

# LEARN ABOUT SOUND

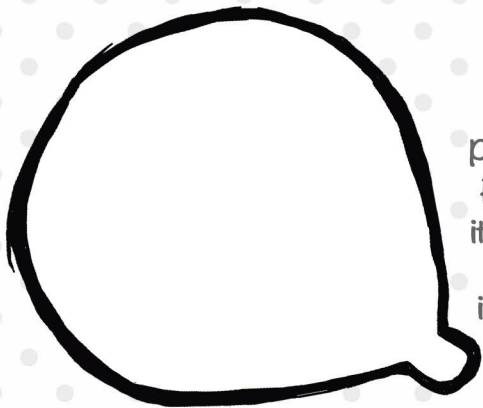
With Les Paul

You have made your own speaker!

Time To Explore:

Point the cups up or down, or in different directions to see how it changes the sound. Don't have a smartphone? Have a friend make a sound into the opening.

With a buddy: Compare your cone with the tube. Take the speaker apart and hold the tube up to your mouth. Make a sound. Now make the same sound into the cone. Which is louder?



Blow up your balloon and tie it off. Press it up to your ear. Now tap on it. Remove it from your ear and tap on it. What changed? What do you think is happening to the sound waves inside the balloon. (draw your ideas)

## Time To Learn

How do you change sound?

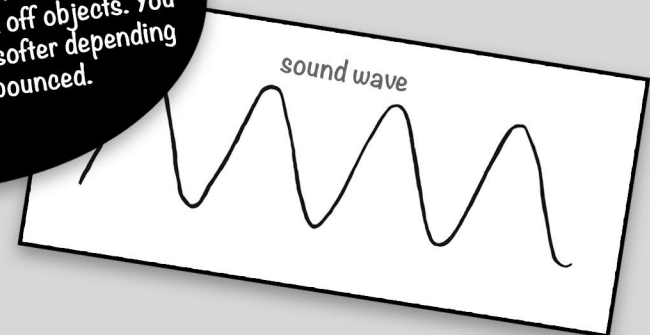
Sounds travel in waves. These waves can be changed when bounced off objects. You can make them louder or softer depending on how they are bounced.

## Les Paul - the innovator

Les Paul was always experimenting with how to change his guitar's sound, which meant changing sound waves. Les played for tips at a drive-in restaurant. When people said his guitar was not loud enough, he jammed the needle arm from a phonograph into the hole and wired it to his dad's radio. This was his amplifier, a machine that made soundwaves louder.

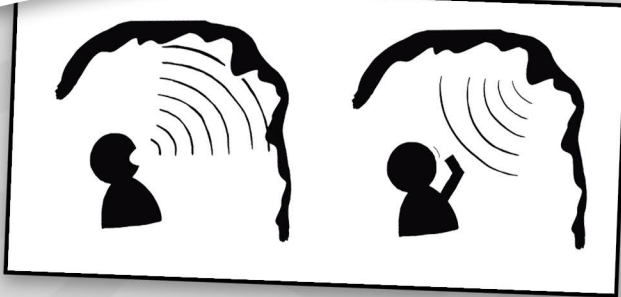


Images courtesy of Les Paul Foundation



## Think about it

Imagine if you were in a cave and shouted your name. The sound waves leave your mouth and travel across the cave. They bounce off the cave ceiling or walls and come back to you. You hear your name. This is called an echo.



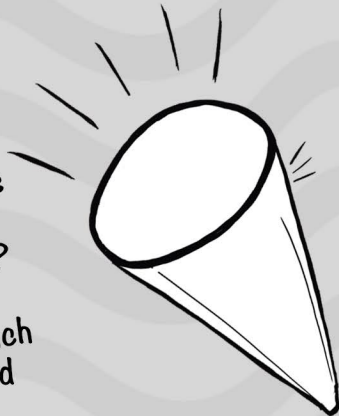
## Device Detail:

Megaphones are a device that bounce sound waves off their sides to make them louder. The more air the sound waves vibrate, the louder the sound.

Musicians, like Les, alter sound waves on purpose to make them louder or softer. They use devices or machines like speakers that bounce sound waves to get the desired effect.

## Try it!

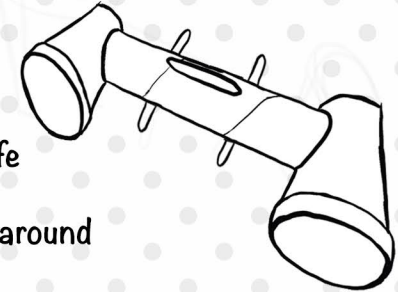
Cut out the cone pattern and tape the sides together. Make a sound. Now make the same sound into the cone. What changed? It got louder. The sound waves bounced around in the cone until they came out. Each time they bounced, more air vibrated and the sound waves got louder.



Let's build our own amplifier like Les.

## Time To Make

Tools: scissors, pencil, craft knife



- Take a smartphone and trace around end onto middle of tube.
- With adult supervision, take a knife or the end of a pair of scissors and make a hole in the middle of the shape. Cut it out. This is where your smartphone slides in.
- Use the end of the cardboard tube to trace a circle on the side of your cup, near the bottom. Use your scissors to poke a hole in the center and cut out the circle.
- Repeat for the other cup. Now push the end of the tube into the cups and swivel the cups till they point forward with the opening on top.
- The cardboard tube may rotate when you put in your smartphone. Tape the popsicle sticks across the bottom of the tube to make it stand up.