

OPTICAL SCIENCE

A hand holding a magnifying glass over a colorful, abstract background with a grid pattern and a rainbow-like spectrum.

WARNING — Science Education Set. This set contains chemicals and/or parts that may be harmful if misused. Read cautions on individual containers and in manual carefully. Not to be used by children except under adult supervision.

What's in your experiment kit



Checklist: Find – Inspect – Check off

✓	No.	Description	Qty.	Item No.
<input type="checkbox"/>	1	Tracing paper	1	705 800
<input type="checkbox"/>	2	Lens	1	702 342
<input type="checkbox"/>	3	Rubber band	1	161 412
<input type="checkbox"/>	4	Wooden bead	10	772 632
<input type="checkbox"/>	5	String	1	350 134
<input type="checkbox"/>	6	Tube	1	707 448
<input type="checkbox"/>	7	Mirror	1	702 221
<input type="checkbox"/>	8	Red translucent film	1	161 415
<input type="checkbox"/>	9	Blue translucent film	1	702 230
<input type="checkbox"/>	10	Green translucent film	1	161 416
<input type="checkbox"/>	11	Rainbow film (diffraction grating)	1	707 449
<input type="checkbox"/>	12	Chalk	1	705 361
<input type="checkbox"/>	13	Top	1	703 548
<input type="checkbox"/>	14	Optical fiber	1	707 450
<input type="checkbox"/>	15	Modeling clay	1	000 588
<input type="checkbox"/>	16	Cup	1	707 451
<input type="checkbox"/>	17	Mounting foot	5	701 384
<input type="checkbox"/>	18	Pushpin	1	707 452
<input type="checkbox"/>	19	3D poster	1	707 446
<input type="checkbox"/>	20	Flip book paper sheet	1	707 445
<input type="checkbox"/>	21	Die-cut sheet 1 (thick cardboard)	1	711 210
<input type="checkbox"/>	22	Die-cut sheet 2 (thin cardboard)	1	711 211
<input type="checkbox"/>	23	Transparent film sheet	1	707 447
<input type="checkbox"/>	24	“Town” paper sheet	1	710 980

Additional things you will need:

scissors, tape, glue, 3 small flashlights, pencil, dull knife, old newspaper, soup bowl, water, large hand towel, desk lamp, energy-saving bulb, white paper, water, non-permanent marker, set square, compass

Any materials not contained in the kit are marked in *italic script* in the “You will need” boxes.



Please check all the parts against the list to make sure that nothing is missing. If you are missing any parts, please contact Thames & Kosmos customer service.

Light: What Is It? Pages 3 to 11

This is where you will learn about all the things that light can do.



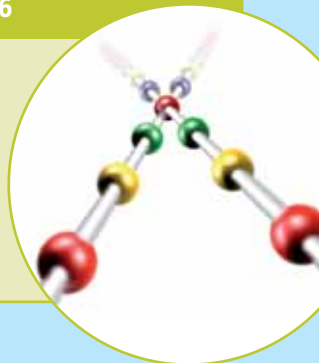
Eye and Camera: How We See Images Pages 12 to 22

Discover how your eyes see.



Seeing in 3D Pages 29 to 36

Why we have two eyes



Optical Illusions Pages 37 to 48

Let your eyes deceive you.



Seeing Colors Pages 23 to 28

How all colors come from three



CHECK IT OUT

You will find supplemental information on pages 10, 11, 21, 22, 35, 36, and 48.



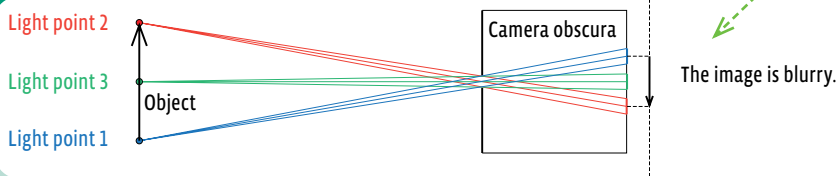
PINHOLE CAMERA & EYE

→ How the image gets onto the pinhole camera screen

Every point of any object emits rays of light in all directions.

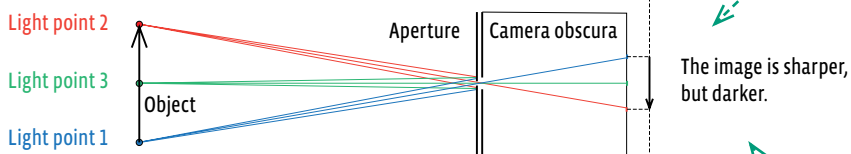
Without an aperture, the image on the screen is bright, because a lot of light finds its way through the hole. However, all the light rays land on all sorts of different spots on the screen — which is why the image is blurry. ↓

Pinhole camera without aperture



When the aperture is used, a lot fewer light rays find their way through the hole, but they arrive at the screen closer together. That makes the image a lot sharper, but unfortunately darker as well. ↓

Pinhole camera with aperture



→ What does the lens do?

With the lens, the image is crystal clear and bright. The lens collects all the scattered incoming light rays and displays them on one point of the screen.

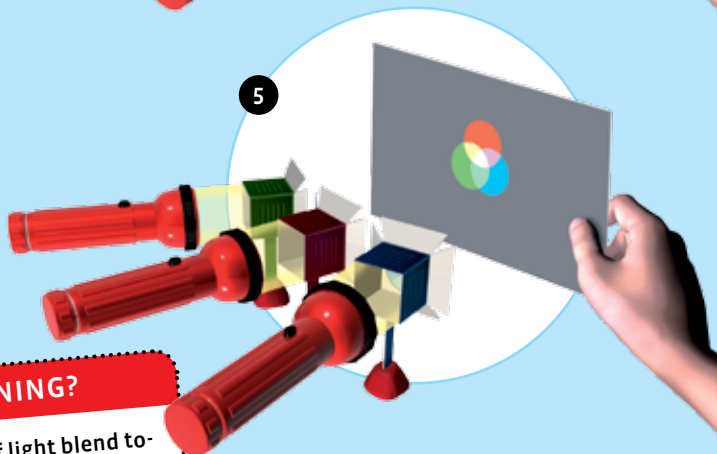
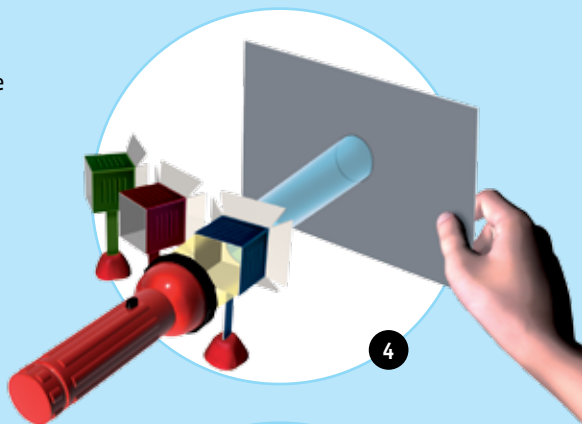
In the two diagrams, you can also see why the image on the screen is turned upside down.

EXPERIMENT 17

HERE'S HOW IT CONTINUES

- Draw a circle with a diameter of about 7 cm on the sheet of white paper. Hold it in front of the spotlights like a screen. Now each person should take his or her flashlight and shine it through one of the three spotlights, so the cone of light hits the circle as closely as possible.
- Now watch what happens when you shine light through two or all three spotlights at the same time.

What happens when you vary the light intensity by holding the flashlights a little farther away or by switching off one of the flashlights?



→ WHAT'S HAPPENING?

The colors of the cones of light blend together to produce other colors: red and green make yellow, red and blue make purple, blue and green make bluish green. By varying the intensity of light that you shine through the spotlights, you can get further color variations. And all three on full power produce: white!

