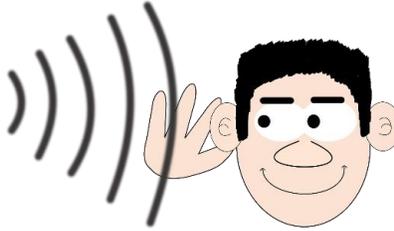


GOOD VIBRATIONS

If you have a healthy **auditory system**, you hear thousands upon thousands of sounds every day! The auditory system is the part of your body that provides the sense of hearing, which allows you to recognize sounds and identify their location.

The two main parts of the auditory system are the ear and the brain. The ear converts sound energy into electrical signals in the nervous system. The brain receives and processes these signals and the information it contains. Sound can also be felt by other parts of the body. For example, you may feel the vibrations from loud noises while you are actually hearing them.



Sound is a **wave** or **vibration** (a type of **energy**), that travels through **matter** (either a **solid, liquid, or gas**) and can be heard. Sound vibrations begin with some kind of mechanical movement, like tapping a table or plucking the string of a guitar. The vibration of the object causes particles, called **molecules**, to move, then bump into each other, and then bump into others. Sound waves need the vibration of those molecules within matter in order to travel.

Sound travels at different speeds depending on the type of matter it is moving through. It travels faster in water than in air, and sound moves even faster in steel! There is no matter in outer space, so it is very quiet there.

ACTIVITY: See the effects of a sound wave

Materials:

- Bowl
 - Rubber band that fits around the top of the bowl
 - Plastic wrap
 - Cake sprinkles
 - Large plate or tray
 - Radio or stereo with speaker
 - Earplugs or earmuffs are **strongly** recommended
1. Place the plastic wrap over the top of the bowl, then place the rubber band around the edge of the bowl to hold the plastic in place. The plastic should be tight and flat, without wrinkles.
 2. A plate can be placed under the bowl to catch any sprinkles that may fall off.



3. **It is highly recommended that you use earplugs or earmuffs to protect your ears before the next step.**
4. Place the bowl next to a radio or stereo speaker and turn up the volume. You will need to turn it up pretty loud, which is why you should protect your ears.
5. Watch the plastic wrap. Does anything happen?
6. Add sprinkles to the top of the plastic wrap, and try again.



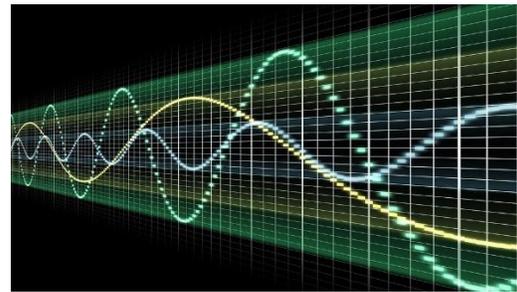
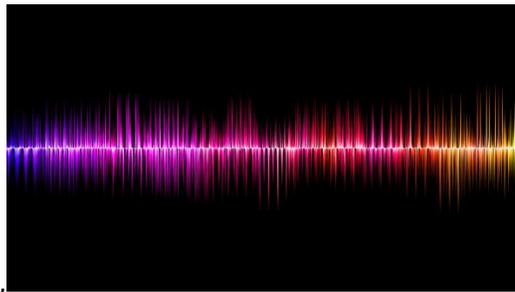
What did you see?

 Did the sprinkles bounce? Adding sprinkles makes it easier to see the sound vibrations compared to just looking at the clear plastic.

 You may have noticed that the sprinkles bounced differently to sounds with a different **pitch**, the rate at which the vibrations are produced. Pitch can be high or low or anything in between.

 The way something responds to different pitches is called a **frequency response**. **Frequency** is a measure of sound (measured in units called **hertz**) and equals the number of sound waves, or **cycles**, per second. One **cycle** is a complete vibration, back and forth. High frequencies have higher pitches while low frequencies have lower pitches.

 Most sounds that you hear every day consist of a mixture of different pitches.



Images of sound waves

♪ Dogs can hear sounds at higher frequencies than humans can hear. They can hear sounds that people cannot hear.



♪**Noise** can be described as sound, but there is a difference. Noises are sounds that are unwanted and inappropriate in the environment.

♪Can you list 5 sounds or noises that you don't like to hear?

♪Dolphins can hear sounds underwater for up to 15 miles away!

♪**Acoustics** is the scientific study of sound waves.

♪Cows that listen to music produce more milk!

♪Sound waves can bend around corners.

♪Keep your ears safe by wearing earplugs around loud noises, and keep the volume down on your music.

Something to think about: When a tree falls in the woods and there is no one there to hear it, does it make a sound? Hmm...

ADDITIONAL RESOURCES:

Books available from the Washoe County Library System:

Jazzy Science Projects with Sound and Music by Robert Gardner and Tom LaBaff

Matter: Physical Science for Kids by Andi Diehn

Music: the Sound of Science by Dr. Margaret E. Albertson and Paula Emick

The Science Book of Sound by Neil Ardley

Sound: Loud, Soft, High, and Low by Natalie Rosinsky

Sound Waves and Communication by Jenna Winterberg

Videos

National Geographic Kids, Learn About Sound, "Nat Geo Kids Sound Playlist"

<https://www.youtube.com/watch?v=HblEhc0gses>

PBS Learning Media, "Understanding Vibration and Pitch Understanding Vibration and Pitch"

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

Sci Show Kids, "What is Sound?"

<https://www.youtube.com/watch?v=3-xKZKxXuu0>



Websites

Acoustical Society of America, Explore Sound!

<https://exploresound.org/>

Dorling Kindersley (DK), DKfindout!, Sound

<https://www.dkfindout.com/us/science/sound/>

