



Curiosity Guide #302

Sound Resonance

Accompanies Curious Crew, Season 3, Episode 2 (#302)

Resonant Pipes

Investigation #10

Description

Air tubes can filter and resonate different sounds! Find out how!

Materials

- 11 paper towel tubes
- Scissors
- Duct tape
- One wooden 2 by 4, two feet long
- Hot glue gun

Procedure

- 1) Cut a 2 by 4-inch wood board to two feet in length.
- 2) Tape cardboard tubes end to end using duct tape. You should end up with 6 tubes of different lengths: 6 inches, 12 inches, 18 inches, 24 inches, 30 inches, and 36 inches. You may need to trim some of the tubes down with scissors.
- 3) Lay each tube perpendicular to the wood board and space the tubes out.
- 4) The tubes should be centered on the board.
- 5) Attach each tube to the board with a dab of hot glue.
- 6) Hold the board. Try listening through different tubes.
- 7) What did you notice? What kinds of sounds do you hear in each tube?

My Results

Explanation

When we listen, we are bombarded with sounds in different frequencies. We choose to pay attention to some sounds and not others. We often refer to this as background noise. In this case, the air in the tube vibrates from the external noises, but the longer the tube is, the more slowly the air vibrates. The air in the longer tube tends to match the lower-frequency sounds in the room, while the shorter tube's air column, which can vibrate more quickly, matches the higher-frequency sounds and filters the others. By covering the end of one of the tubes, the resonant frequencies are lower still. Think about organ pipes and how the large ones can resonate much lower frequencies than can the smaller, narrow ones.

Think about this: Have you ever held a large seashell up to your ear? You might have heard someone say that you can hear the ocean. A shell is a perfect resonator cavity. The cavity of the shell takes all the background noises we usually ignore and amplifies some of the frequencies. The smooth inside of the shell helps sound bounce through the air, and gets some of the air vibrating, too. So to really enjoy the experience, hold the shell to your ear where there is some noise around you. Then you too can hear the ocean!

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