



# Seeing Sound

**Suggested Grades: 6-12**

## Activity Overview

In this activity, you will use a laser pointer to display the waveform of a sound against a flat surface.

*Note: For this activity you will be using a low power laser pointer. It is important that the laser never be pointed in anyone's eye. You will need adult supervision when using the laser pointer.*

## Steps

1. Cut the top off the large balloon as shown in Figure 1. This is to make the opening larger and allow the balloon to be stretched more easily.



Figure 1. Cut the top off

2. Stretch the balloon over on end of the PVC pipe coupler as shown in Figure 2. Having someone help with this makes it much easier.



Figure 2. Stretch the balloon over one end of the PVC pipe coupler

**Time:** 30 minutes

### Materials

- 3 inch PVC pipe coupler
- Large balloon
- Scissors
- Duct tape
- Strong glue
- Small mirror square
- Large sheet of white paper (optional)
- Low power laser pointer

3. Use duct tape to secure the balloon in place as shown in Figure 3.



Figure 3. Secure the balloon in place using the duct tape

4. Glue the small mirror square to the center of the balloon as shown in Figure 4. Hold the mirror in place so the glue can dry.



Figure 4. Glue the mirror to the center of the balloon

5. Once the glue had dried, turn the device on its side with the balloon end facing a light colored wall or large sheet of white paper taped to the wall as shown in Figure 5.



Figure 5. Position the device on its side with the balloon end facing a wall

6. Use the tape to secure the device in place as shown in Figure 6. This should prevent it from moving.



*Figure 6. Use tape to secure the device in place*

7. This step should only be done with the help of an adult. It is important to make sure the laser is never pointed in anyone's eye.

Position the laser pointer so that it reflects off the mirror onto the light colored wall or large piece of white paper as shown in Figure 7. The laser needs to stay on and motionless. If it has a push button instead of an on/off switch, use a piece of tape to keep the button pushed so the laser stays on.



*Figure 7. Align the laser so the light beam reflects off the mirror onto the wall*

8. The laser pointer should produce a dot of light on the wall. Make noise into the open end of the PVC pipe coupler by clapping, talking, singing, or playing music. Observe the light on the wall while the sound is being made. You should see the light moving similar to what is shown in Figure 8.



*Figure 8. The light should move on the wall in response to the sound*

9. Experiment by making different sounds and/or changing the volume of the sound you make. Try playing different songs into the open end of the PVC pipe coupler.

## **Background Information**

Sound can only be generated through vibration. When we speak, play music or otherwise produce sound, the air is vibrated which in turn vibrates our ear drums, allowing us to hear it. In a vacuum such as in space, there is no air to vibrate and therefore it is silent.

In the most basic sense, when a sound is created it causes the molecule nearest the source to vibrate. As this molecule is touching another molecule it causes that molecule to vibrate too. This continues, from molecule to molecule, passing the energy on as it goes. This is also why at a rock concert, or even being near a car with a large subwoofer, you can feel the bass notes vibrating inside you. The molecules of your body are vibrating, allowing you to physically feel the music.

The noise produced by aircraft can impact both people and animals. Aircraft noise reduction is an important part of NASA's research efforts. NASA engineers study the properties of sound waves in order to design aircraft which produce less noise.