Science - Volume 9 - Version 9

CARDINAL COMPASS - NO. 9 - HANDS-ON LEARNING - WITH CARL THE CARDINAL

Sound & Vibration

VOL. 9

Every sound is a tiny shaking you can hear. Make rice dance on a drum, build a box guitar, and whisper through a string in three experiments you can do safely at home.

Sound itself is invisible. But it starts with something shaking, and this book lets you see the shaking, feel it, and send it down a string.



Cover illustration: a drum and a guitar waiting in a sunny corner, two sound makers resting until your hands wake them up.

Read together	Build together	Grown-up with you for every experiment



Meet Carl - Sound Carl

Carl the Cardinal is your guide. For this project, he plays a drum with a soft mallet and listens for the shaking in every sound. His green neckerchief and gold compass medallion stay on. Color your own Carl on the last page.

How to use this book: Pages 2-4 tell the story. Page 5 is safety. Read it first, and read it well. This unit protects ears, so the ear rules matter every single time. Then do the three experiments. Finish with the questions. Color Carl at the end.

Keep a notebook near you. Write what you guess. Write what you see.

You will need, for all three experiments: a bowl, plastic wrap, rubber bands (a few thick, a few thin, and one big one for the drum), dry rice (a small pinch), a sturdy open box, a pencil, two paper cups, a long string (about 10 feet), two buttons or bits of toothpick, crayons, a notebook, and a pencil for writing.

What is sound?

Tap a table. Hum a tune. Clap once. Every sound you just made started the same way: something shook. Sound is shaking that travels to your ears. No shaking, no sound.

> **Vibration:** a vibration is a tiny, fast back-and-forth shaking. Every sound starts with something vibrating.
>
> **Sound wave:** a sound wave is the invisible train of pushes a vibration sends out. The pushes travel through the air, and they can travel through string, wood, and water too.
>
> **Pitch:** pitch is how high or low a sound is. Fast vibrations make high sounds. Slow vibrations make low sounds.
>
> **Volume:** volume is how loud or soft a sound is. Bigger shakes make louder sounds. Smaller shakes make softer sounds.

The sound chain, step by step

Here is how every sound reaches you:

1. Something shakes. A drum skin, a rubber band, or your own voice box.
2. The shake pushes the air next to it, again and again.
3. The pushes travel out in every direction. That traveling train of pushes is the sound wave.
4. Your ears catch the pushes. A small skin inside your ear, like a tiny drum, shakes too.
5. Your ear sends the news to your brain. That is hearing.

Try it now: feel your own voice

Rest your fingertips gently on the front of your throat. Now hum, soft and low. Feel that buzz? That is your voice vibrating. Hum higher, and the buzz shakes faster. Hum louder, and the buzz shakes bigger. You just felt pitch and volume with your fingers.

Most sounds travel through air to reach you. But air is not the only road. In this unit, sound will travel through a drum skin you can watch, through rubber bands you can pluck, and through a string you can hold.

When a sound grows weak on its road

Sounds can fade on their way to your ear. Watch for these three thieves of shaking:

- **Distance:** pushes spread out as they travel, so faraway sounds are softer.
- **Soft covers:** pillows and thick curtains soak up shaking on its way.
- **A loose or blocked road:** on a string, a sag or a resting hand uses up shakes early.

The fix-it page later in this book hunts all three, one change at a time.