



Make Your Own Exhibit

From the Sound Gallery: Bucket Radio

At Discovery Museum, we don't just listen to sound in our [Sound Gallery](#). We also see and feel it. Our Bucket Radio exhibit allows visitors to experience sound using their sense of sight, touch, and hearing. Let's recreate a version of this exhibit and add a few more fun experiments along the way. Please, share your experiences with us to the email address below—we'd love to know what you discover!



Supplies

Be sure to ask an adult for help as you gather your supplies to recreate the exhibit!

- Large bowl
- Plastic wrap or large piece of malleable plastic
- Rubber band large enough to fit over the top of your bowl
- Ingredient such as sugar, salt, or sprinkles (avoid powdery substances such as flour)
- A collection of noise-making devices—your voice, clapping hands, pots and pans, instruments, a speaker transmitting sound

Don't have the suggested supplies? We've got you covered! Check out the "Get creative!" section below.

Exploration

- Cut a piece of plastic wrap large enough to cover the top part of your bowl. It will serve as your Bucket Radio membrane.
- Stretch the membrane tightly across the bowl. Use a rubber band to secure the membrane in place.
- Pour a small amount of your ingredient (about 1/2 teaspoon; you can always add more) onto your membrane and spread it around.
- Make noise next to your Bucket Radio.

What do you notice?





Things to try

- Make softer and louder noises.
What do you observe about the ingredient you put on the membrane?
- Make both high and low pitch noises.
Do different pitches cause changes in how your ingredient moves?
- Try making noise from different positions around the bowl.
Does the direction the sound is coming from make a difference?
- Use different noisemakers.
Do different sounds change what you see?
- Using your voice, sing a note for a short time. Now sing the same note for a long time.
What do you notice about the movement of your ingredient?

Get creative!

Remember, experimenting is about trying new things, observing what happens, and then trying more new things. Not all of the supplies you try will work equally well with your exhibit, and that's ok—it's an experiment! Here are some questions to help you get creative...

- If you don't have plastic wrap, what else could you stretch over your bowl? Do you think using different materials might change what you observe?
- What else can you use besides a bowl? How do you think a different container might affect what happens when you make noise?
- Having trouble getting your membrane to do anything? With the help of an adult, play your favorite song on a cell phone and gently rest the speaker against your membrane. What happens? To take it a step further, call a friend or family member, put them on speaker phone, and ask them to talk to you while you place the phone speaker on your membrane. Does the person's voice affect your membrane at all?
- What happens if you poke holes in the top of the plastic wrap of your Bucket Radio? We recommend waiting to do this until after you're done exploring your intact Bucket Radio.
- What else do you want to try with your exhibit? Share your ideas with those in your house and see if they can help you make it happen!
- Don't have any ingredients to put on your membrane? No problem! Here's another activity that uses different supplies that still lets you see sound.



See sound waves in water

- Supplies: container for water, funnel (see photo for an example of a homemade funnel), plastic wrap or another material to spread across the large opening of your funnel
- Start exploring
 - Fill your container with water and place it on a table or the floor where it won't be easily disturbed.
 - Tightly stretch your membrane over the large opening of your funnel and hold the membrane in place with one hand
 - Place the small end of the funnel above the water and tap on your membrane. Will anything happen to the water? Note: You may have to experiment with how hard to tap your membrane.

What do you notice about the water?



- Things To try
 - Does tapping harder or lighter on your membrane affect the water differently?
 - What happens if you tap very quickly? Very slowly?
 - Does holding your funnel closer and farther from the water surface change what you see?
- Get creative!
 - Can you test out funnels of different sizes or shapes? Remember, you can make your funnels!

What's going on?

When you play sounds directed towards your membrane, do your bits of ingredient bounce along to the rhythm? Does the movement of the membrane, and therefore your ingredient, change as the sound changes pitch, or loudness, or location?

Sound is a type of energy, and this energy travels through the air—and any other mediums, like water, wood, and plastic—in waves. These waves are made up of *particles*—tiny bits of the air, wood, plastic, or other medium—vibrating back and forth. When you sing to your Bucket Radio, your vocal cords vibrate (feel the front lower part of your neck next time you talk or sing a song to feel them vibrate!). This vibration causes particles around your vocal cords to vibrate, which in turn vibrate the particles next to them, and eventually this wave of vibration reaches your membrane, causing it to vibrate, too. And the salt and sugar on top of the membrane bounce up and down as if they're on a trampoline.



Changing the loudness, pitch, location, and type of sound you produce changes how the nearby particles vibrate, which in turn changes how your membrane—and therefore bits of ingredient on top of your membrane—move.

But wait! There's a bit more to our Bucket Radio exhibit at Discovery Museum....

Our Bucket Radio not only allows you to feel sound and see sound vibrations, but it also lets you try to increase the volume, or *amplify*, the sound coming from the Bucket Radio. Let's play with this second Bucket Radio idea of sound amplification now. And for those of you who tried the **See sound waves in water** activity in the **Get creative!** section, you were using sound wave amplification to move your water!

Supplies

Be sure to ask an adult for help as you gather your supplies to recreate the exhibit!

- Container of any type (drinking cups and empty cans work well)
- Rubber band large enough to fit across the opening of your container. Some hairbands will work, too.

Exploration

- Stretch your rubber band across your thumb and forefinger and pluck it. Listen to the sound it makes.
- Now, stretch it over an empty container (see photo) and pluck it again.

What do you notice about the sound?

Things to try

- Use containers of different sizes and materials.
Does anything about the sound change?
- Try out different sized rubber bands on your containers.
Do different rubber bands produce different sounds on the same container?
- Stretch more than one rubber band across one container.
How do the two sounds compare when you pluck each rubber band separately? And when you pluck them together?





What's going on?

What did you notice about the sound you heard when you plucked your rubber band stretched across your fingers compared to when you stretched it across a container? Did the loudness of the sound change? By stretching the rubber band across a container, you created a way for the sound waves to get bigger, or *amplify*.

Remember earlier when we talked about how sound waves are vibrating particles that pass along their vibration to the particles around them? (You can always revisit the earlier **What's going on?** section for a reminder.) When you vibrate your rubber band on the container by plucking it, the vibrating rubber band particles pass, or transfer, their vibration to the container. The container is larger than the rubber band (it has a larger *surface area*), so it can vibrate even more particles than the rubber band can. This strengthens, or amplifies, the sound wave, making the sound louder. Many string instruments, including violins and guitars, use strings stretched across an open container (this is called the *sound box* of the instrument) to amplify the sound of the string.

Discovery Museum Bucket Radio Challenge

Can you compose a song using different sized cups and rubber bands?

- Collect an assortment of containers and rubber bands and/or hairbands.
- Pick a simple song you know. Combine the rubber bands and cups you collected so that you can pluck a few notes of the song. Maybe you'll even be able to play the whole thing!

Can you create high notes?

Can you create low notes?

Can you play more than one note on one container?

What happens when you pluck the rubber bands with more force? Less force?





Share your discoveries with us!

We want to know about your Bucket Radios. Share your experience with us in any of the following ways:

- Draw a picture
- Take photos of your various Bucket Radios
- Make an audio or video recording of your music
- Tell us which materials were your favorites to use, why you liked making your own Bucket Radio, what song you tried to play, or any other fun things about your Bucket Radio.

Then, email us at MyHomeDiscoveries@discoveryacton.org, we can't wait to hear from you!

And next time you're at the Discovery Museum, check out our Bucket Radio exhibit in our Sound gallery, and show us what you learned from creating your own exhibit at home. We'll see you here!

Want even more Sound and Bucket Radio fun? Check out these resources:

Videos

What is Sound?

<https://www.youtube.com/watch?v=3-xKZKxXuu0>

Watching Sound in Action

<https://www.youtube.com/watch?v=BoeDI-YkzI0>

Activities

Conversation Piece

<https://www.exploratorium.edu/snacks/conversation-piece>

Listening to the Radio Through Your Teeth

<https://www.exploratorium.edu/snacks/radiohead>

Seeing Sound

<http://cymatica.com/2009/11/25/cymatics-for-kids-a-sound-waves-lesson-plan/>