

How the Ears Hear

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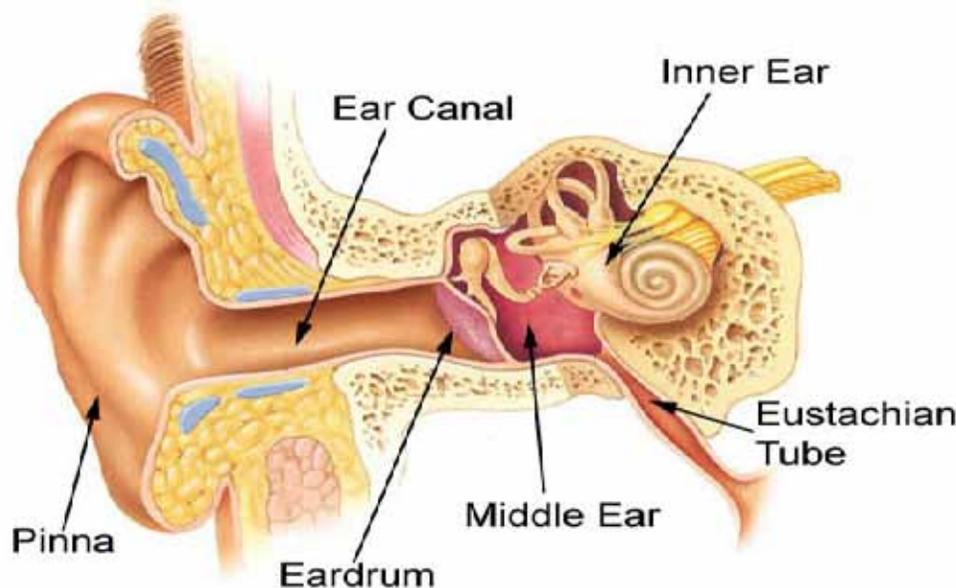
How the Ear Works

The ears are more than just part of our appearance. The ear is a complex, intricate system of bones, cartilage, hair follicles and skin. It contains one of the smallest bones in our body. The ear is made of five sections: the outer ear, the middle ear, the inner ear, the acoustic nerve, and the brain's auditory processing center.

The outer ear is called the pinna. It is the part of the ear that is visible on our heads. The pinna is responsible for collecting the sound vibrations. The shape of the ear allows for excellent funneling of sound to the ear canal that leads to your eardrum. The canal happens to be covered by tiny hairs and has a wax secretion coating. This hair and wax in the canal help to keep out foreign objects, debris, and germs.

The middle ear starts with the eardrum. The eardrum is made up of a translucent fiber. There are three small bones called the ossicles found in the eardrum. When sound reaches the ossicles they vibrate creating mechanical sound waves. These sound waves pass to the inner ear.

The inner ear has many parts but a main part is called the cochlea. The cochlea is the size of a pea and resembles the shape of a snail. The cochlea holds the organ of Corti, which is the sensory receptor of the ear. Inside the organ of Corti are tiny hairs, which act as the nerve receptors of hearing. These receptors send messages to the brain about the qualities of sound such as the loudness, pitch and tone.



After reading about the ear and how sound is interpreted try these sound games!

Animal Sounds Game:

<http://www.juliasrainbowcorner.com/html/animalgame.html>

Animals at Night Game:

<http://www.kidsplanet.org/games/js/whoami.html>

MOST*

HELPFUL TERMS

Acoustic nerve

Auditory processing

Cartilage

Cochlea

Ear canal

Eardrum

Inner ear

Middle ear

Organ of Corti

Ossicles

Pinna

Translucent Fiber

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New York State Standards

Elementary

Communicating, Comparing and Contrasting, Generalizing, Identifying

Standard 2: Information Systems: Key Idea 1

Skills and Strategies for Interdisciplinary problem solving: Gathering and Processing Information

General Skills: i, iii, v, x, xii, xx

Standard 4: Living Environment
Key Idea 3: 3.1a

How the Ears Hear

What is Sound?

A vibration, or mechanical wave caused by a release of energy produces sound.

Sound is made by a compression wave. Take a slinky and pull it apart. Now hold about 5 to 7 rings together and release them. Watch the motion in the slinky. Place a paper clip on the slinky and repeat making a compression wave. Which way does the wave move? Which way does the wave vibrate (watch the paper-clip to get a better idea).

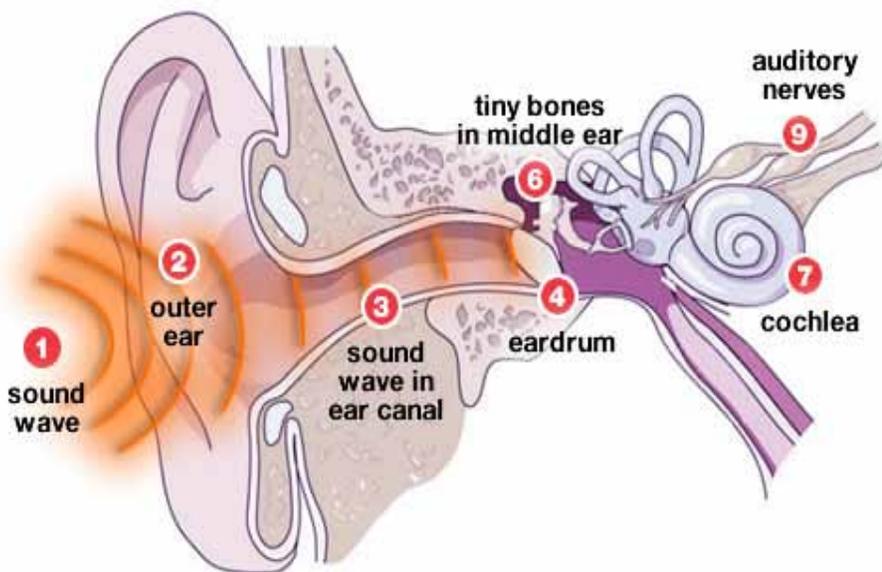
Because one particle bumps up against another as sound travels, it can travel through solids, liquids and gases. The more dense the substance the better sound can travel. You have probably noticed this in the summertime when swimming. If you click together two rocks in the dry air and then click them together under water with your ear to the water, the second sounds much louder.

What is the difference between noise and music?

When sound produces a noticeable pattern we identify this as music. Noise tends to be made from irregular repeating sound waves. To produce low toned musical notes the sound wave is lengthened and regular. Short sound waves with a regular pattern of vibrations produce high pitches.

Students should be able to:

Describe the four parts of the ear and how the function to produce hearing.



For more information about sound:

The Sound Site:

<http://www.smm.org/sound/nocss/top.html>

Interactive Sound Site:

<http://library.thinkquest.org/19537/>

MATERIALS NEEDED

Rubberbands--Same Size
Tacks
Cardboard
4 to 6 Glass Bottles (Exactly Alike)
Container of Water
Pencil

Students should be able to:

Design two different sound systems so that the sound pitch increases or decreases.

Produce three to five different notes from the sound systems designed.

To be completed in teams or pairs:

What to do:

Activity 1:

1. Listen to a musical instrument. Play a scale on the instrument from low to high notes.
2. Determine what causes the pitch to change.

Activity 2:

1. Using a small cardboard box/plastic bin, have the students mount rubberbands around the opening.
2. The students should increase the tensions of the rubber bands as they add them to the container

Activity 3:

1. Have the students line up 5 to 6 glasses/bottles that are exactly alike.
2. Fill the bottles with water at different levels from lowest to highest
3. Gently strike the glass container with a pen, and listen for the pitch.

Helpful Tips:

Discuss why the notes change. What causes the change in pitch?

Have the students make a correlation between the height of the water in each container and the pitch of the system. Write down their observations.