



SoundScience

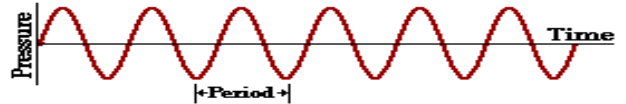
Feel Sound? See sound? Sound weird? Here's what (probably) happened today:

You know that sound is what we hear when something makes our ears wiggle or **vibrate**. Usually the vibrations are too small to feel, so we may even forget that something is vibrating. To make things big, we made a **subwoofer** vibrate a few dozen times a second. It was slow enough that you could see the vibrations! Even when the speaker moved too fast to see, you could still *feel* the vibrations by touching it.

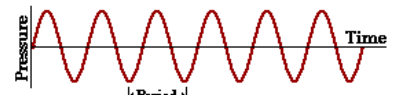


Even if vibrations are too fast or small to be seen or felt, a **microphone** can pick them up and turn them into **electricity**. The vibrations of the microphone were turned into up-down movement of a **laser beam**. To spread the vibrations out on the wall, we made the dot run side-to-side. This really is a laser show made of sound. Another word for waves is oscillations, and a scope is something you use to see, therefore a tool for *seeing waves* is called an **oscilloscope**.

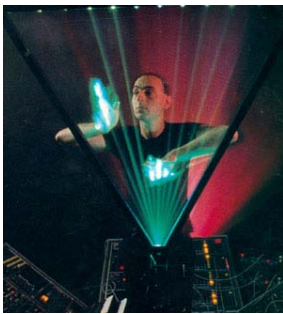
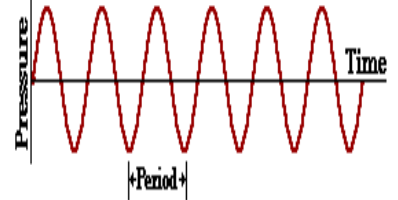
Now that we can see quick vibrations, we can see what makes *sounds sound* the way they *sound*. Whew!



If something vibrates more often, it makes a higher pitched sound. Less often makes a lower sound. **Frequency** is how often something happens (for example, you go to camp once a day), and is how we talk about pitch. On the oscilloscope, higher frequency waves were bunched closer together.

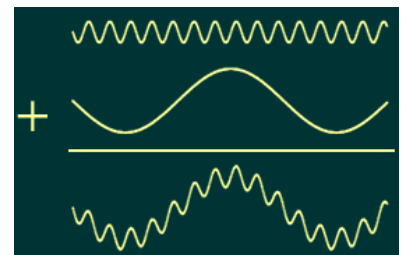


To make a sound louder or softer, we need to make the speaker work harder. Louder sounds come from **bigger vibrations**. On the oscilloscope, we see bigger waves. Usually we hear vibrations that travel through the air, so the more air something vibrates, the louder the sound.



Using this knowledge, we made different sounds by making things happen more or less often, and making bigger vibrations in the air. One weird way we made sound is by turning a laser on and off quickly by getting in the way of the beam. Whenever the light changed, a speaker would move, and if it changed fast enough, we made some really funny sounds.

If different sounds arrive somewhere together, they can add up into a more complicated vibration. In fact, most sounds that we hear are made up of many different sounds, even if they sound simple or come from a single instrument. When we listen to music with only two speakers, we can hear many instruments at the same time



Sometimes objects can stop parts of waves. For example, when a car passes with its windows closed, the music they're playing inside sounds different. The windows blocked the quick vibrations (high frequencies) while letting slow vibrations through.



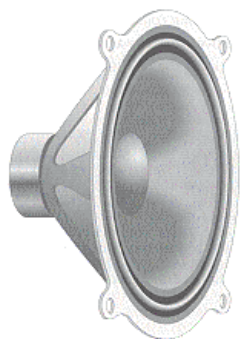
Our voice starts with many different sounds. We move our mouth like a car window opening and closing to allow only some sounds out. That's how we make the sounds that make up our words.

Find out more about sound at wondergy.com, and call or email us with questions, or to bring Wondergy to your school or party!

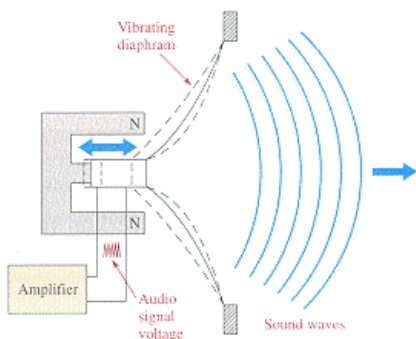


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Build a **WONDERGY** Speaker



(a) Speaker



(b) How the speaker produces sound

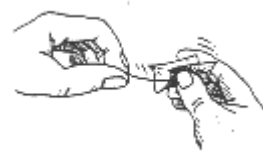
“Sound” is how we notice the air vibrating. If you make something that vibrates the air often enough, it can make whatever sound you want. We call that a speaker.

Most speakers use only two parts to make vibrations: A **coil of wire** and a **magnet**. When electricity flows through the wire, it can attract or repel the magnet. Change the electricity fast enough, and the coil/magnet will vibrate with sound. It tickles a little too! Attach a cone or cup to carry the vibrations into more air, and you’ve made a speaker!

Here’s how to do it:

Cut a piece of **wire** about 5 feet (as long as your arms can reach).

Use **sandpaper** to make about 1 inch at each end of the wire very shiny. It will look like a different color of brass, almost like gold.



About one foot from the end, wrap it around a **marker or two fingers**, until one foot of wire is left at the other end. Wrap the wire close together. When you are done, slip the ring off the canister.



Once you’ve made a ring of wire, loop each straight end through the ring twice, and pull gently, so the wire holds its shape, like the photo on the left.



Tightly tape the wire ring to the outside bottom of a **cup**, by placing a piece of tape all the way across the cup bottom.



Tape a **magnet** to the cup in the center of the coil. Make sure it is taped tightly too.

That’s it! You’ve made a speaker! Go try it out!

Do you want to use your speaker at home? There is one final step: You need a plug that fits into the headphone jack of your CD player. Ask a Wondergy scientist for a “**one-eighth inch headphone plug**” and twist one end of your wire to each bare wire attached to the plug.



WARNING: Do not use this speaker with high power or high-quality stereos.

Because it needs more power than a normal speaker, it may sound quiet while stressing out your stereo. And **NEVER, EVER, EVER plug this speaker into an electrical outlet.**

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