



Curiosity Guide #302

Sound Resonance

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

Tuning Fork Tube

Investigation #2

Description

Investigate how to make sounds louder!

Materials

- Large graduated 1-liter cylinder. Clear is preferred, but you could substitute a 2-foot length of 3-inch PVC with a PVC cemented base. You could also use a large vase or a 5-gallon bucket.
- 2-inch PVC, cut to 3 feet long, that can slide freely in the larger tube
- Metal file
- Tuning forks of different sizes
- Rubber mallet
- Tape
- Hacksaw
- Tape measure
- Water

Procedure

- 1) Measure and cut a 3-foot length of PVC with a hacksaw.
- 2) File the cut edge flat with a metal file.
- 3) Place the slender tube inside the larger one.
- 4) Fill the tube half full with water.
- 5) Tape the handle of the mallet to the table surface so that one striking end is facing up.

- 6) Strike the tines of the tuning fork on the mallet and hold the fork so that the vibrating tines are just above the open end of the slender tube.
- 7) Keep the fork just above the surface and raise the fork up or down while moving the slender tube up and out of the water, then back down into it.
- 8) Can you increase the sound of the fork?

My Results

Explanation

Every object has the potential to vibrate, from air molecules to the earth itself. Those vibrations occur in different wave patterns, or natural frequencies. In the case of musical instruments, when a vibration occurs with its natural frequency, harmonic sound is produced.

By adding an additional force with a matching frequency, the wave increases in amplitude. A louder sound is produced. This is known as resonance.

Lengthening the area that can vibrate, such as you did with a tube of air, increases the wavelength and reduces the natural frequency. This is how the classic Tuning Fork Tube works. By sliding the tube up and down in the water, it is possible to lengthen or shorten the vibration area for the air in the tube and try to match the natural frequency of the tuning fork. When achieved, the sound wave is magnified, resonance is achieved, and a louder sound is produced.

Think more about it: Check the internet for photos of musical instruments and their sound waves. Type "sound waves of musical instruments" in the search box. Then click Images. Can you find illustrations that compare the sound waves of various instruments?

Every object has the potential to vibrate, from air molecules to the earth itself. Those vibrations occur in different wave patterns, or natural frequencies. If a second object with the same frequency as the first vibrating object starts to vibrate, too, the waves combine and make an even bigger wave. This is called resonance. When this happens with sound waves, it produces a much bigger sound. Pretty cool!

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