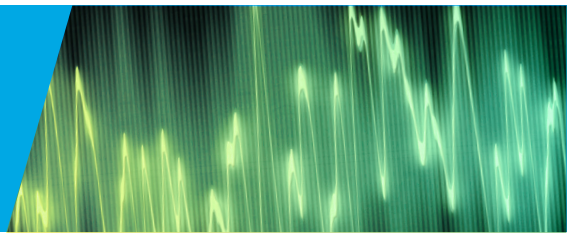
CURIOSITY AT HOME

BOUNCING SOUND WAVES



Have you ever heard an echo in a canyon or large, empty room? Sound travels in waves that can bounce, or reflect off of some surfaces. In this activity, use two cardboard tubes to aim sound waves at a wall and bounce them back into your ears.

MATERIALS

- Small portable speaker (substitute radio, or speaker function on a tablet or phone)
- Cardboard tubes (substitute a rolled-up magazine or papers)
- Bare wall space
- At least 2 people to do the activity
- Science notebook or paper to record findings (optional)
- Something to write with (optional)

PROCEDURE

- Begin playing music through your speaker at a low volume and place it near a wall with speaker facing the wall. You might also experiment with playing a podcast or a video instead of music.
- Each partner should have a cardboard tube. Partner A should place one end of their tube against the speaker and point the other end toward the wall, leaving about 2–4 cm (1–2 inches) of space between the tube and the wall. The tube should be pointing to the wall at an angle, rather than straight on.
- Partner B should put one end of their tube up to one ear and point the other end toward the wall at an angle, leaving 2–4 cm (1–2 inches) of space between the tube and the wall.
- The open ends of the two partners' tubes should be fairly close together, only 2–4 cm apart (1–2 inches).
- If both tubes are aimed just right, the music or voices from the speaker will sound louder to the partner holding the tube to their ear. If the sound is not louder, try changing the direction the tubes are pointed a little until a difference is noticed.
- Repeat the activity, this time trading jobs so that both partners get a chance to hear the difference in loudness.

Experiment continued on next page...

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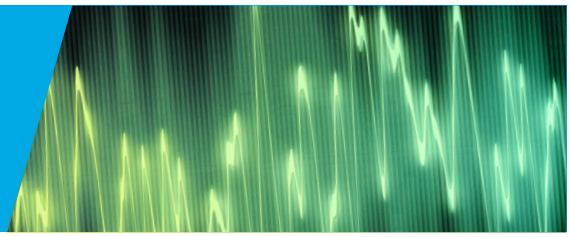
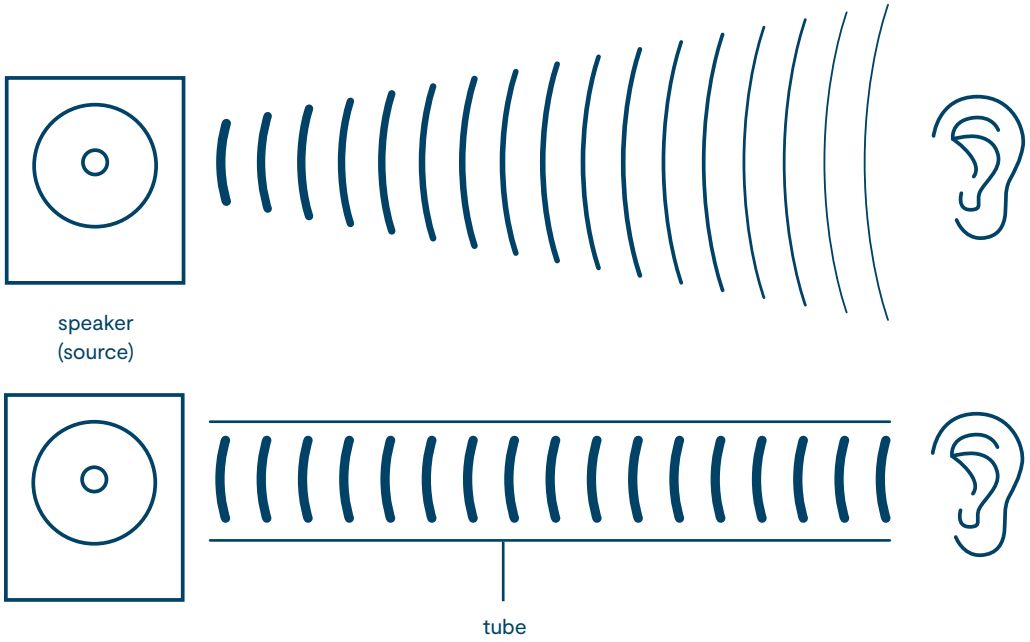


EXPLORE MORE

- Try replacing the cardboard tubes with a glass or a different tube-shaped object.
  - › Does it make the sound louder or softer? Does it sound clearer or muddier?
- Try placing the speaker from the activity fully inside a large glass or vase.
  - › How does that affect the sound? Can you feel the vibrations by touching the glass or vase?
- Try changing how far the speaker and tubes are from the wall. How far back from the wall can you get and still hear the louder sound waves in the listening partner's tube?

WHAT'S HAPPENING?

Normally, sound waves spread out as they travel from the object that made them to your ear. The more they spread out, the fainter they sound. In this experiment, the sound waves coming from the speaker travel straight down the first tube and bounce off the wall into the second tube. The sound is directed by the second tube right to your ear, and therefore sounds louder. The sound waves do not have a chance to spread out as much as normal because they are being captured and aimed by the tubes.



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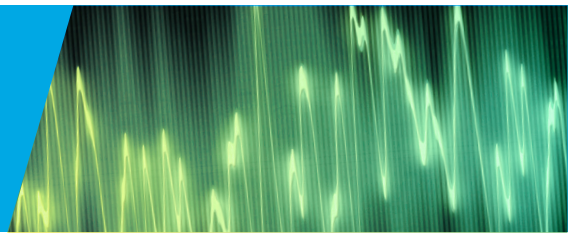

K–2 GRADE EXPLORATION

- Try making a paper cone to replace a cardboard tube.
  - Bend a piece of paper into a tube so that one end of the tube is very narrow and the other end is wider. Secure the cone with a piece of tape
  - Try the activity again using the cone next to the listener's ear instead of the cardboard tube. What happened? Is it louder or softer? Clearer or less clear? What if you stacked multiple tubes on top of each other? Or multiple cones?

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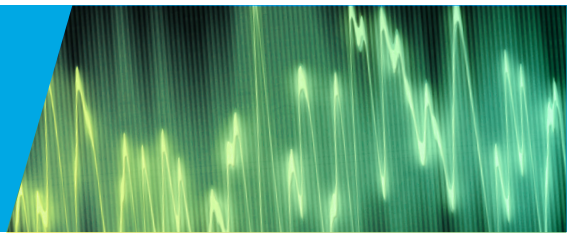

3–5 GRADE EXPLORATION

- If a wall can bounce sound around, what might stop the sound and absorb the waves?
  - Try replacing the wall in the activity with a curtain or a bedsheet. Does it make the sound louder or softer?
  - Using an egg carton and some plush materials, try to create your own sound panel that stops any sound from bouncing off of it and absorbs the waves.
- What other variables could you change in the original experiment? Could you change the length of the cardboard tube, or how close you are standing to the wall? Choose one thing to change and do another test. How were your results different than the first time you did the experiment?

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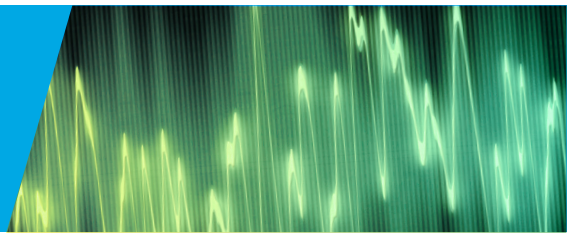

6–8 GRADE EXPLORATION

- Remembering that sound moves in waves, try to draw the path of the waves during the activity in your science notebook or on a spare piece of paper. Follow the sound waves as they leave the speaker, go through the first tube, hit the wall, go through the second tube, and enter the listener's ear. Are any sound waves lost? Do you think the sound waves get bigger, smaller, or stay the same as they travel?
- Try adding a third tube to the activity and using a book or other hard surface to bounce sound. In this modification, the sound would go from the speaker, through a tube, off the wall, through a tube, off a book, through a tube and into the listener's ear. How is the sound affected? How many objects can you bounce sound off of?
- What other variables could you change in the original experiment? Could you change the length of the cardboard tube, or how close you are standing to the wall? Choose one thing to change and do another test. How were your results different than the first time you did the experiment?