

Sound Receiver

National Capital

Radio &
Television
Museum

SUMMARY

Project Objective	Make your own sound receiver to showcase how vibrations can produce different tones based on how long the waves travel through their amplifier.
Project Supplies	• 11 inch paper towel tubes (x8) • Rigid material, at least 2 feet in length, to serve as the backbone of the sound receiver (Foam pool noodle, yard stick, cardboard all work well) • Scissors • Tape / Hot glue gun

Introduction:

Have you ever wondered why some sounds are high like a whistle, and others are low like a drum? Or how your ears can hear so many noises happening all at the same time? In this activity, you'll build your very own sound receiver—a special tool made of tubes that helps you “zoom in” on different sounds around you.

Each tube you create will let your ears focus on a different kind of sound. Some tubes help you hear higher, squeakier noises, while others make lower, rumbling sounds easier to pick out.

When you listen through the tubes one by one, you'll discover that the everyday noises around you are actually made of many different pitches all mixed together!

Instructions:

1. Cut and tape the cardboard tubing to create five tubes of different lengths.
 - a. Cut two tubes in half, creating two 5.5” (half) tubes
 - b. Tape a half tube onto a whole tube, creating a 16.5” tube
 - c. Tape two whole tubes together, creating a 22” tube
 - d. Tape two whole tubes and a half tube together, creating a 27.5” tube
2. Use hot glue to attach the tubes to the rigid backbone in order of size; half tube, whole tube, one-and-one-half tube, two tube, and two-and-one half tube.

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Instructions Continued:

3. Start listening!
 - a. Head to a space with lots of background noise, such as a cafeteria, mall, or playground.
 - b. Place one of the tubes completely over one ear so it is fully sealed. Plug your other ear with your finger.
 - c. Move to the next tube after a few seconds. Compare the sounds you hear. Do this for all of the tubes you've created.
 - d. The background noise in a room is a mixture of many sounds with different pitches. Normally, these pitches blend, but you can separate them by listening through different lengths of the tube. Which length of tube allows you to hear high-pitched sounds? Which length or tube allows you to hear low-pitched sounds

More:

Want to learn more about pitch? Collect some different objects from around your house (glass jars, books, metal pans, etc.). Anything that makes a sound when you gently tap it will work! Tap them with a pencil or a pen and sort them in pitch from low to high. Is it high and tinkly? Or low and thumpy? What do you notice about an object's size and the pitch it makes?

What's Happening?

Any given sound we hear is often a mixture of many different frequencies. For example, an ambulance siren makes its distinct sound with frequencies that are very fast and others that are slower and longer.

Objects have natural frequencies, that is, the way they vibrate when making a sound. When you listen through the receiver tubes the "object" that's vibrating is the air inside the tubes. The longer the column of air in the tube, the more slowly it vibrates. Because each tube has a different length, it selects for a different set of frequencies from the many frequencies in the many noises around you. When you put your ear to the longest tube, you hear the lowest frequencies; when you listen to the shortest tube, you hear the highest frequencies.