

ELEMENTARY EXPLORATION: Seeing the Light

GOAL: To develop students' critical thinking skills by exploring angles of reflection of light.

To answer the question: How does a periscope work?

MATERIALS:

- Flashlight
- 2 Books
- 4 Mirrors with mirror clips*
- Toy periscope
- Paper and pencils

PROCEDURE:

1. Set up a center with the materials listed.
2. Make a sign with the diagram to the right (leaving out the mirrors and the path of the light) and the following instructions for the center:

Examine the periscope. How does it allow you to see in a different direction?

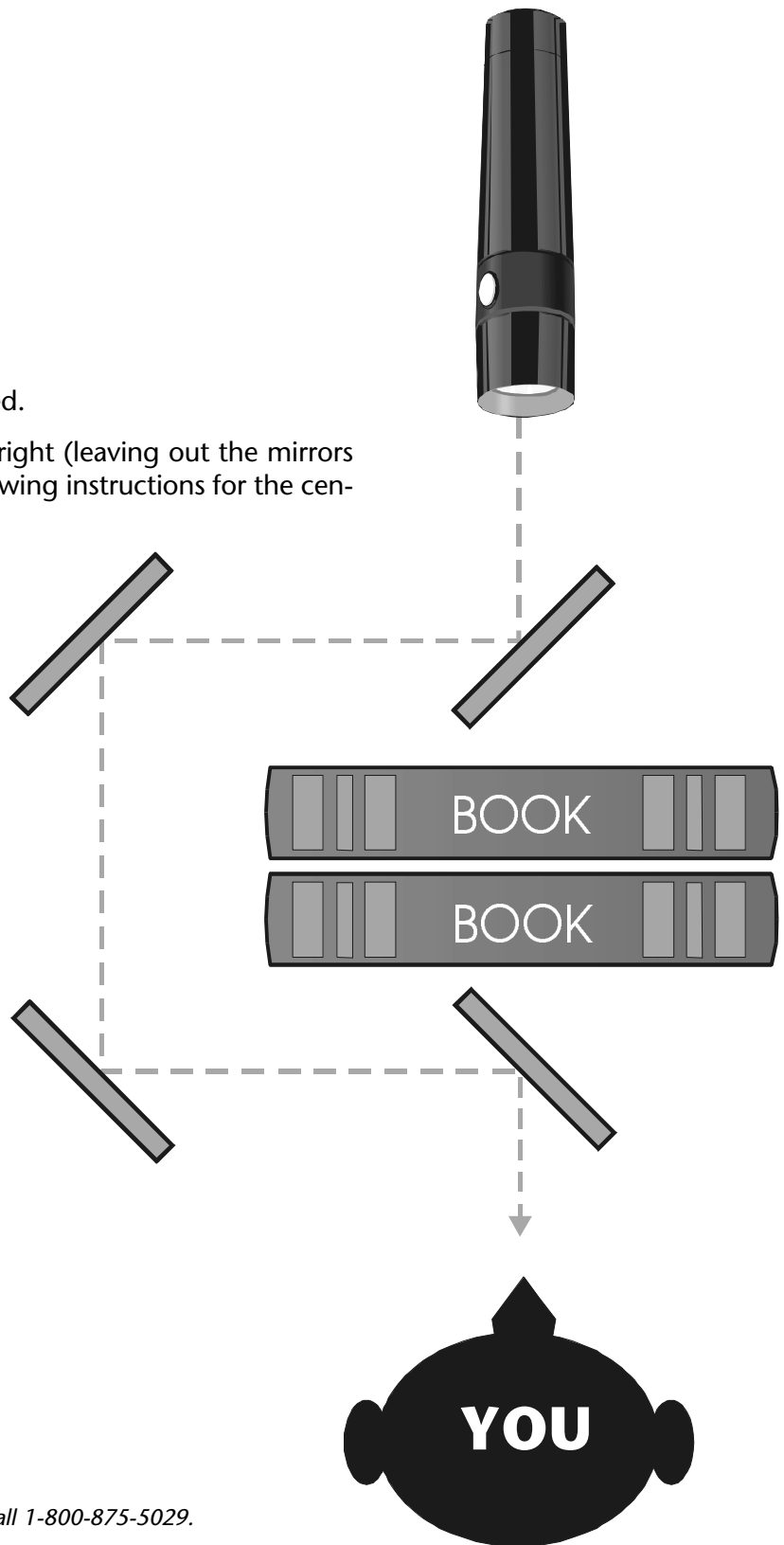
Set up the flashlight and the books like in the diagram so that you can not see the flashlight.

Arrange the mirrors so that they reflect the light from the flashlight around the books and to your eyes. Remember that light will reflect off a mirror at the same angle it hits the mirror.

Draw a picture of the flashlight, the books, and you. Show how you arranged the mirrors in order to see the light.

Draw the path of the light from the flashlight to you, showing how it was reflected by the mirrors. Do the angles look the same?

Can you explain how the periscope works?



* for information on obtaining mirrors with clips, call 1-800-875-5029.

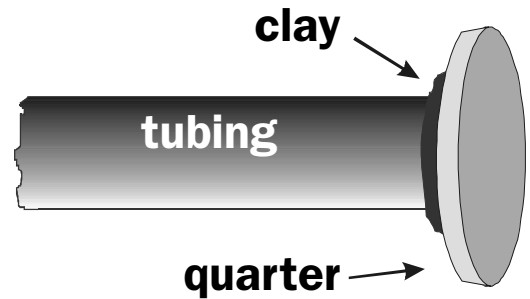
ELEMENTARY EXPLORATION: SOUND & STATES OF MATTER

GOAL: To explore how sound waves travel in different states of matter.

To answer the question: Does sound travel better in solids, liquids, or gases?

MATERIALS:

- 2—8' length of 1/2" soft plastic tubing*
- 6—Quarters or tokens of similar size
- Clay
- Pencils, paper, & tape
- Water
- 8' table



PREPARATION:

1. Fill one of the tubes with water, seal both ends with small amounts of clay, and label it Tube 2. Seal the ends of the other tube so that it is filled with air and label it Tube 1.

PROCEDURE:

1. Set up a center on the 8' table with the tubes, clay, cups, quarters, pencils and paper.
2. Schedule the students in groups of four to explore the center at five minute intervals.
3. Make a poster with the following instructions for the center:

Does sound travel better in solids, liquids or gases? Write your hypothesis on a piece of paper. Conduct the experiment to find out.

1. Stretch out Tube 1, which is filled with air, along the table. Attach a quarter to each end of the tube with a small amount of clay.
 2. Two students (A & B) hold the ends of the tube and two students (C & D) lift the tube off the table.
 3. Student A hold the quarter flat to your face right in front of your ear. Student B tap the quarter with a pencil, barely making a noise. Student A observe the loudness of the sound.
 4. Student B listen and Student A tap.
 5. Students A & B hold the tube, while Students C & D listen and tap.
 6. Conduct Steps 1 through 5 with Tube 2, which is filled with water. Make sure you tap with the same amount of energy.
 7. Stick quarters to both ends of the table with a small amount of clay. Conduct the same experiment with sound traveling through the table.
 8. In which experiment was the tapping loudest? Each person write his/her observations on the paper.
 9. As a group, come to a conclusion to answer the question. Was your hypothesis correct?
4. As an extension, experiment with different solids to see if some solids transfer sound energy better than others—wood versus metal, for example.

* for information on obtaining inexpensive tubing, call 1-800-875-5029, or check your local aquarium supply store.

ELEMENTARY EXPLORATION: LOCATING SOUND

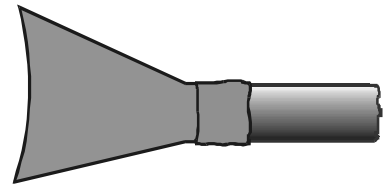
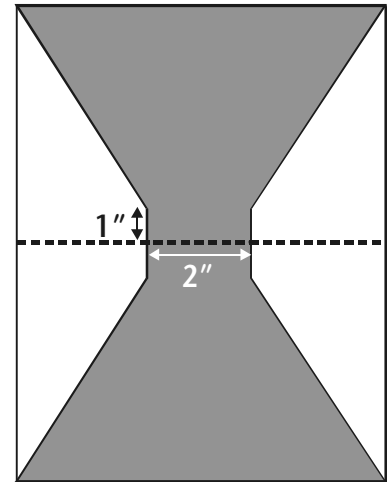
GOAL: To explore how we locate the direction of sounds because of the relative time it takes sounds to reach our ears. (For example, a sound on our left will reach our left ear before it reaches our right.)

MATERIALS:

- 2—4' length of 1/2" soft plastic tubing*
- 2—Pieces of construction paper
- Scissors
- Tape
- Paper and pencils

PREPARATION:

1. Cut the construction paper as shown in the template on the right, so that you have four pieces of paper in the shape of the dark areas of the template.
2. Tape the sides of the pieces of paper together to make four funnel-shaped *sound gatherers* and tape them to the ends of the tubing, as shown in the diagram on the right.



PROCEDURE:

1. Set up a center with the tubing.
2. Schedule the students in groups of four to explore the center at five minute intervals.
3. Make a poster with the following instructions for the center:

How do you locate sounds? Without seeing what is making a sound and where it is coming from, how do you know the direction of the sound? Write your hypothesis on a sheet of paper.

1. Student A—hold one tube to each ear.
2. Two students (B & C)—hold the other ends of the tubes behind Student A as shown in Diagram 1.
3. Student D—make tapping sounds with two pencils behind Student A—to the left, to the right, and directly behind. Can Student A correctly locate the position of the sounds?
4. Student B—cover the end of your tube and see if Student A can correctly locate the direction of the tapping sound.
5. Students B & C—hold the ends of the tubes behind Student A as shown in Diagram 2.
6. Student D—make tapping sounds as you did in Step 3. Can Student A correctly locate the position of the sounds?
7. Each student take a turn as Student A.
8. As a group, discuss your results and write a conclusion to answer the question. Was your hypothesis correct?

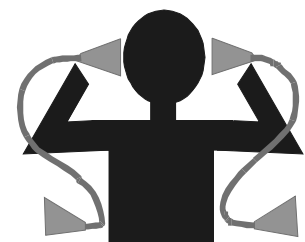


Diagram 1



Diagram 2

* to obtain inexpensive tubing, check your local aquarium supply store.