Sound and Music

Acoustical Society of America

What is Sound?

Sit quietly and listen to the sounds around you.

Today you will be Sound Detectives

What is Sound?

- Strike the tuning fork with a rubber mallet or text book.
- Listen to the fork

What do you observe?

Warning: Do not touch your glasses or teeth with the tuning fork!

What is Sound?

What do you feel when it's making a sound?

What do you feel if it's silent?

Vibrations make sound

Warning: Do not touch your glasses or teeth with the tuning fork!

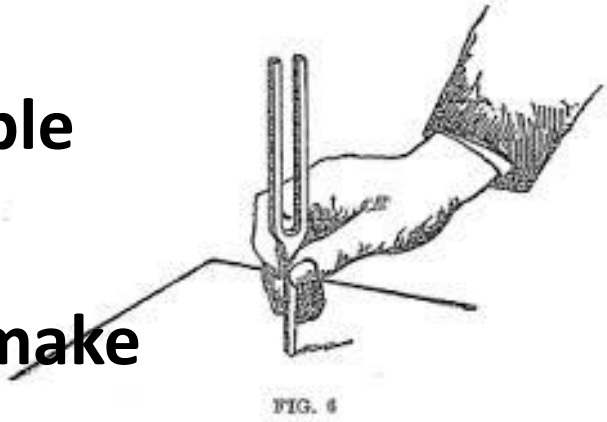
What is Sound?

How can you make the sound stop?

Vibrations make sound

Sympathetic Vibration

Place the vibrating fork on the table



Sound carries energy. – It can make things move.

What is Sound?

- Hang the ping pong ball
- Gently touch *the quiet* tuning fork to the ping pong ball.

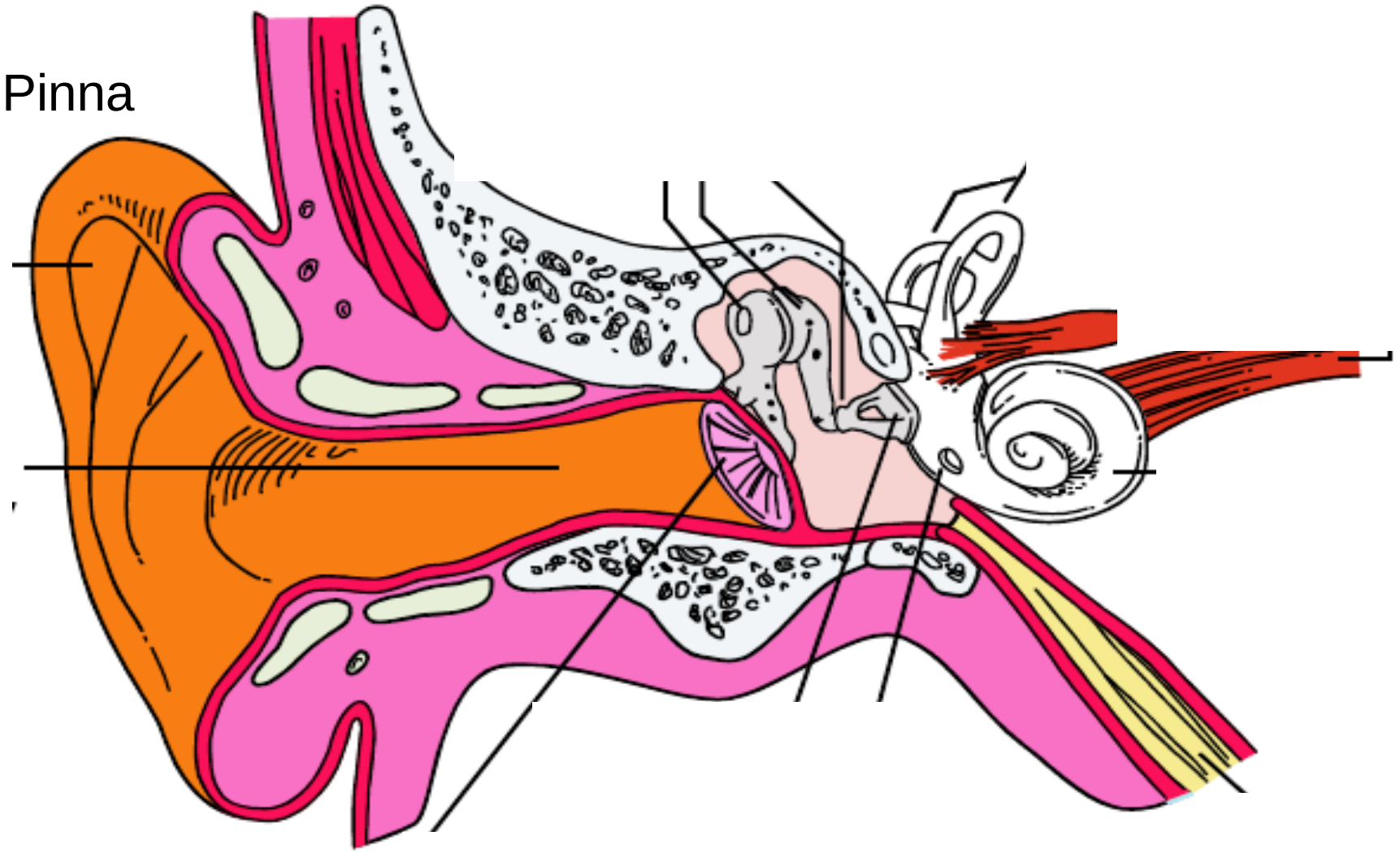
What is Sound?

Touch the *vibrating* tuning fork to the ping pong ball.

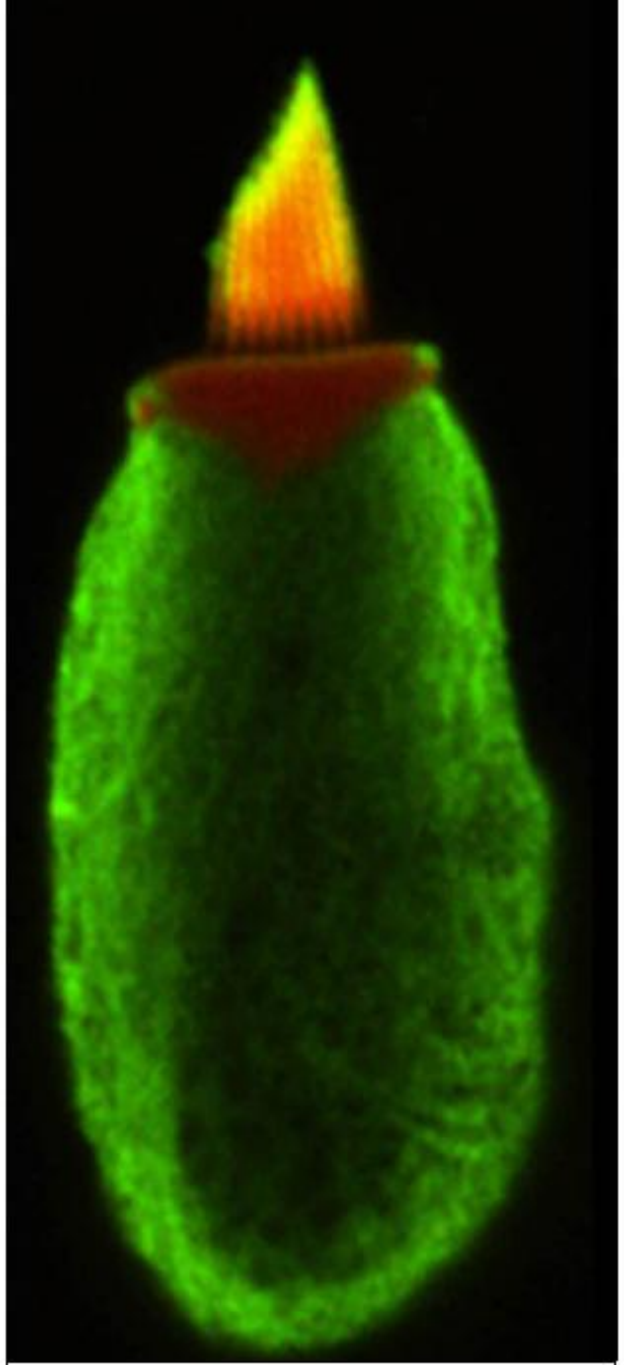
What happens?

Sound carries energy. **– It can make things move.**

Your ear



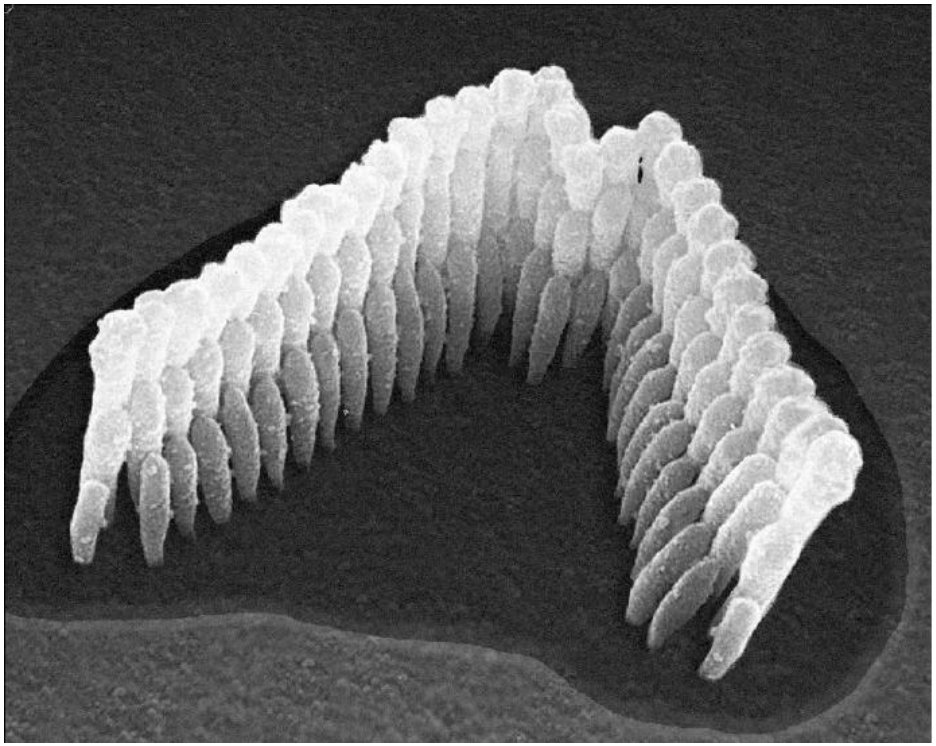
http://www.dangerousdecibels.org



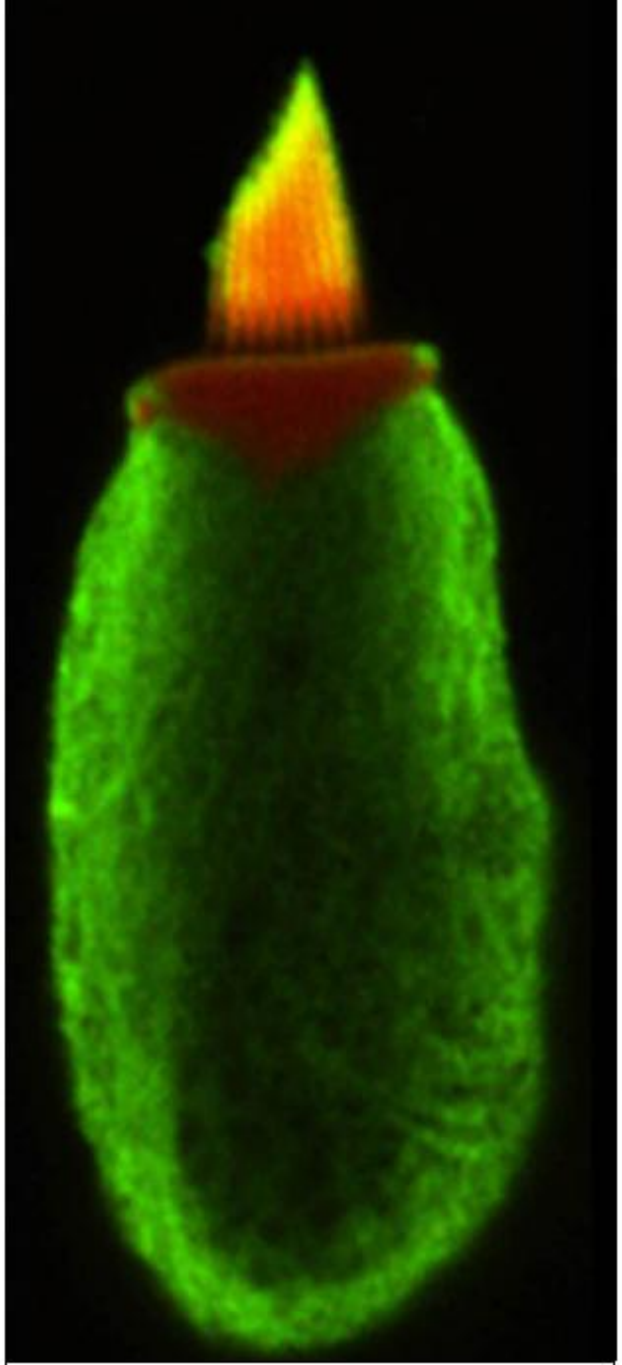
Peter Gillespie and Janet Cyr, Oregon Hearing Research Center, Oregon Health & Science University. 2005

http://www.dangerousdecibels.org

One Inner Ear Hair Cell
Large Cell body with hair bundle on top



Black and white photo of one hair bundle



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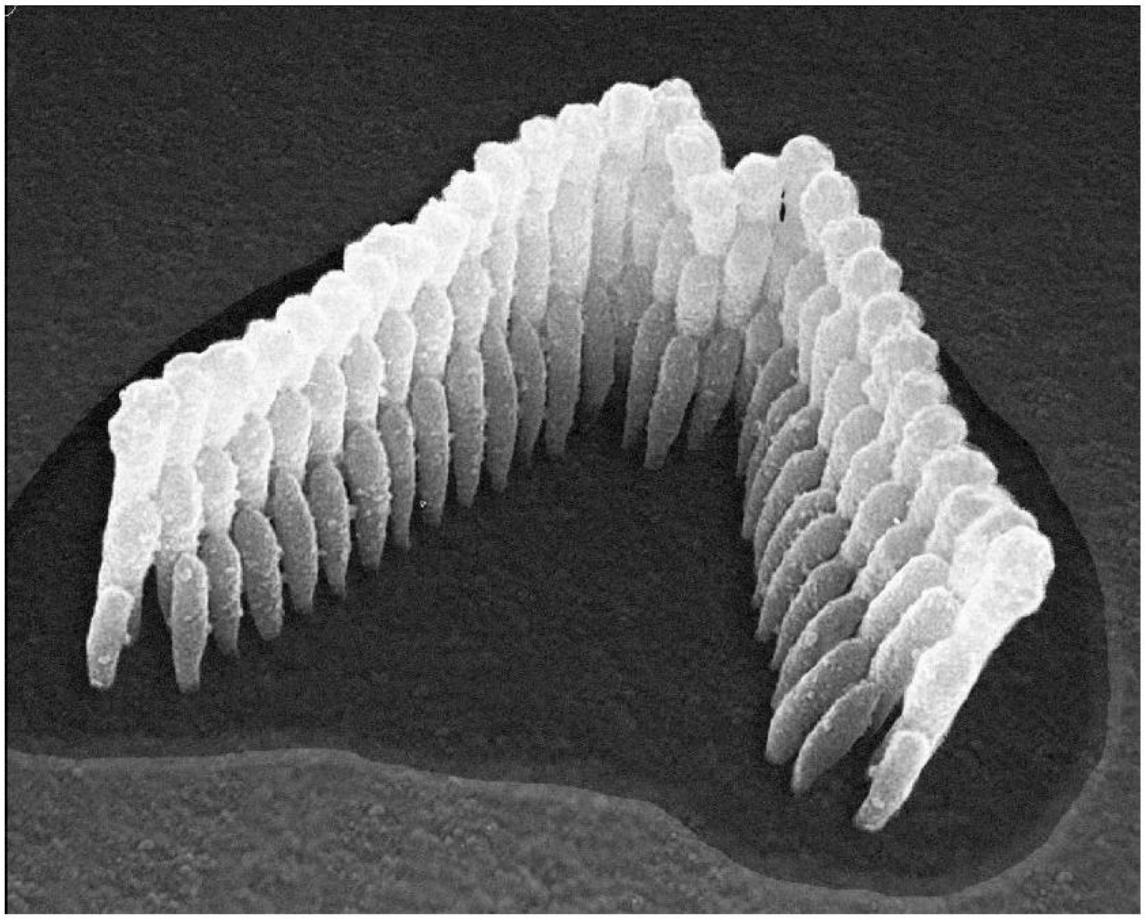
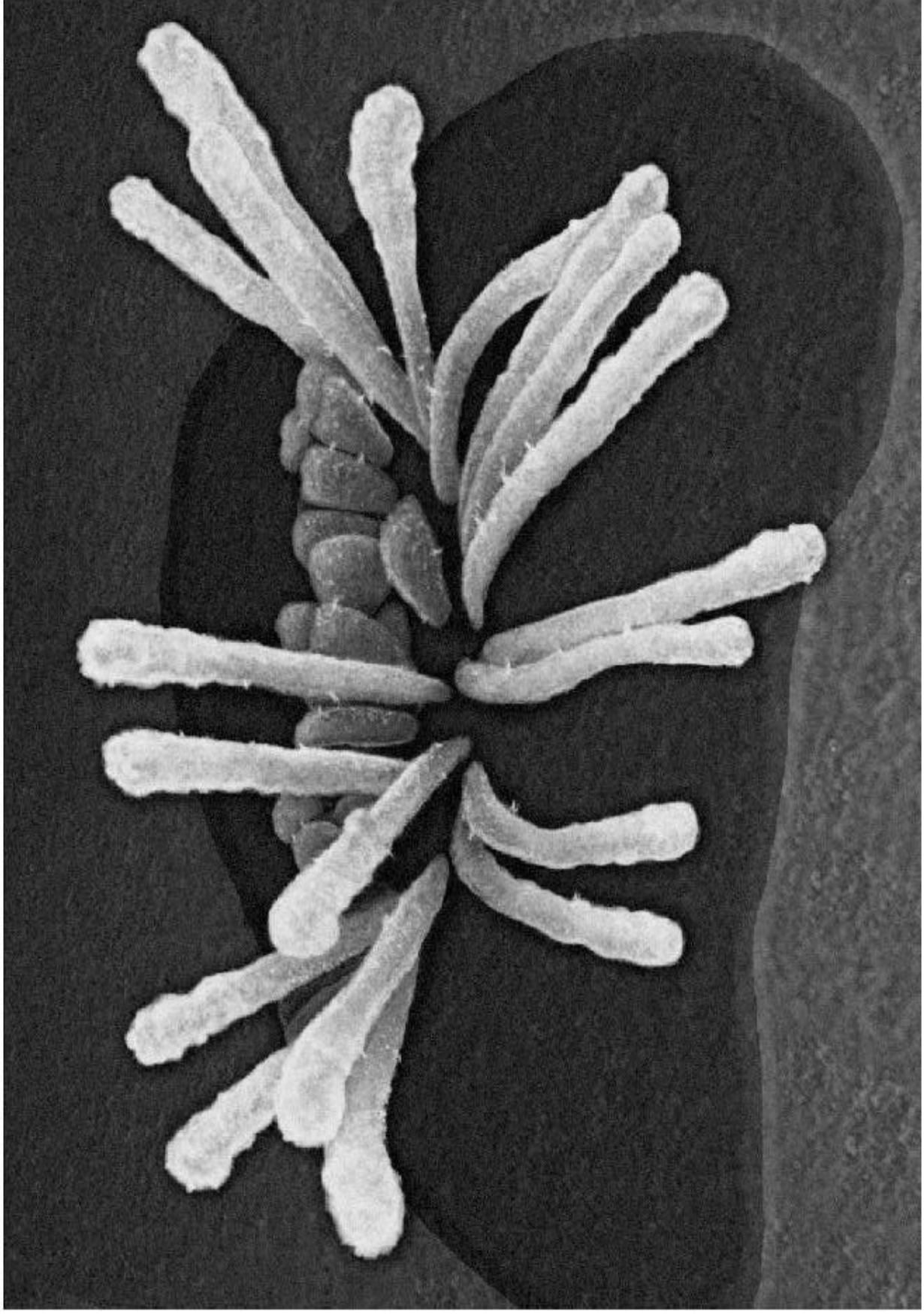
Here is a normal hair bundle.



Appendix D.1 Normal Healthy Hair Cell Stereocilia (Hair Bundle)



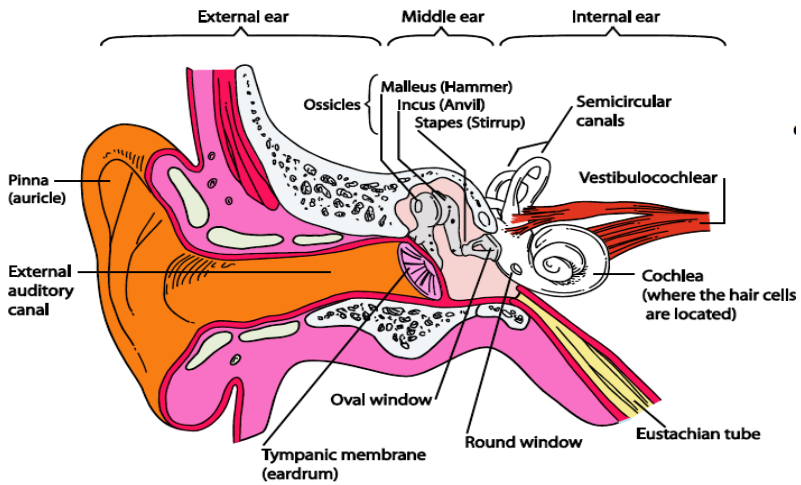
Build a Model

Have you ever made a model?

Build a Model

Loud sounds carry more energy than quiet sounds.

Your Ear



- Pretty amazing organ
  - Listen to a range of sounds from 20 Hz to 20,000 Hz
  - Sweep
  - Can you hear each frequency found here:?
  - http://www.noiseaddicts.com/2009/03/can-you-hear-this-hearing-test/

Raise your hands when you hear the sound.

High pitch is a high sound

Your Voices

- Hold your fingers on the front of your throat and say Aaaah

Notice the vibrations

Vibrations make sound.

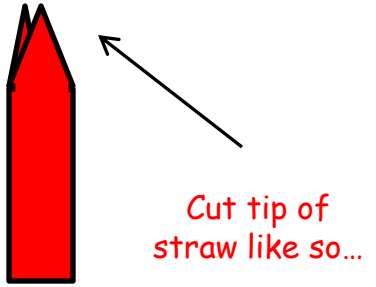
High pitch is a high sound.

Do low and high voices feel different?

High pitch has a higher rate of vibration – more wiggles per second.

Straw Instrument

- Now, *gently* chew on the straw to soften the tip, and to get the edges to be smooshed together. You would like the straw just below the two tips to be *almost* touching.



- Now, put the pointy end in your mouth, and *blow really hard*.

Straw Instrument

What is vibrating?

Vibrations make sound.

Straw Instrument

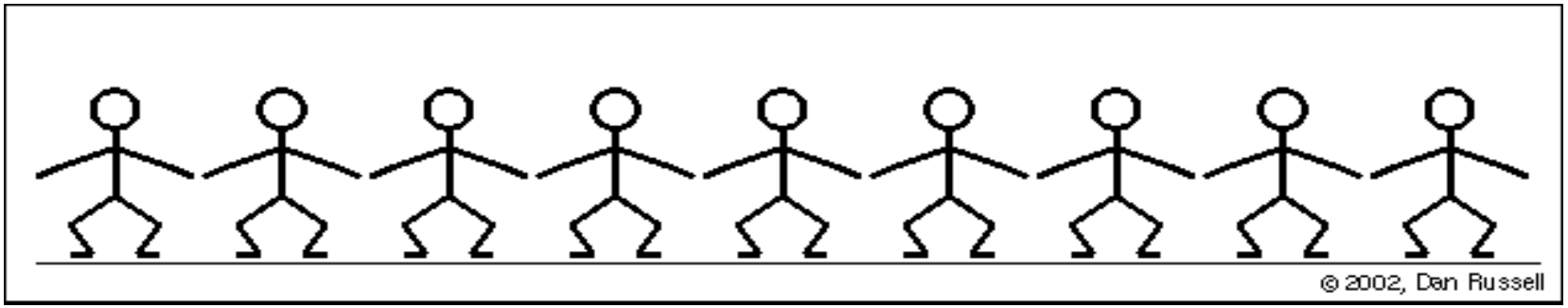
Does the person across the room hear your straw instrument?

Does the air you blow into the straw go in his/her ear for them to hear?

Sound carries energy it travels through air, air is not the sound.

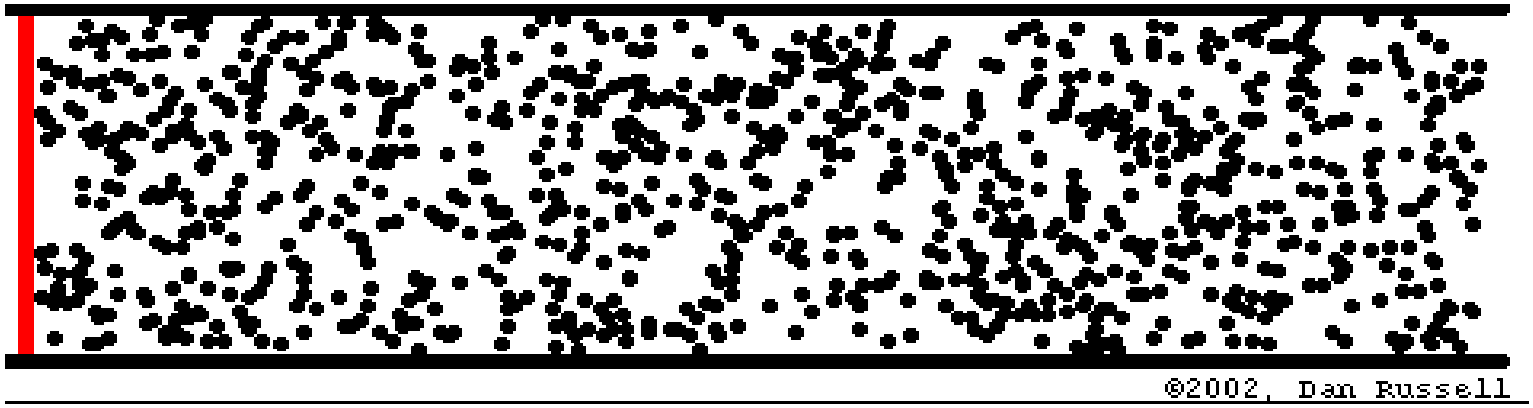
Sound travels

Do the wave!



http://www.kettering.edu/physics/drussell/Demos/waves-intro/waves-intro.html

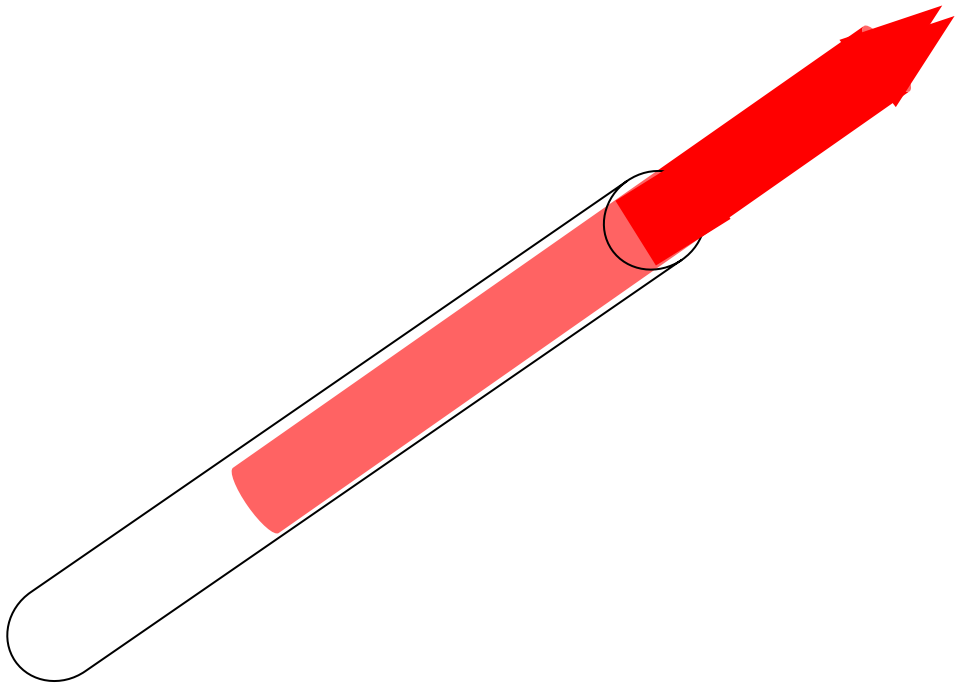
Sound travels



Sound carries energy. **It travels through the air, but air is not the sound.**

Straw Instrument

- Put the bigger straw over the end of your straw instrument.
  This makes a sort of straw trombone!



Straw Instrument

- Make the lowest pitch, bass notes, that you can.
- Make the highest pitch, treble notes, that you can.

High pitch is a high sound.

Straw Instrument

- **Is the buzzing on your lips different with low and high sounds?**

High pitch has a higher rate of vibration.

Natural Frequency

- Frequency: rate: wiggles per second (moves back and forth).

- Natural frequency: the frequency at which an object likes to vibrate

Pasta Demo

- The slow vibration is in ***Resonance*** with the long pasta's ***Natural Frequency***

Here is a video of the pasta raisin demonstration:
http://www.youtube.com/watch?v=MA8WEFhA3DM&feature=player_embedded

Natural Frequency

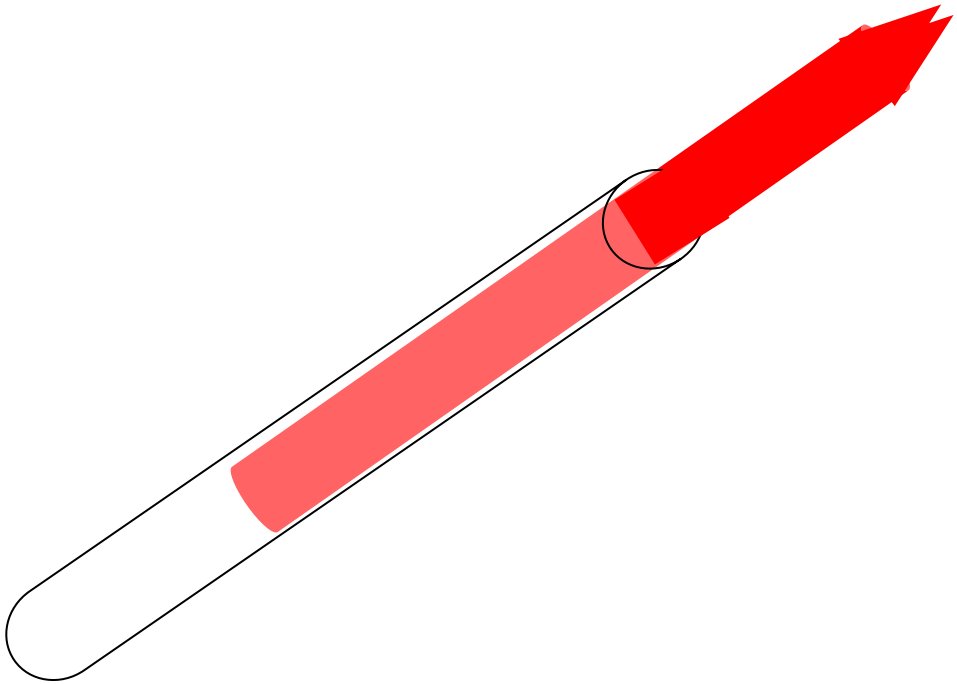
Lower frequencies have longer wavelengths.

Low pitch is a low sound,
and low pitch has less wiggles per second

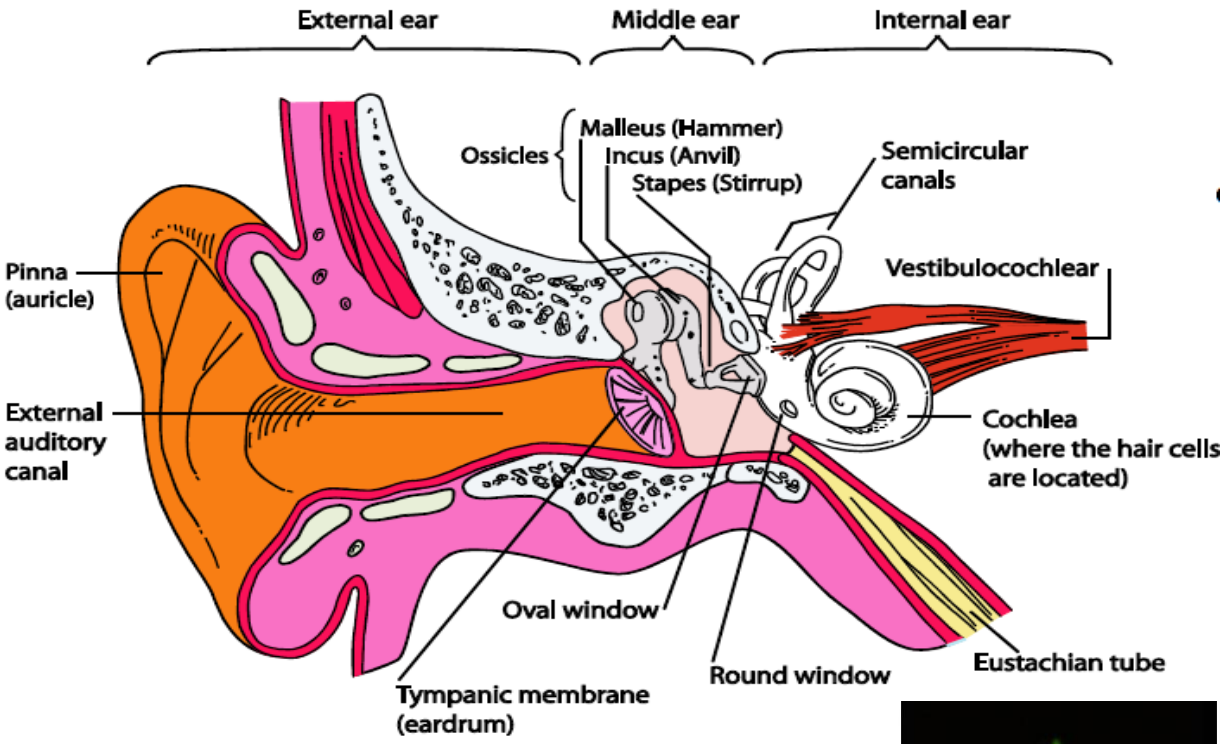
Pitch is how we hear frequency.

Straw Natural Frequency

Low frequencies have longer wavelengths.



- Sound is made from vibrations
- The vibrations travel through the earcanal, eardrum, ossicles – the three tiny bones and then into the cochlea.



- Different parts of the cochlea resonate with certain frequencies ....

  Some like high pitches and

  Some like low pitches…

- The hair cells sense the sound and send electrical signals to your brain.