



SINGING FORK



Different types of sounds can be sweet music to our ears or an overload of very unpleasant noise -- a racket, an uproar, a din (all of those words are **synonyms**, words that mean the same thing). Sound makes up a small part of a range of **vibrations** (movements such as shaking, pulsing, or trembling) that exist all around us. Imagine plucking a guitar string, tapping a metal tuning fork or brushing against a set of wind chimes. Those are all vibrations, and most of us think that the sounds they make are very pleasant to hear.



Guitar strings



Set of tuning forks



Wind chime

Sound is a form of energy that travels in waves. It begins with a vibration that bumps against **air molecules** (particles of oxygen and nitrogen that make up the air we breathe). Those molecules bump into neighboring molecules, which bump into even more neighbors, as the vibration travels to our ears. The sound wave that we hear depends on things like the type of **matter** (anything that takes up space) it traveled through and how powerful the initial vibration was.

Acoustics is the study of how sound travels. Understanding acoustics can help us control how sound behaves, which is important when setting up musical equipment or designing buildings like auditoriums, theaters, and libraries.

Sound has different qualities, such as **pitch** (the rate at which vibrations are produced) and **volume** (loudness). Pitch describes the shrillness and flatness of a sound and its position (high or low) on a musical scale. You can change pitch by changing the number of vibrations per second. Volume depends on the strength, intensity, pressure, or power of the sound. Bigger vibrations create bigger, or louder, sounds while smaller vibrations create softer sounds. Volume can be loud, soft, or anything in between.

When sound waves reach our ears, they pass through the outer ear and along the **ear canal**, a narrow pathway leading to the **eardrum**. The eardrum is a thin flap of skin that is stretched tight like a drum and vibrates when sound hits it. Those vibrations are felt by tiny bones in the middle ear, which **amplify** (increase) them and send them to the inner ear. There, tiny hair cells change vibrations into electrical signals and pass them on to your brain. The brain recognizes the electrical signals as sound and can tell you what that sound is.

Our ears and our brain have to work together to receive sound and make sense of what we hear. It's a delicate and amazing system!

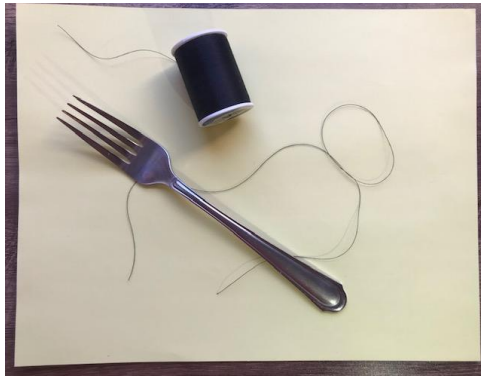


ACTIVITY: Make a fork sing

Materials

- Metal fork
- Thread
- Scissors
- Table or countertop

1. Measure a length of thread so that it's about as long as your arm, then cut it the length with scissors.
2. Tie the middle of the string around the fork handle, as near to the end of the handle as you can get it without the fork slipping off.

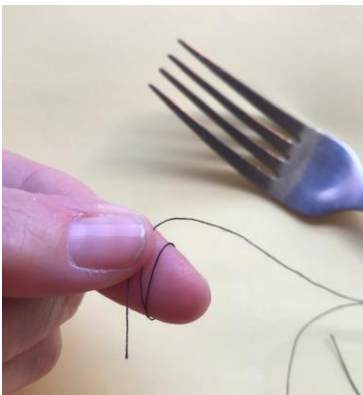


Step 1



Step 2

3. Wrap the ends of the thread around your index ("pointer") fingers, but don't wind it too tightly.
4. Swing the fork by the thread so that it taps gently against the edge of a table or countertop. You should hear a dull clinking sound.
5. Next, touch your index fingers to the small flaps of skin just in front of your ear holes (each of those flaps is called a **tragus**) and let the fork hang down in front of you.



Step 3



Step 4



Step 5

6. Swing the fork so that it taps gently against the table again.



What do you hear when you hold the thread away from your ears and then when close to your ears?

When you hold your fingers close to your ears, you bring the thread close to the sound sensors in your ears. You can hear those vibrations much more clearly, so they now make a clear chiming sound in your ear.

ADDITIONAL RESOURCES

Materials from the Washoe County Library System:

[*All About Sound*](#) by Angela Royston

[*Science Kids: Sound*](#) [DVD videorecording] by Wonderscape Entertainment

[*The Science of Sound: Projects with Experiments with Music and Sound Waves*](#) by Steve Parker

[*Secrets of Sound: Studying the Calls and Songs of Whales, Elephants, and Birds*](#) by April Pulley Sayre

[*Sound*](#) by Cindy Devine Dalton

[*Sound: From Whisper to Rock Band*](#) by Christopher Cooper

[*The Way Things Work: Sound*](#) [DVD videorecording, based on the book by David Macaulay] by Schlessinger Media

[*Why Can't I Hear That?: Pitch and Frequency*](#) by Louise and Richard Spilsbury

[*The Wizard of Sound: A Story About Thomas Edison*](#) by Barbara Mitchell

Videos:

PBS Learning Media, "Understanding Vibration and Pitch"

<https://knpb.pbslearningmedia.org/resource/phy03.sci.phys.howmove.collage/understanding-vibration-and-pitch/>

SciShow Kids, "What is Sound?" <https://youtu.be/3-xKZKxXuu0>

U.S. Department of Health and Human Services, National Institutes of Health, National Institute on Deafness and Other Communication Disorders, "Journey of Sound to the Brain"

<https://www.nidcd.nih.gov/health/journey-of-sound-video>

Websites:

Acoustical Society of America, Explore Sound, Elementary Students <https://exploresound.org/elementary/>

DKfindout!, Sound <https://www.dkfindout.com/us/science/sound/>

Idaho Public Television, Science Trek, Sound: Facts <https://sciencetrek.org/sciencetrek/topics/sound/facts.cfm>

