ruler
- Sharpened pencil
- Utility knife
- Clear adhesive tape
- Scissors
- 7.5 cm x 7.5 cm square of heavy-duty aluminium foil
- White tissue paper or tracing paper
- Matte black paint (optional)
- Plastic water bottle, any size

1. The shoebox used in this activity should be 12 inches long by 8 inches wide by 4 inches deep. Measure out a 5 inch by 10 inch rectangle on the bottom of the box.

2. Using the ruler as a straight edge, carefully cut out the rectangle with the utility knife.

3. Cut a piece of tissue or tracing paper larger than the cut-out rectangle and tape it over the opening.

4. Draw a 2 inch by 2 inch square in the center of the box's cover. You can find the center of the cover by drawing two diagonal lines. The place where the lines intersect is the center. Cut out the 2 inch by 2 inch square.

5. Use the sharpened pencil to poke a small hole in the center of the piece of aluminum foil.

6. Tape the foil over the square in the cover. Make sure that the foil is completely taped down on all four sides so that light will only pass through the hole.

7. As an option, paint the inside of the cover with the flat black paint.

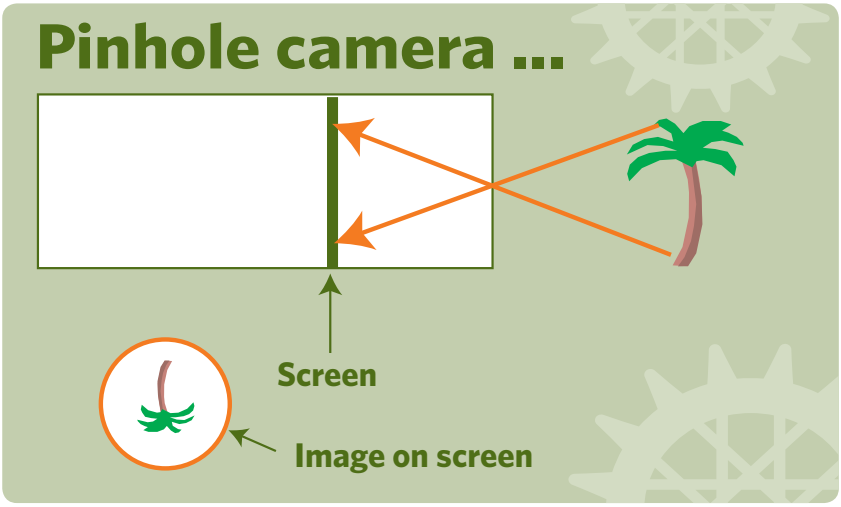
8. Place the cover onto the bottom portion of the box and seal it with tape.

9. The pinhole camera will work best in a darkened room with a strong back light coming through a window.

10. Place an object such as a plastic water bottle on the windowsill.

11. Hold the pinhole side of the camera up to the bottle. Move the box back and forth away from the bottle to focus the image on the tracing paper.

Since light travels in a straight line, the image of the bottle should be upside-down. See the illustration below.



In this drawing the tree replaces the water bottle you used.

Find more information about Muslim civilisation and optics:

El-Bizri, Nader. “Ibn al-Haytham: An Introduction.” 2011.

http://www.muslimheritage.com/article/nader-el-bizri-ibn-al-haytham-introduction

Ozturk, Ruveyda. “Ibn al-Haytham and the New Optics.” 2009.

http://www.muslimheritage.com/article/book-review-ibn-al-haytham-and-new-optics71

Malik, Saira. “The Influence of Ibn al-Haytham on Kamal al-Din al-Farisi.” 2011.

http://www.muslimheritage.com/article/influence-ibn-al-haytham-kamal-al-din-al-farisi